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This is the *Journal of Endovascular Resuscitation and Trauma Management*. We want to provide a truly Open Access platform for the dissemination of knowledge and peer-reviewed research in the field of endovascular and hybrid hemorrhage control.

To achieve this, we do not wish to be bound by medical discipline, country, resource or even the conventional rules of medical publishing. To achieve this goal, we have assembled an Editorial Board of clinicians and scientists who are experts within the field. This project is generously supported by a grant from the Department of Cardiothoracic and Vascular Surgery, Örebro University Hospital, Sweden.

We are keen to receive manuscript submissions that present new original findings, review important topics or educate our readers on any aspect of hemorrhage control, where an endovascular technique has been employed. This can either be in isolation or in combination with open surgical techniques (hybrid surgery). For further information for authors, please see <https://publicera.kb.se/jevtm>.

As the subject of hemorrhage and resuscitation is a common problem across many medical disciplines, we encourage submissions from all specialties: vascular, trauma, acute care, obstetrics, emergency medicine, to mention a few.

The Journal will publish 3 times a year with additional special issues on specific topics, and will be truly Open Access. There will be no article processing charges or publishing fees. All articles will be published online and indexed using a digital object identifier. The Archives can be found on <https://publicera.kb.se/jevtm> under journals and are there with no time or access limitations.

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Author Guidelines

INSTRUCTIONS FOR AUTHORS

A manuscript submitted to the Journal must constitute a unique piece of work that is not previously published or under consideration for publication, in part or whole, elsewhere.

Guidelines for Submission

Submissions should preferably be produced using Microsoft Word, although other formats will be considered. Submissions should be anonymized.

The submission process requires three discreet documents:

1. Cover Letter
2. Title Page
3. Manuscript (including Abstract, Tables and Figures)

Please ensure that the names and contact details of **all** authors are entered on the online submission system.

Cover Letter

This should be written by the corresponding author and must contain the following:

1. The type of manuscript submission (Original Article, Review Article, etc).
2. A sentence or two on the subject of the study.
3. Confirmation that the study is not under consideration for publication by another journal.
4. Confirmation that all of the authors have made a substantial contribution to the manuscript and that they have seen and approved the submission draft.
5. A conflict-of-interest statement regarding the authors. Where there is none, this should be clearly stated. More information about the Journal's publication ethics can be found on the journal webpage: <https://publicera.kb.se/jevtm/ethics>.
6. A clear statement that the authors follow the ethical guidelines as stated on the Journal webpage: <https://publicera.kb.se/jevtm/ethics>.

Title Page

This should consist of the following:

- Title (Compulsory): This should be concise and reflect the type and purpose of the study.
- Authors (Compulsory): These should be listed in order for publication, with first name, initials and surname. If ORCID is available, this should be listed. If it is not, please state so.
- Affiliations (Compulsory): The institution(s) that the authors are affiliated with should be listed. Ensure that sufficient information is included to identify the authors (full addresses are not required).
- Corresponding Author (Compulsory): This individual should be clearly identified, along with one full institutional address and email address.
- Presentation (Optional): The meeting where any of the submitted data was presented should be listed.
- Disclosure (Compulsory): To disclose any official information.
- Acknowledgements (Optional): Any acknowledgements that you would like to include.

- Conflicts of Interest (Compulsory): A conflict-of-interest statement regarding the authors. Where there is none, this should be clearly stated.
- Funding Declaration (Compulsory): Any grant funding should be listed or it should be noted if no grant funds were used.
- Declaration of the Use of Generative AI in the Writing Process (Compulsory): Any use or not use of generative AI or AI-tools during the writing process should be declared here (see Declaration of the Use of Generative AI in the Writing Process below).
- Author Contributions (Compulsory): All authors are expected to have substantially contributed to the study and manuscript writing (see <https://publicera.kb.se/jevtm/policies>).
- Data availability statement (Compulsory): Please include a statement about data sharing.

Main Body

This should consist of text in 12 pts, double spaced with a justified margin, written in US English. While each article type has specified headings, the use of sub-headings is encouraged to aid clarity. These should be formatted as follows:

Main Heading: **BOLD, FULL CAPITALS**

Sub-Heading: ***Bold and Italicized, Title Case***

Sub-sub-heading: *Italicized, sentence case*

Abstract

The abstract should be a maximum of 250 words and consist of the following headings (but see specific manuscript types below for exceptions):

- Introduction
- Methods
- Results
- Conclusions

Keywords

Three to six appropriate keywords should be included.

References

References should follow the Vancouver Style and should be noted in the text numerically in sequence within the text, using square brackets, e.g.: [1] or [1,2] or [1–3].

Example references:

Stannard W, Rutman A, Wallis C, O'Callaghan C. Central microtubular agenesis causing primary ciliary dyskinesia. *Am J Respir Crit Care Med*. 2004;169:634–7.

Tang AL, Diven C, Zangbar B, et al. The elimination of anastomosis in open trauma vascular reconstruction. *J Trauma Acute Care Surg*. 2015; *In Press*. doi: XXXXXXXXXX.

Rasmussen TE, Tai NRM. *Rich's Vascular Trauma*. 3rd ed. Philadelphia: Elsevier; 2015.

Thamm DH. Miscellaneous tumors. In: Withrow S, Vail D, editors. *Small Animal Clinical Oncology*. 5th ed. St. Louis: Elsevier; 2013. pp. 679–88.

Where there are more than six authors, the first three should be included followed by et al.

Figures

Images should be provided as TIFF, JPEG or EPS files. Each image must have a minimum resolution of 300 DPI (dots per inch):

- Half page width: 1200 pixels (8 inches / 2 * 300 dpi)
- Full page width: 2400 pixels (8 inches * 300 dpi)

However, the recommended resolution is (600 dpi)

- Half page width: 2400 pixels (8 inches / 2 * 600 dpi)
- Full page width: 4800 pixels (8 inches * 600 dpi)

If an image includes text, it must be a minimum of 10-point font, preferably in Times New Roman. However, the author must make sure that the smallest text size used is perfectly readable on the intended page width.

Please upload the images as separate files in the electronic submission system. This will allow our staff to evaluate the quality of each image separately.

When submitting radiological and other clinical and diagnostic images, as well as pictures of pathology specimens or photomicrographs, before-and-after images should be taken with the same intensity, direction, and color of light.

When submitting photomicrographs, internal scale markers should be included. Remember to explain the internal scale as well as identify the method of staining in the figure legend.

If symbols such as arrows, asterisks or letters are used in an image, they should contrast with the background. Furthermore, it should be explained in the figure legend what they highlight.

All figures must be cited within the text, presented as Figure 1, Figure 2a,b, and Figures 1 and 2. Figure legends should be styled as follows:

Figure 1 Title of the figure. (a) First sub item. (b) Second sub-item.

Figures should be made as self-explanatory as possible, since many will be used directly in slide presentations. Titles and detailed explanations belong in the legends—not on the illustrations themselves. Remember to always include explanations to abbreviations used in the Figure in the Figure legend.

Tables

Tables should be created in Microsoft Word using 12 pt, preferably using Times New Roman font.

All tables must be cited within the text, presented as Table 1, and Table 1 and 2.

Table legends should be styled as follows:

Title 1 Title of the table. Explanation of the data presented in the table.

Remember to always include explanations to abbreviations used in the table in the table legend or as a footnote to a table.

Supplementary Digital Content

Where manuscripts would benefit from additional content (datasets, images, video) that does not necessarily need to be included in the published article, supplementary digital content

(SDC) can be hosted. This includes, but is not limited to, tables, figures, or video. Authors should include in their cover letter a description of this content and its purpose. All supplementary digital content should be cited within the text, presented as e.g. Supplementary Table 1, Supplementary Figure 1, Supplementary Video 1 etc. Legends to the supplementary digital content should be styled in the same way as the figures and tables included in the main manuscript.

Declaration of the Use of Generative AI in the Writing Process

The guidance below only refers to the writing process, and not to the use of artificial intelligence (AI) tools to analyze and draw insights from data as part of the research process. We strongly recommend not using AI in any analysis and any such use should be reported. Not reporting use of AI can cause direct rejection of the submission.

Where authors use generative AI and AI-assisted technologies in the writing process, authors should only use these technologies to improve readability and language. Applying the technology should be done with human oversight and control, and authors should carefully review and edit the result. AI and AI-assisted technologies should not be listed as an author or co-author or be cited as an author.

Authors must disclose in their manuscript the use of AI and AI-assisted technologies in the writing process by adding a statement at the end of their manuscript in the core manuscript file, before the References list. The statement should be placed in a new section entitled 'DECLARATION OF THE USE OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS'. This declaration does not apply to the use of basic tools for checking grammar, spelling, references etc. If AI tools were used, please include the following statement:

STATEMENT: During the preparation of this work the author(s) used [NAME TOOL / SERVICE] in order to [REASON]. After using this tool/ service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

If there is nothing to disclose, please include the following statement:

STATEMENT: No generative AI or AI-assisted technologies were used during the writing process of this manuscript.

The statement will appear in the published work. Please note that authors are ultimately responsible and accountable for the contents of the work. The Journal of Endovascular Resuscitation and Trauma Management is using dedicated tools for analysis of use of AI in submitted articles.

Proofreading After Acceptance

Once your article has been accepted and undergone peer review, it will be processed, and you will receive the proofs. The purpose of the proof is to check for typesetting or conversion errors and the completeness and accuracy of the text, tables and figures. Substantial changes in content, e.g., new results, corrected values, title, and authorship, are not allowed without the approval of the Editor-in-chief.

All proofs should be revised for corrections by both the author and the scientific quality editor of JEVIM within five working days.

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After online publication, further changes can only be made in the form of an Erratum, which will be hyperlinked to the article.

Online First

The article will be published online after receipt of the corrected proofs. This is the official first publication citable with the DOI. After release of the printed version, the paper can also be cited by issue and page numbers.

SUBMISSIONS

Types of Articles

We accept the following types of articles, and all of them are peer reviewed:

Original Articles

This is a report of a formal basic science or clinical research study. Manuscripts reporting unique scientific studies should be no longer than 5000 words for the main body of the text (from introduction to conclusion, and excluding abstract, references, tables and legends). A maximum of 50 references can be included.

Manuscripts should consist of the following sections:

- **Introduction:** This should concisely present the background to the problem that the study hopes to answer. An aim should be clearly stated at the end of the introduction.
- **Methods:** This section should be suitably detailed to permit replication of the study. Subheadings may be useful in this section to help clarify the content in longer papers. For established methods, appropriate references and a brief description are sufficient; but for new methods, appropriate details are required. For human studies, where relevant, these details are generally important: eligibility (inclusion and exclusion criteria), randomization methods, blinding methods, total consecutive patients enrolled, and number of exclusions or dropouts and reasons. The regulatory permissions for the study should also be detailed, e.g. Institutional Review Board, ethical committee etc, including a protocol/registration number. Where animal research has been undertaken, the institutional animal care and use guidelines that have been followed should be clearly stated.
- **Results:** These should involve the reporting of the salient positive and negative findings of the study in clear language. The use of images, figures and tables are encouraged, of which the data should not be duplicated in the prose. There is no maximum number of figures or tables, but these should be appropriate to the study. Numerical results and P values should be reported to three decimal places.
- **Discussion:** This should place the reported study findings in the context of the literature. Limitations and future direction should also be discussed. Authors must be careful to ensure that conclusions are not overstated and are supported by data.
- **Conclusion:** This section should concisely conclude the findings of your study.

Original articles should contain a structured abstract with a maximum of 250 words.

We recommend that authors use the appropriate Reporting Guideline (<https://www.equator-network.org/>) for their study. If any checklists are used, they should be included during submission.

Editorials

Short, focused Editorials on an important aspect of endovascular hemorrhage control are welcomed. These should endeavor to bring attention to an important topic, or accompany an article published within the Journal. The latter will be invited by the Editor. Submitted manuscripts should be a maximum of 1500 words and can include a maximum of ten references. There is no formal structure on this type of manuscript. Abstracts are not included.

Narrative Review Articles

This style of article can afford the author considerable latitude in examining a pertinent topic in endovascular hemorrhage control. The literature should be examined objectively and presented to the reader in the context of current understanding. The author should be able to synthesize a narrative, which leaves the reader with a good understanding of an emerging or controversial topic. The author is welcome (and encouraged) to express an opinion, but where this is the case, it should be clearly stated.

The submitted manuscript should be no longer than 5000 words for the main body of the text (from introduction to conclusion, and excluding abstract, references, tables and legends). A maximum of 125 references can be included. There is no formal structure; however, the use of logical headings/sub-headings is important to enable readers to follow the article easily. The abstract should also be unstructured and be a maximum of 150 words.

Systemic Reviews and Meta-Analyses

Where there is a topic within the subject area of endovascular hemorrhage control that has a substantial evidence base, a Systematic Review with/without a Meta-Analysis is considered more appropriate than a narrative review article. These articles should follow the methodology established by PRISMA. The overall aim is to provide a pooled analysis that enables firm conclusions to be drawn on a particular subject.

Submitted manuscripts should be no longer than 5000 words for the main body of the text (from introduction to conclusion, and excluding abstract, references, tables and legends). A maximum of 125 references can be included. Manuscripts should consist of the following sections:

- **Introduction:** This should concisely present the background to the problem that the study hopes to answer. An aim should be clearly stated at the end of the introduction.
- **Methods:** This section should be suitably detailed to permit replication of the study. Subheadings may be useful in this section to help clarify the content in longer papers. For established methods, appropriate references and a brief description are sufficient; but for new methods, appropriate details are required. The complete search strategy, if long, could preferably be included as a supplementary digital table, rather than text directly under the method section.
- **Results:** These should involve the reporting of the salient positive and negative findings of the study in clear language. The use of images, figures and tables are encouraged, of which the data should not be duplicated in the prose. There is no maximum number of figures or tables,

but these should be appropriate to the study. Numerical results and P values should be reported to three decimal places.

- *Discussion:* This should place the reported study findings in the context of the literature. Limitations and future direction should also be discussed. Authors must be careful to ensure that conclusions are not overstated and are supported by data.
- *Conclusion:* This section should concisely conclude the findings of your study.

Authors should include a PRISMA checklist in their submission. The abstract should be a maximum of 250 words.

Tips and Techniques

In the evolving world of endovascular hemorrhage control, the advice and opinion of actively practicing clinicians is of great importance. Both solicited and unsolicited submissions are reviewed, both on major and minor components of endovascular techniques. This can be presented in the context of “evidence” or just as an opinion. The use of quality images and diagrams is encouraged. This type of article permits the author to write from experience, rather than from the published literature. Articles explaining how to approach certain problems or how to accomplish certain maneuvers are welcomed.

The submitted manuscript should be no longer than 1500 words for the main body of the text (from introduction to conclusion, and excluding abstract, references, tables and legends). A maximum of 30 references can be included. Manuscripts should consist of the following sections:

- *Introduction:* This should concisely present the background to the problem that the study hopes to answer. An aim should be clearly stated at the end of the introduction.
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- *Discussion:* This should place the reported study findings in the context of the literature. Limitations and future direction should also be discussed. Authors must be careful to ensure that conclusions are not overstated and are supported by data.
- *Conclusion:* This section should concisely conclude the findings of your study.

The abstract should be unstructured and be a maximum of 150 words.

Images of Interest

The Journal accepts images of interest accompanied by a short commentary. The aim of this section is to demonstrate and illustrate an educational message, rather than just to demonstrate dramatic pathology. Images can be submitted as a multi-panel with a series of scans/photographs in order to support the message presented in the narrative. Please remember to carefully follow the instructions for figures (<https://publicera.kb.se/jevtm/instructions>) in this type of publication.

The submitted manuscript should be a maximum of 250 words for the main body of the text, references excluded. A maximum of five references can be included. There is no formal structure on this type of manuscript. Abstracts are not included.

Case Reports

These are short case reports including current literature reviews.

The submitted manuscript should be no longer than 2000 words for the main body of the text (from introduction to conclusion, and excluding abstract, references, tables and legends). A maximum of 30 references can be included. Manuscripts should consist of the following sections:

- *Introduction:* This section should give a brief overview of the problem that the case addresses and include a summary of the relevant literature related to the case. The introduction should include a single sentence describing the patient and the basic condition that he or she suffers from. For Case Reports authors must follow the CARE Guidelines available at <https://www.care-statement.org/> and declare their use at the end of the Introduction.
- *Case Presentation:* This section should include relevant demographic details such as background information about the patient, medical history, details of the patient's symptoms, physical examination, and laboratory/imaging results, the confirmed diagnosis and the course of treatment or intervention, management, and clinical outcome.
- *Discussion:* This section should expand on what has been said in the introduction, focusing on why the case is noteworthy and the problem that it addresses. This should be followed by a summary of the existing literature on the topic that describes the existing theories and research findings on the key issue in the patient's condition. The review should narrow down to the source of confusion or the main challenge in the case. Finally, the case report should connect to the existing literature, mentioning the message that the case conveys. The author should explain whether this corroborates with or detracts from current beliefs about the problem and how this evidence can add value to future clinical practice.
- *Conclusion:* This section should concisely conclude the findings of your study.

An abstract can be included (a maximum of 150 words) but is not compulsory. We recommend that authors use the CARE Reporting Guideline for their study. A completed CARE checklist should be included during submission.

Letters to the Editor

Letters to the Editor that comment on anything within the Journal can be submitted for publication. There is no formal structure on this type of manuscript. The submissions should be a maximum of 1000 words and can include a maximum of ten references. Abstracts are not included.

EVTM-ST Section

Content in this section is published as part of the regular journal issues and is curated by the EVTM-ST Senior Editor.

The EVTM-ST Section is designed to support resident and fellow education. For each issue, the editors will invite one trainee to submit an educational case report. An invited reviewer will then provide a brief accompanying editorial. EVTM-ST editors do not participate as authors or reviewers for this section.

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The section includes a standard case report accompanied by relevant figures (e.g. CT scans, angiography, or other pertinent imaging). The discussion should conclude with a concise “What I learned” summary or bullet points. The invited reviewer’s short editorial forms the final paragraph of the section.

Submissions should be no longer than 1500 words for the main body of text (from introduction to conclusion), excluding the abstract, references, tables, and legends). A maximum of 30 references can be included. Manuscripts should consist of the following sections:

- **Introduction:** This section should give a brief overview of the problem that the case addresses and *include* a summary of the relevant literature related to the case. The introduction should end with a single sentence describing the patient and the basic condition that he or she suffers from.
- **Case Presentation:** This section should include relevant demographic details such as background information about the patient, medical history, details of the patient’s symptoms, physical examination, and laboratory/imaging results, the confirmed diagnosis and the course of treatment or intervention, management, and clinical outcome.
- **Discussion:** This section should expand on what has been said in the introduction, focusing on why the *case* is noteworthy and the problem that it addresses. This should be followed by a summary of the existing literature *on* the topic that describes the existing theories and research findings on the key issue in the patient’s condition. The review should narrow down to the source of confusion or the main challenge in the case. Finally, the case report should connect to the existing literature, *mentioning* the message that the case conveys. The author should explain whether this corroborates with or detracts from current beliefs about the problem and how this evidence can add value to future clinical practice.
- **Conclusion/Learning Points:** This section should concisely conclude the findings of your study and what you learned from it.

An abstract can be included (a maximum of 150 words) but is not compulsory. We recommend that authors use the CARE Reporting Guideline for their study. A completed CARE checklist should be included during submission.

Commentary

Commentaries that comment on anything within the Journal can be submitted for publication. There is no formal structure on this type of manuscript. The submissions should be a maximum of 1000 words and can include a maximum of ten references. Abstracts are not included.

Conference Proceedings

JEVTM publishes selected work from conferences that are formally affiliated with the Journal. Conference affiliation must be approved by the Editorial Board, and all associated submissions remain under the full editorial responsibility of JEVTM.

In line with COPE’s 2025 guidance, all conference proceedings undergo the Journal’s standard double-blind peer-review process, even when guest editors are involved. Guest editors may assist in managing submissions, but the Editor-in-Chief (or a designated Associate Editor) makes all final editorial decisions. The Journal may pause or withdraw review if concerns regarding research integrity arise.

There is no formal structure on this type of manuscript. The submissions should be a maximum of 1000 words and can include a maximum of 10 references. Abstracts are not included. This type of work must also follow all Journal ethical and formatting guidelines.

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Our mission is to promote optimal treatment and new methods for bleeding control in trauma and non-trauma patients, and state-of-the-art endovascular resuscitation. This will be achieved by a joint international body that will support the following:

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- Promoting open dialogue and cooperation between societies, organizations and the industry.
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- Promoting PR for EVTM issues, grants, and collaboration with industry.
- Encouraging residents and young colleagues to carry out research on EVTM issues.
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The EVTM council, led by the society chair, will change membership periodically (i.e., after two years). The council aims to have one or two representatives from each participating country and discipline.

The EVTM Society is supported at this stage by Örebro University Hospital in all financial respects (as part of EVTM research group support). This support has been granted for the forthcoming five years.

The main task of the council is to pave the way for the EVTM venture, and promote the JEVTM/EVTM symposium, EVTM-related courses, cooperation, and free exchange of information.

Members will obtain free access to all JEVTM information and discussions as well as regular updates on EVTM-related activities, education, and developments. Members will also be offered a reduced fee for the EVTM round table symposium.

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As JEVTM develops, the Editorial Board has undertaken a comprehensive review of journal processes to ensure that all editorial procedures remain robust, transparent, and aligned with current international medical publishing standards. We are working intensively on getting the journal to the highest standard of medical journals.

The **Author Guidelines**, submission requirements and style documentation have been updated to reflect best practices in scientific publishing. The journal website is also undergoing improvements to better support authors, reviewers, and readers. All future submissions will be assessed under these updated requirements with the help of the scientific editor team.

In addition, the journal is implementing a more structured and regulated editorial review process to strengthen oversight of submitted manuscripts. This includes closer evaluation of authorship criteria, conflict of interest disclosures, ethical approvals, patient consent where applicable, AI-assisted writing disclosures, data transparency, and adherence to reporting standards relevant to clinical and experimental research.

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Tal M Hörer, editor in Chief, for the JEVTM editorial board.

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Feasibility and Outcomes of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for Non-Compressible Torso Hemorrhage in a Resource-Limited Setting

Panu Teeratakulpisarn, Parichat Tanmit, Weeriya Jeerasuwannakul,
Phati Angkasith, Supatcha Prasertcharoensuk and Narongchai Wongkonkitsin

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Introduction: We evaluated feasibility and outcomes of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for non-compressible torso hemorrhage in a resource-limited setting.

Methods: This retrospective–prospective cohort study included 23 trauma patients undergoing REBOA at a tertiary center in Thailand (2012–2024). Primary endpoints were 24-hour and 28-day survival.

Results: Patients presented with profound shock (median systolic blood pressure 60 mmHg) and severe neurological impairment (median Glasgow Coma Scale 7); 43.5% received prehospital cardiopulmonary resuscitation. REBOA increased systolic blood pressure by 39.8 ± 20.7 mmHg, achieving 82.6% return of spontaneous circulation. The 24-hour and 28-day survival rates were 26.1% and 21.7%, respectively—superior to historical resuscitative thoracotomy outcomes (2–8.5%). Univariate analysis identified Glasgow Coma Scale 9–12 as the strongest survival predictor versus 3–8 (crude odds ratio 23.33, 95% confidence interval 1.95–279.43, $P = 0.013$). No limb ischemia occurred, and acute kidney injury developed in 21.7% of the patients.

Conclusions: In this small observational cohort from a resource-limited setting, REBOA was feasible and was associated with an immediate systolic blood pressure increase, with 26.1% 24-hour survival and 21.7% 28-day survival. Higher Glasgow Coma Scale on arrival was associated with survival. REBOA represents a feasible option in resource-limited trauma centers.

Keywords: REBOA; Hemorrhagic Shock; Non-Compressible Torso Hemorrhage; Endovascular Procedures

Received: 23 February 2026; Accepted: 26 March 2026

INTRODUCTION

Exsanguinating hemorrhage constitutes the leading cause of preventable mortality in trauma patients, accounting for 30–40% of trauma-related deaths worldwide [1,2]. Among hemorrhagic deaths, non-compressible torso hemorrhage (NCTH) presents unique therapeutic challenges. In contrast to extremity hemorrhage, which responds to tourniquet application or direct pressure,

NCTH arising from thoracic, abdominal, or pelvic injuries necessitates urgent surgical or endovascular intervention [3].

For several decades, resuscitative thoracotomy (RT) with aortic cross-clamping has served as the definitive intervention for patients with non-responding hemorrhagic shock from NCTH. Nevertheless, survival following RT remains poor, ranging from 2% in blunt trauma to 8.5% overall [4,5]. The procedure is highly invasive, demands considerable surgical expertise, and is associated with substantial morbidity among survivors.

Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) was initially described by Hughes in 1954 during the Korean War to be used in saving the lives of soldiers suffering from intra-abdominal hemorrhage [6]. The procedure has gained renewed interest in contemporary trauma care [7]. The technique employs percutaneous or open femoral arterial access with endovascular balloon catheter placement to achieve temporary aortic occlusion, thereby maintaining cerebral and

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coronary perfusion while controlling subdiaphragmatic hemorrhage [8].

Recent investigations from Western trauma centers report survival rates of 50–65% in selected REBOA patients, suggesting potential advantages over RT [9,10]. However, these outcomes might not be generalizable to diverse healthcare environments. Data from Southeast Asian trauma centers remain limited, and critical questions persist regarding optimal patient selection, deployment timing, and complication rates in resource-constrained settings.

Our institution, a tertiary referral trauma center located in northeastern Thailand, has been performing REBOA since 2012. This study evaluates clinical outcomes of REBOA in patients with NCTH, identifies factors associated with survival, and characterizes the complication profile in our population. These findings contribute to the expanding evidence base supporting REBOA utilization and could inform protocol development in similar healthcare settings.

METHODS

Study Design and Setting

We conducted a combined retrospective–prospective observational cohort study in a 1,000-bed tertiary referral trauma center serving northeastern Thailand. The study population comprised all trauma patients undergoing REBOA for NCTH between January 2012 and December 2024. The retrospective phase encompassed January 2012 to December 2022; the prospective phase extended from January 2023 to December 2024. The Ethics Committee approved this study; informed consent requirements were waived for retrospectively collected data.

Patient Selection

This was a complete enumeration study including all consecutive patients meeting the inclusion criteria during the 12-year study period.

Inclusion criteria: adult trauma patients (age > 18 years); clinical diagnosis of NCTH (abdominal, pelvic, or thoracic hemorrhage); REBOA performed as a component of resuscitation in non-responder hemorrhagic shock patients.

Exclusion criteria: age < 18 years; REBOA performed for non-traumatic indications; incomplete medical records (retrospective cohort only).

No formal sample size calculation was performed a priori. With 23 patients (18 from the retrospective phase and five from the prospective phase) and an observed survival rate of 21.7%, the 95% confidence interval for survival ranges from 7.5% to 43.7%, providing reasonable precision for this rare intervention in a resource-limited setting.

Primary Survey

All patients underwent the primary survey with simultaneous resuscitation following the ATLS®-protocol. Extended Focused Assessment Sonography in Trauma (eFAST) and portable chest X-ray were performed as the adjunct to the primary survey to exclude significant intrathoracic injuries. All of the results were reviewed immediately by the trauma surgeon staff on duty before deciding to undergo the REBOA procedure. However, owing to limitations in capabilities (such as hybrid emergency room, emergency computed tomography (CT) scan, or availability of interventional radiology), most decisions regarding the procedure are the responsibility of the trauma surgeon staff on duty (Figure 1).

The procedure can be performed in the emergency department (ED), operating room, or the intensive care unit (ICU). This decision depends on the hemodynamics of the patient and the availability of the operating room. In other words, if the patient's condition is stable enough and the operating room is available, the patient should undergo the procedure in the operating room. However, if the operating room is unavailable at that time, the procedure can buy some time for resource management.

REBOA Technique

All REBOA procedures adhered to our standardized institutional protocol:

- (1) *Vascular access:* Common femoral artery cannulation via open cutdown or percutaneous Seldinger technique.
- (2) *Sheath insertion:* 7-French introducer sheath was inserted to ensure intraluminal placement, then exchanged to 10–12-French Aortic sheath.
- (3) *Catheter deployment:* An aortic stent graft balloon was advanced under fluoroscopic guidance when available, or by utilizing external anatomical landmarks without fluoroscopy.
- (4) *Balloon positioning:*
 - Zone 1 (descending thoracic aorta): Abdominal or pelvic hemorrhage
 - Zone 3 (infrarenal aorta): Isolated pelvic hemorrhage
- (5) *Balloon inflation:* Gradual inflation with contrast medium until distal pulse cessation
- (6) *Occlusion management:*
 - Maximum continuous occlusion duration: 60 minutes
 - Partial deflation or intermittent occlusion is employed if prolonged hemorrhage control is required
- (7) *Definitive hemorrhage control:* Emergency surgery or interventional radiology

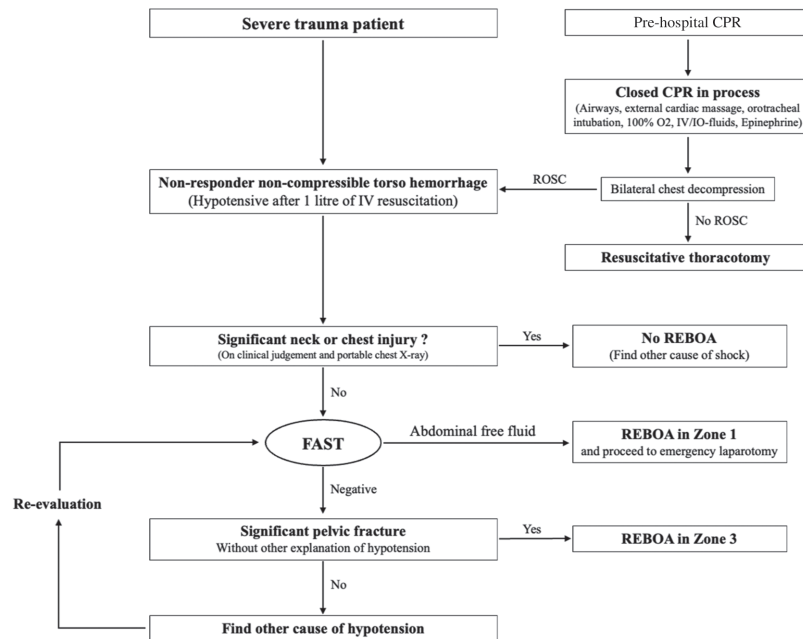


Figure 1 Flowchart showing algorithm for severe non-compressible torso hemorrhage management. CPR: cardiopulmonary resuscitation; ROSC: return of spontaneous circulation; FAST: Focused Assessment Sonography in Trauma; REBOA: Resuscitative Endovascular Balloon Occlusion of the Aorta; IV: intravenous; IO: intraosseous

(8) *Balloon removal*: Gradual deflation following hemorrhage control. After sheath removal, the common femoral artery was sutured using polypropylene material in the open cut down group, and using percutaneous vascular closure device in the percutaneous puncture group. The distal pulses were evaluated when the operation was finished.

All of the patients received the treatment in the same protocol and same devices.

The attending trauma surgeon determined REBOA deployment based on clinical presentation, hemodynamic instability despite resuscitation, and suspected NCTH.

Data Collection and Definitions

All data, such as electronic medical records, trauma registry databases, and operative documentation, were extracted from the internal hospital database. Variables collected encompassed:

Demographic characteristics: Age, sex, weight, height, body mass index; mechanism of injury; prehospital cardiopulmonary resuscitation.

Presentation variables: Vital signs on arrival (systolic blood pressure measured by cuff in the upper extremity; heart rate); Glasgow Coma Scale (GCS) score on arrival (prior sedation); injury severity scores.

Procedural variables: REBOA deployment location (ED, operating room, ICU); vascular access method (open versus percutaneous); balloon Zone (1 or 3); time metrics (door-to-procedure, door-to-occlusion, pre-hospital-balloon-inflation, emergency department-to-operating room transfer, aortic occlusion duration, total operative time).

Physiologic response: Change in systolic blood pressure post-REBOA; return of spontaneous circulation; cardiopulmonary resuscitation requirement during REBOA. If the patient survived the first operation, the invasive monitoring is performed in the ICU to measure the physiologic response.

Resource utilization: Total blood products transfused (first 24 hours); ICU length of stay; hospital length of stay.

Outcomes

- Primary: 24-hour survival and 28-day survival.
- Secondary: Complications (lower limb ischemia, acute kidney injury, continued bleeding requiring intervention, mesenteric ischemia, access site complications); amputation requirement; cause of death.

NCTH was defined as suspected or confirmed hemorrhage from thoracic, abdominal, or pelvic sources not amenable to external compression. *Non-responder hemorrhagic shock* was defined as systolic blood pressure

< 90 mmHg with clinical signs of hypoperfusion after 1-L of intravenous (IV) crystalloid resuscitation. *Acute kidney injury* was defined according to Kidney Disease: Improving Global Outcomes (KDIGO) criteria (a serum creatinine increase of >0.3 mg/dL within 48 hours, or serum creatinine increase 1.5–1.9 times baseline within 7 days, or urine output < 0.5 mL/kg/h for 6–12 hours). *Lower limb ischemia* was defined by clinical manifestations: pain, pallor, pulselessness, paresthesia, and paralysis, which is assessed by the trauma team physicians using clinical assessment and Doppler ultrasonography immediately post-operative and every 6–8 hours until the hemodynamic is stable.

Statistical Analysis

Continuous variables were expressed as mean $\pm$ standard deviation (SD) for normally distributed data or median with interquartile range (IQR) for non-normally distributed data. The Shapiro–Wilk test assessed normality. Categorical variables were presented as frequencies and percentages.

Univariate comparisons between survivors and non-survivors used Student's *t*-test or the Mann–Whitney *U*-test for continuous variables, and chi-square or Fisher's exact test for categorical variables. Crude odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. Statistical significance was defined as $P < 0.05$ (two-tailed). Given the small sample size ($N = 23$) and limited number of outcome events, multivariable regression models were restricted to avoid overfitting. All analyses were conducted using SPSS version 26.0 (IBM Corp., Armonk, NY, USA).

Missing Data

Complete case analysis was performed for all variables. The retrospective cohort ($N = 18$, 2012–2022) had complete data for all primary and secondary outcomes. Missing data occurred for the following variables: door-to-procedure time, door-to-aortic-occlusion time, ED-to-operating room time, operative time, and aortic occlusion time. Patients with missing data for specific variables were excluded only from analyses involving those variables. No imputation methods were employed, given the small sample size.

Ethics Approval and Informed Consent

The study protocol was approved by the Khon Kaen University Ethics Committee in Human Research (HE641418). The study was conducted according to the Declaration of Helsinki. For the retrospective component, informed consent was waived by the ethics committee. For the prospective component, written informed consent was obtained from all participants or their

legal representatives. Patient data were de-identified prior to analysis.

RESULTS

Patient Selection and Flow

During the 12-year study period, from a total of 659 patients with torso hemorrhage (492 abdominal hemorrhages, 60 pelvic hemorrhages, and 107 thoracic hemorrhages), 28 trauma patients underwent REBOA at our institution. Five patients were excluded: three were < 18 years of age, and two had incomplete medical records (retrospective cohort). The final study cohort comprised 23 patients (Figure 2).

Patient Characteristics

During the study period, 23 patients underwent REBOA for NCTH. Baseline characteristics are summarized in Table 1. Mean age was 38.4 ± 19.2 years; 20 patients (87%) were male. Mean body mass index was 23.1 ± 3.7 kg/m². Ten patients (43.5%) received prehospital cardiopulmonary resuscitation.

On arrival, patients demonstrated non-responsive hemorrhagic shock after 1-L of IV crystalloid resuscitation: median systolic blood pressure 60 mmHg (IQR 40–68). Five patients (21.7%) presented with unmeasurable blood pressure; only three patients (13.0%) had systolic blood pressure ≥ 81 mmHg. Median GCS was 7 (IQR 3–11); 15 patients (65.2%) exhibited severe neurological impairment (GCS 3–8).

Procedural Details

The REBOA was decided upon and initiated by a trauma surgeon staff on duty at the emergency room based on the clinical judgement of non-responsive hemorrhagic shock from NCTH after 1-L of IV resuscitation without significant neck or chest injury. The procedure was performed in the operating room (13 patients, 56.5%), ED (nine patients, 39.1%), or ICU (one patient, 4.3%). The principle of the procedures in the operating room is to slow down bleeding and increase blood flow to vital areas. The procedures performed in the emergency room serve as a bridge to the operating room. Percutaneous access was achieved in 13 cases (56.5%), and open cutdown was required in 10 cases (43.5%). Zone 1 occlusion was employed in 22 patients (95.7%), and one patient received Zone 3 occlusion. However, the REBOA procedure did not influence the principle of damage control resuscitation.

Seven patients (30.4%) required cardiopulmonary resuscitation during REBOA deployment. Following balloon inflation, 19 patients (82.6%) achieved return of spontaneous circulation.

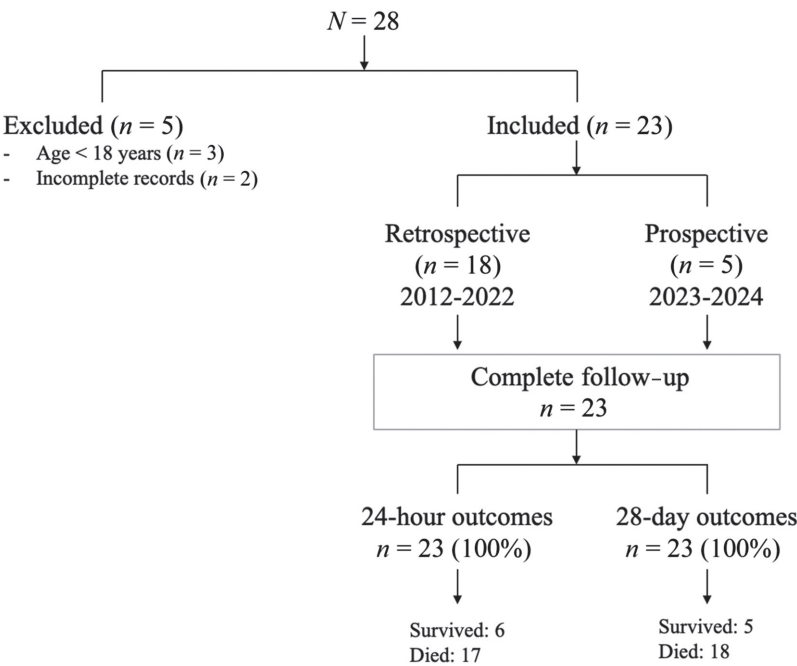


Figure 2 Total number of trauma patients treated with Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for non-compressible torso hemorrhage between 2012 and 2024. Out of the 23 patients included, 17 died within the first 24 hours and, out of the remaining six patients, only five were alive after 28 days.

Only one type of balloon, the Stent graft aortic balloon, was used throughout the study period.

Time Metrics and Hemodynamic Response

Median door-to-procedure time was 33 minutes (IQR 18–54), and median door-to-occlusion time was 39 minutes (IQR 22–62). Mean time to balloon inflation was 6.7 ± 3.4 minutes. For patients undergoing ED REBOA, the median operating room transfer time was 40 minutes (IQR 15–73). Median aortic occlusion time was 53 minutes (IQR 30–93), and mean operative time was 215.4 ± 99.8 minutes.

REBOA produced a mean systolic blood pressure increase of 39.8 ± 20.7 mmHg. Patients required massive transfusion: mean 38.7 ± 25.6 units of blood products within the first 24 hours.

Clinical Outcomes

Survival

The 24-hour survival rate was 26.1% (6/23). One additional patient died between 24 hours and 28 days, yielding a 28-day survival rate of 21.7% (5/23). All five 28-day survivors were discharged alive (Table 2).

Complications

Continued bleeding necessitating additional intervention occurred in 15 patients (65.2%) while en-route for damage

Table 1 Baseline characteristics and procedural details for patients who underwent Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for non-compressible torso hemorrhage (N = 23).

Variable	Value
Demographic Data	
Age, years	38.4 ± 19.2
Male sex	20 (87.0)
Weight, kg	68.5 ± 7.0
Height, cm	171.8 ± 6.7
Body mass index, kg/m²	23.1 ± 3.7
Mechanism of injury	
Blunt	22 (95.65)
Penetrating	1 (4.35)
Prehospital	
Cardiopulmonary resuscitation	10 (43.5)
Presentation	
Systolic blood pressure, mmHg*	60 (40–68)
Systolic blood pressure category	
0 mmHg	5 (21.7)
1–59 mmHg	6 (26.1)
60–80 mmHg	9 (39.1)
>81 mmHg	3 (13.0)
Glasgow Coma Scale	7 (3–11)
Glasgow Coma Scale category	
3–8	15 (65.2)
9–12	8 (34.8)
Trauma score	
AIS – Head > 2	14 (60.87)
AIS – Chest > 2	10 (43.47)
AIS – Abdomen > 2	23 (100)

(Continued)

Variable	Value
AIS – Extremities > 2	12 (52.17)
ISS*	41 (29, 51)
RTS*	4.50 (2.63, 6.38)
Major bleeding sources	
Liver	12 (52.17)
Pelvic bones	7 (30.43)
Spleen	4 (17.39)
Mesenteric vessels	4 (17.39)
Portal vein	1 (4.35)
Pancreas	1 (4.35)
Vena cava	1 (4.35)
Common iliac artery	1 (4.35)
Hepatic artery	1 (4.35)
REBOA procedure	
Location	
Operating room	13 (56.5)
Emergency department	9 (39.1)
Intensive care unit	1 (4.3)
Access method	
Percutaneous	13 (56.5)
Open cutdown	10 (43.5)
Balloon occlusion zone	
Zone 1	22 (95.7)
Zone 3	1 (4.3)
CPR during REBOA	7 (30.4)
Return of spontaneous circulation	19 (82.6)
Time metrics	
Door-to-procedure, minutes*	33 (18–54)
Door-to-aortic occlusion, minutes*	39 (22–62)
Time to balloon inflation, minutes	6.7 ± 3.4
Emergency department-to-operating room, minutes [†]	40 (15–73)
Aortic occlusion time, minutes*	53 (30–93)
Operative time, minutes	215.4 ± 99.8
Hemodynamic response	
Change in systolic blood pressure, mmHg	39.8 ± 20.7
Transfusion	
Total blood products, units	38.7 ± 25.6

Data are mean ± SD, n (%), or *median (interquartile range). [†]Among patients who underwent REBOA in the emergency department (n = 9). CPR: cardiopulmonary resuscitation; SD: standard deviation; AIS: Abbreviated Injury Scale; RTS: Revised Trauma Score; ISS: Injury Severity Score. All variables had complete data for all 23 patients. No imputation was performed.

control surgery. Acute kidney injury developed in five patients (21.7%), all of whom were survivors. Notably, no cases of lower limb ischemia were observed (0%).

Factors Associated with Survival

Univariate analysis

Table 3 presents univariate analysis comparing 24-hour survivors and non-survivors. Higher systolic blood pressure on arrival demonstrated a trend toward improved survival (median 69 versus 58 mmHg, $P = 0.103$). Higher GCS was significantly associated with survival (median 11 versus 3, $P = 0.024$). There were three

Table 2 Clinical outcomes and complications for patients who underwent Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for non-compressible torso hemorrhage ($N = 23$).

Outcome	n (%)
Survival	
24-hour survival	6 (26.1)
28-day survival	5 (21.7)
In-hospital survival	5 (21.7)
Mortality cause	
Exsanguination	15 (65.2)
Severe acidosis (multiorgan failure)	2 (8.7)
Brain herniation	1 (4.3)
Complications	
Continued bleeding requiring intervention	15 (65.2)
Acute kidney injury	5 (21.7)
Lower limb ischemia	0 (0)

intracerebral hemorrhages and one diffuse axonal injury from the six surviving patients reported from the CT scan after stabilization. No survivor had received prehospital cardiopulmonary resuscitation, compared with 58.8% of non-survivors. A shorter aortic occlusion time showed a trend toward improved survival (median 31.5 versus 65 minutes; $P = 0.147$).

28-day mortality

Similar patterns emerged for 28-day mortality (Table 4). Patients with GCS 9–12 had 14-fold higher odds of survival than those with GCS 3–8 (crude OR 14.0, 95% CI 1.20–163.37, $P = 0.035$). Other variables demonstrating trends included arrival systolic blood pressure (crude OR 1.13 per mmHg, 95% CI 0.97–1.31, $P = 0.112$), ED-to-operating room time (crude OR 1.02 per minute, 95% CI 1.00–1.04, $P = 0.078$), and total blood products (crude OR 0.96 per unit, 95% CI 0.90–1.01, $P = 0.121$).

DISCUSSION

This study presents our 12-year institutional experience with REBOA for non-compressible torso hemorrhage at a tertiary trauma center in Thailand. Our findings demonstrate that REBOA achieved 21.7% survival in a critically ill patient population presenting with profound hemorrhagic shock. While this survival rate is lower than that reported in some recent Western series (50–65%) [9,10], it must be interpreted in the context of our patient population's extreme physiologic derangement.

Patient Severity and Outcomes

Our cohort represented exceptionally critically ill patients. Median systolic blood pressure on arrival was 60 mmHg; 21.7% presented with unmeasurable blood pressure. Nearly half (43.5%) required prehospital cardiopulmonary resuscitation, and two-thirds

Table 3 Factors associated with 24-hour survival in patients who underwent Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for non-compressible torso hemorrhage.

Variable	Died (N = 17)	Survived (N = 6)	Crude OR (95% CI)	P
Age, years*	27 (24–48)	47 (20–62)	1.01 (0.97–1.06)	0.566
Weight, kg	67.6 ± 6.9	71.2 ± 7.4	1.08 (0.94–1.24)	0.282
Body mass index, kg/m ² *	21.8 (20.1–25.5)	22.9 (21.5–25.1)	1.15 (0.89–1.49)	0.279
Prehospital CPR				
No	7 (41.2)	6 (100)	Reference	—
Yes	10 (58.8)	0 (0)	—	—
Systolic blood pressure, mmHg*	58 (0–64)	69 (67–81)	1.13 (0.98–1.31)	0.103
Glasgow Coma Scale*	3 (3–8)	11 (9–12)	1.76 (1.08–2.89)	0.024
Glasgow Coma Scale category				
3–8	14 (82.4)	1 (16.7)	Reference	—
9–12	3 (17.6)	5 (83.3)	23.33 (1.95–279.43)	0.013
Trauma scores				
ISS	39.9 ± 16.5)	49.7 ± 17.2	1.228 (–6.74–26.19)	0.233
REBOA location				
Operating room	9 (52.9)	4 (66.7)	Reference	—
Emergency department	7 (41.2)	2 (33.3)	0.64 (0.09–4.58)	0.659
Intensive care unit	1 (5.9)	0 (0)	—	—
Access method				
Open	8 (47.1)	2 (33.3)	Reference	—
Percutaneous	9 (52.9)	4 (66.7)	1.78 (0.25–12.45)	0.562
CPR during REBOA				
No	11 (64.7)	5 (83.3)	Reference	—
Yes	6 (35.3)	1 (16.7)	0.37 (0.03–3.91)	0.406
Change in SBP, mmHg	36.9 ± 18.4	47.8 ± 26.3	1.03 (0.98–1.08)	0.268
Door-to-procedure, minutes*	28 (15–40)	34.5 (30–126)	1.01 (0.99–1.02)	0.428
Door-to-occlusion, minutes*	35 (20–51)	42 (38–131)	1.01 (0.99–1.02)	0.438
Occlusion time, minutes*	65 (35–103)	31.5 (25–55)	0.97 (0.93–1.01)	0.147
Operative time, minutes	231.1 ± 107.3	176.0 ± 70.7	0.99 (0.98–1.01)	0.261
Total blood products, units*	41.7 ± 26.5	30.3 ± 23.2	0.98 (0.94–1.02)	0.349

Data are mean ± SD, n (%) or *median (interquartile range). Bold indicates $P < 0.05$. CI: confidence interval; CPR: cardiopulmonary resuscitation; OR: odds ratio; SBP: systolic blood pressure; SD: standard deviation; ISS: Injury Severity Score. Total blood products included red blood cells, plasma, platelet concentration, and cryoprecipitated.

Table 4 Factors associated with 28-day mortality in patients who underwent Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for non-compressible torso hemorrhage.

Variable	Died (n = 18)	Survived (n = 5)	Crude OR (95% CI)	P
Age, years*	27 (22–48)	53 (41–62)	1.03 (0.98–1.09)	0.215
Weight, kg	68.3 ± 7.3	69.4 ± 6.7	1.02 (0.89–1.18)	0.746
Body mass index, kg/m ²	23.2 ± 4.1	22.7 ± 1.5	0.97 (0.73–1.28)	0.818
Prehospital CPR				
No	8 (44.4)	5 (100)	Reference	—
Yes	10 (55.6)	0 (0)	—	—
Systolic blood pressure, mmHg*	58.5 (0–65)	70 (68–81)	1.13 (0.97–1.31)	0.112
Glasgow Coma Scale*	4.5 (3–8)	11 (9–11)	1.52 (1.00–2.31)	0.051
Glasgow Coma Scale category				
3–8	14 (77.8)	1 (20.0)	Reference	—
9–12	4 (22.2)	4 (80.0)	14.00 (1.20–163.37)	0.035
Door-to-occlusion, minutes*	37 (20–51)	45 (38–131)	1.01 (0.99–1.02)	0.317
Emergency department-to-operating room, minutes*	35 (15–59)	63 (60–121)	1.02 (1.00–1.04)	0.078
Occlusion time, minutes*	59 (30–103)	33 (25–55)	0.98 (0.94–1.01)	0.219
Operative time, minutes	232.6 ± 103.9	160.2 ± 66.2	0.99 (0.97–1.00)	0.174
Total blood products, units	43.3 ± 26.6	22.2 ± 13.3	0.96 (0.90–1.01)	0.121

Data are mean ± SD, n (%), or *median (interquartile range). Bold indicates $P < 0.05$. CI: confidence interval; CPR: cardiopulmonary resuscitation; OR: odds ratio; SD: standard deviation. Total blood products included red blood cells, plasma, platelet concentration, and cryoprecipitated.

demonstrated severe neurological impairment (GCS 3–8). These characteristics indicate that our patients were moribund, representing a population that would traditionally undergo resuscitative thoracotomy with anticipated survival rates of only 2–8.5% [4,5].

Compared with these historical outcomes, REBOA appears to confer superior survival in this critically ill population. The American Association for the Surgery of Trauma (AAST) Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery (AORTA) registry reported overall REBOA survival of 54.8%; however, their cohort demonstrated a median systolic blood pressure of 80 mmHg with only 23% receiving cardiopulmonary resuscitation [11]. When examining exclusively their most severely injured patients (systolic blood pressure < 70 mmHg), survival approximated 30%, which is more comparable with our results [11].

GCS as a Prognostic Indicator

The most striking finding was the robust association between presenting GCS and survival. Patients with GCS 9–12 had 23-fold higher odds of 24-hour survival than those with GCS 3–8, with important implications for patient selection.

GCS likely serves as a surrogate marker for multiple physiologic derangements. Lower GCS may reflect: prolonged hypoperfusion with cerebral injury; more severe hemorrhagic shock; concomitant traumatic brain injury; advanced acidosis and coagulopathy, which can improve after resuscitation. This finding aligns with previous investigations suggesting that REBOA achieves optimal efficacy when deployed before complete cardiovascular collapse [12,13]. The Japanese DIRECT-IABO (Diagnostic and Interventional Radiology in Emergency, Critical care and Trauma-Intra-Aortic Balloon Occlusion registry) study similarly identified consciousness level as a significant REBOA survival predictor [14].

We did not perform formal sensitivity analyses given the small sample size ($N = 23$). However, the consistency of GCS as a predictor across both 24-hour and 28-day mortality on univariate analysis, and the magnitude of effect (crude OR 23.33 for 24-hour, crude OR 14.00 for 28-day) strengthens confidence in this finding. The finding remained robust when analyzed as both a continuous variable (OR 1.76 per point) and a categorical variable (9–12 vs 3–8). Nevertheless, GCS alone cannot be the sole deciding factor in initiating or terminating a procedure. We recommend using it as part of a decision-making process, along with other factors.

Procedural Metrics and Timing

Our median door-to-occlusion time of 39 minutes exceeds that reported by many Western centers (20–30 minutes) [15,16]. However, this must be contextualized

by our deployment locations. Only 39.1% of REBOA procedures were performed in the ED; the majority (56.5%) occurred in the operating room, necessitating patient transport. For patients undergoing emergency department REBOA, the median door-to-occlusion time was 37 minutes, which is more comparable to the published literature. Upon reviewing their medical history, we found that some patients reported a transient response to resuscitation for a short period, which might have been the reason for the delay in deciding to proceed with the procedure. But once the decision was made to proceed with the procedure, it only took about 6 minutes to the aortic occlusion time.

Interestingly, shorter prehospital-occlusion showed a trend toward improved survival, but this did not reach statistical significance ($P = 0.438$). This might reflect competing priorities in trauma resuscitation. Some patients might benefit from rapid ED REBOA deployment, whereas others might be better served by immediate operative intervention with REBOA performed in the operating room concurrent with definitive hemorrhage control.

Hemodynamic Response

REBOA achieved a mean systolic blood pressure increase of 39.8 mmHg, consistent with the physiologic objective: temporarily augmenting afterload and maintaining vital organ perfusion proximal to the balloon. The 82.6% return-of-spontaneous-circulation rate demonstrates REBOA's effectiveness in reversing cardiovascular collapse.

Nevertheless, hemodynamic improvement must be weighted against the risk of prolonged aortic occlusion. Our median occlusion time of 53 minutes falls within recommended limits; however, 25% of patients experienced occlusion times exceeding 93 minutes. Prolonged occlusion is associated with reperfusion injury, metabolic acidosis, and spontaneous-circulation dysfunction [17].

Complications

Our complication profile was favorable compared with some published series. Most notably, no cases of lower limb ischemia requiring intervention were observed, in contrast to some studies reporting limb ischemia rates of 10–20% [18,19]. Several factors could explain this finding: short occlusion times (median 53 minutes), potentially preventing severe distal ischemia; Zone 1 occlusion predominance (95.7%), possibly providing superior collateral flow versus Zone 3 occlusion; percutaneous access (56.5%), potentially reducing vascular injury compared with open cutdown; and early mortality before limb ischemia manifestation.

Acute kidney injury occurred in 21.7% of patients, exclusively among survivors, representing an acceptable

complication rate for a life-saving intervention and lower than the 30–40% acute kidney injury rate reported in some REBOA series [17]. The true rate might be higher, as many patients died before kidney injury.

Comparison with Resuscitative Thoracotomy

Although our study lacked a direct comparison with a resuscitative thoracotomy group, our 21.7% survival rate compares favorably with historical resuscitative thoracotomy survival rates of 2–8.5% in similar patient populations [4,5]. REBOA offers several theoretical advantages: less invasive (percutaneous capability); faster deployment (thoracotomy not required); maintainability during operating room transport; reversibility (controlled reperfusion via gradual balloon deflation) and lower technical skill threshold than resuscitative thoracotomy.

However, the REBOA cannot replace the resuscitative thoracotomy in the event of witnessed cardiac arrest, or the need of intrathoracic intervention. The procedure serves only if it is certain that the patient has abdominopelvic bleeding and no significant neck or chest injury.

The resuscitative thoracotomy retains advantages in specific clinical scenarios: cardiac tamponade requiring pericardial window; cardiac injury requiring direct repair; massive air embolism requiring cardiac venting; and inability to obtain femoral access. The optimal algorithm likely incorporates both techniques, with REBOA serving as the initial approach for most NCTH patients without significant neck or chest injury, and resuscitative thoracotomy reserved for specific thoracic injuries or failed REBOA [20].

Resource-Limited Settings

Our experience demonstrates the feasibility of REBOA in resource-limited settings. Thailand is classified as an upper-middle-income country; while our center maintains adequate basic equipment and blood supply, we lack certain resources available at Western trauma centers, such as hybrid operating rooms, hybrid emergency room, 24/7 interventional radiology, or a fluoroscopic machine in the emergency room. Despite these limitations, reasonable outcomes were achieved.

Key factors enabling REBOA success in our setting included: institutional commitment (a dedicated trauma team and standardized protocols); training (ongoing education for surgeons and staff); equipment availability (maintenance of REBOA catheter inventory); and a multidisciplinary approach (surgery, anesthesia, and nursing collaboration). Our findings suggest that REBOA can be successfully implemented in similar healthcare environments, without delaying the diagnosis and management, potentially saving lives in regions where resuscitative thoracotomy is not available.

However, this procedure only slows down bleeding in the abdominopelvic cavity but does not achieve hemostasis. Therefore, there is an ongoing hemorrhage. A hospital with an insufficient blood supply or massive transfusion protocol may be another factor contributing to the mortality, which should be further studied.

Clinical Implications

Based on our findings, we propose the following clinical recommendations:

Patient selection: REBOA should be considered for NCTH patients in hemorrhagic shock; patients with higher GCS (≥ 9) are most likely to benefit; spontaneous-circulation cardiopulmonary resuscitation associates with poor outcomes but should not constitute an absolute contraindication and patients in complete cardiovascular collapse might derive limited benefit.

Deployment strategy: ED deployment may be appropriate for patients requiring immediate intervention; operating room deployment is reasonable for patients tolerating brief transport; goal door-to-occlusion time < 40 minutes and percutaneous access should be attempted when feasible.

The decision to transfer a patient depends on several factors, such as the patient's hemodynamic status at the time and the availability of the team and equipment, as surgical procedures are usually performed in an operating room with more advanced facilities. Furthermore, moving patients with so much equipment is not easy and could lead to complications.

Occlusion management: Target occlusion time < 60 minutes; consider partial deflation or intermittent occlusion if prolonged hemorrhage control is required and coordinate with the surgical team for definitive hemorrhage control.

Complication prevention: Monitor for limb ischemia, though risk appears low with appropriate technique; anticipate acute kidney injury in survivors and optimize renal protection and employ gradual balloon deflation to minimize reperfusion injury.

Study Limitations

Several important limitations exist: small sample size (23 patients) limiting statistical power and generalizability; single-center experience with potentially limited external applicability; absence of comparison group precluding direct comparison with resuscitative thoracotomy or alternative strategies; retrospective component with potential for missing data such as the duration of CPR en-route and selection bias; heterogeneous population mixing injury mechanisms and anatomic locations; lack of long-term outcomes (functional status, quality of life); variable operator

experience as the technique evolved over the 12-year period.

The small sample size ($N = 23$) with limited outcome events (six survivors at 24 hours, five at 28 days) severely constrains our statistical analyses. With an events-per-variable ratio of 5–6:1, well below the recommended 10:1 threshold, the multivariable models are at high risk of overfitting and should be interpreted as exploratory rather than confirmatory.

Because some patients did not respond to the procedure and resuscitation, ongoing data collection, such as lactate trends and base-deficit, was incomplete. Therefore, the analysis of complications related to the procedure was lacking.

Missing Data

Of the 17 fatalities, 10 were consistent with clinical signs of severe traumatic brain injury, but only six were confirmed by CT scans or autopsies. Owing to religious and belief reasons, the patients' relatives did not consent to the examination. Some of this information is therefore missing.

Similarly, the complication data (such as acute kidney injury, lower limb ischemia, or multiorgan failure) of the early deaths cannot be collected.

Future Directions

Several areas warrant further investigation: randomized controlled trials comparing REBOA with resuscitative thoracotomy in appropriate patient populations; partial REBOA evaluating partial occlusion strategies to reduce ischemic complications; multiorgan REBOA assessing prehospital deployment feasibility and safety; predictive models developing algorithms to identify ideal REBOA candidates; long-term outcomes examining quality of life and functional status in survivors; cost-effectiveness analyses of REBOA implementation; training methodologies determining optimal education strategies for REBOA proficiency and zone selection comparing Zone 1 versus Zone 3 occlusion effectiveness.

CONCLUSIONS

In this single-center cohort of trauma patients with NCTH and profound shock, REBOA use was associated with 21.7% 28-day survival and an immediate rise in systolic blood pressure. Higher GCS on presentation was associated with better survival in both 24-hour and 28-day analyses. REBOA was feasible in our resource-limited setting with no observed limb ischemia and acute kidney injury in 21.7%, but these findings should be interpreted cautiously given the small sample size and observational design.

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Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Author Contributions

Panu Teeratakulpisarn significantly contributed to the conception, design, review, editing, and drafting the original manuscript. Parichat Tanmit was responsible for verification, formal analysis, and serving as the corresponding author. Weeriya Jeerasuwannakul focused on data collection and interpretation. Phati Angkasith contributed to designing the methodology and analysis. Supatcha Prasertcharoensuk and Narongchai Wongkonkitsin served as scientific research advisors. All authors reviewed and approved the final version of the manuscript.

Data Availability

For restricted access due to confidentiality: The data that support the findings of this study are not publicly available due to confidentiality restrictions of the hospital but are available from the corresponding author upon reasonable request.

Declaration of the Use of Generative AI in the Writing Process

No generative AI or AI-assisted technologies were used during the writing process of this manuscript.

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Endovascular Therapy Versus Open Surgical Repair for Lower Limb Vascular Trauma

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Introduction: Lower limb vascular trauma is a time-critical emergency with a high risk of limb loss. Open surgical repair (OSR) has traditionally been the standard treatment, but endovascular therapy (ET) is increasingly utilized. This study aimed to compare the effectiveness and safety of ET versus OSR.

Methods: A systematic review and meta-analysis of comparative observational studies was performed. Adult patients with traumatic lower limb arterial injuries involving the popliteal artery and/or superficial femoral artery were included. A random-effects model was used to calculate pooled risk ratios (RRs) with 95% confidence intervals (CIs). Statistical heterogeneity was assessed using the I^2 statistic.

Results: Six retrospective cohort studies involving 9,503 patients were included. Of these, 1,315 patients underwent ET and 8,188 underwent OSR. ET was associated with a reduced risk of amputation compared with OSR (RR 0.67; 95% CI 0.50–0.91). Subgroup analyses demonstrated no significant difference in blunt (RR 0.90; 95% CI 0.59–1.37) or penetrating popliteal artery injuries (RR 0.84; 95% CI 0.21–3.34). ET significantly reduced the risk of compartment syndrome (RR 0.43; 95% CI 0.33–0.56) and the need for fasciotomy (RR 0.43; 95% CI 0.27–0.69).

Conclusions: ET might provide limb salvage outcomes comparable to OSR while significantly reducing ischemia-related morbidity, particularly compartment syndrome and fasciotomy. These findings suggest that ET may be considered in selected patients, although the evidence remains limited.

Keywords: Vascular Trauma; Endovascular Therapy; Open Surgical Repair; Compartment Syndrome; Fasciotomy; Meta-Analysis

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INTRODUCTION

Lower limb vascular trauma is a time-critical surgical emergency associated with high risks of hemorrhage, acute limb ischemia, amputation, and mortality [1–3]. Injuries to major vessels—particularly the superficial femoral artery (SFA) and popliteal artery—most commonly result from high-energy blunt or penetrating mechanisms and are frequently accompanied by complex musculoskeletal, venous, and soft tissue injuries [3,4]. Delayed revascularization might lead to irreversible

ischemic damage, ischemia–reperfusion injury, and permanent limb dysfunction [5,6].

Historically, open surgical repair (OSR) has been considered the gold standard for traumatic lower extremity arterial injury, providing reliable arterial control and acceptable limb salvage when performed promptly [2,4,7]. However, OSR is inherently invasive and often requires extensive exposure, vascular clamping, and prolonged operative time, which might exacerbate ischemia–reperfusion injury and contribute to postoperative morbidity [8–10]. A major complication following OSR is acute compartment syndrome, driven by prolonged ischemia, reperfusion edema, venous obstruction, and extensive soft tissue dissection, frequently necessitating fasciotomy and leading to increased morbidity [11–14].

Over the past two decades, endovascular therapy (ET) has emerged as an alternative or adjunct to OSR in selected trauma patients [1,2,15]. Advances in imaging, device technology, and operator expertise have enabled minimally invasive approaches such as covered stent placement and intraluminal revascularization in the acute

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trauma setting [15–17]. These techniques offer potential advantages, including reduced soft tissue trauma, shorter ischemic times, and avoidance of prolonged arterial clamping, which might mitigate ischemia-related complications [9,10,18]. The expansion of hybrid operating rooms and multidisciplinary trauma teams has further facilitated the integration of ET into modern damage control strategies [19–22]. Recent international guidelines, including those from the American Association for the Surgery of Trauma–World Society of Emergency Surgery (AAST–WSES) and the European Society for Vascular Surgery (ESVS), emphasize rapid diagnosis and timely restoration of arterial perfusion as key principles in the management of extremity vascular injuries [20–21].

Despite these advances, the comparative effectiveness of ET versus OSR remains debated. Concerns regarding durability, thrombosis, reintervention, and delayed complications persist, and observational studies are inherently limited by selection bias, as ET is often applied to older patients or anatomically favorable injuries [23–27]. While recent database analyses suggest comparable limb salvage outcomes between ET and OSR for SFA and popliteal artery injuries, the impact of ET on ischemia-related morbidity—particularly compartment syndrome and fasciotomy—remains incompletely defined [11,14,28].

Accordingly, this systematic review and meta-analysis aimed to evaluate the comparative effectiveness and safety of ET versus OSR for traumatic lower limb vascular injury in adult patients, with a specific focus on limb salvage and ischemia-related morbidity, including compartment syndrome and fasciotomy, in accordance with a prospectively registered study protocol.

METHODS

Study Design and Protocol

This study was conducted as a systematic review and meta-analysis in accordance with a prospectively registered PROSPERO (the International Prospective Register of Systematic Reviews) protocol (CRD420251243627).

Outcomes

The prespecified primary outcome was limb salvage. As the included studies did not consistently report a uniform time frame (e.g., 30-day or long-term amputation), amputation was defined as any reported limb loss during the study-specific follow-up period. Reported timeframes varied across studies and included in-hospital, 30-day, or unspecified follow-up durations. Secondary outcomes included ischemia-related morbidity, specifically compartment syndrome and the need for fasciotomy. Additional outcomes of interest included mortality, arterial patency, reintervention, and length of hospital stay; however, these were not consistently reported and were not included in the quantitative synthesis.

Protocol Registration and Deviations

Although risk of bias assessment using ROBINS-I (Risk Of Bias In Non-randomized Studies of Interventions) and certainty assessment using GRADE (Grading of Recommendations Assessment, Development and Evaluation) were prespecified, its application was limited by incomplete reporting in the included studies, which were primarily retrospective database analyses [29,30].

Literature Search

A systematic search was conducted in PubMed, Cochrane CENTRAL, and ScienceDirect for studies published between January 1, 2016, and March 14, 2026 using the search terms (“Vascular Injuries”[Mesh] OR “vascular trauma” OR “arterial injury”) AND (“Lower Extremity”[Mesh] OR femoral OR popliteal OR tibial OR peroneal) AND (“Endovascular Procedures”[Mesh] OR endovascular OR stent* OR embolization OR angioplasty).

Eligibility Criteria

Out of 1,540 publications identified, and 75 studies assessed for full-text eligibility, six met the criteria for quantitative synthesis. Adults were defined as patients aged ≥ 18 years. ET was defined as minimally invasive vascular repair techniques including stent or stent-graft placement and other catheter-based interventions. OSR was defined as conventional open vascular reconstruction procedures, including interposition grafting, bypass grafting, primary repair (direct suture), and patch angioplasty.

Data Extraction

Extracted data included study characteristics, study design, study period, arterial segment involved, and reported outcomes.

Subgroup analyses based on the specific arterial segment (SFA versus popliteal artery, including injuries below the knee) were not performed in this meta-analysis, as most included studies did not report outcomes stratified by precise injury location. Consequently, differences in prognosis or the utilization of endovascular therapy between SFA and popliteal artery injuries could not be assessed. Subgroup analysis by mechanism of injury was only feasible for studies that reported stratified data.

Risk of Bias Assessment

Risk of bias was assessed using the ROBINS-I tool, evaluating seven domains including confounding, participant selection, intervention classification, deviations from intended interventions, missing data, outcome measurement, and selective reporting.

Statistical Analysis

All statistical analyses were conducted using Review Manager (RevMan) version 5.4.1 (The Cochrane Collaboration, Copenhagen, Denmark). A random-effects model (DerSimonian and Laird method) was used to account for inter-study variability. Dichotomous outcomes were analyzed using the Mantel–Haenszel method and reported as risk ratios (RRs) with 95% confidence intervals (CIs). Statistical heterogeneity among studies was assessed using the I^2 statistic, with thresholds of 25%, 50%, and 75% indicating low, moderate, and high heterogeneity, respectively. A p -value <0.05 was considered statistically significant.

Ethical Approval Statement

Ethical approval was not required for this study because it is based exclusively on previously published data.

RESULTS

Study Selection

The database search identified 1,540 records (PubMed $n = 107$, CENTRAL $n = 16$, ScienceDirect $n = 1,417$). After removal of 210 duplicate records and 10 unrelated records, 1,320 records remained for title and abstract screening. Of these, 1,240 records were excluded during the screening stage. Eighty reports were sought for retrieval and five reports were not retrieved. Seventy-five full-text articles were assessed for eligibility. Sixty-nine reports were excluded for the following reasons: non-traumatic population or non-traumatic acute limb ischemia ($n = 28$), conference abstracts only ($n = 9$), systematic or narrative reviews without primary data ($n = 14$), single-arm studies without a relevant comparator ($n = 10$), and insufficient or non-extractable outcome data ($n = 8$). Ultimately, six studies were included in both the qualitative synthesis and the quantitative meta-analysis [22–27] (Figure 1). The PRISMA flow diagram was reviewed and corrected to ensure consistency in record counts across all stages of study selection. The study selection process is illustrated in Figure 1.

Study Characteristics

The six included studies comprised a total of 9,503 adult patients (≥ 18 years) with traumatic lower extremity arterial injury. Of these, 1,315 patients (13.8%) underwent ET and 8,188 patients (86.2%) underwent OSR. Vascular injuries involved the popliteal artery, SFA, and the tibioperoneal arteries. One study reported outcomes stratified by mechanism of injury, including blunt and penetrating popliteal artery injuries, allowing for subgroup analyses [22], whereas the remaining five studies evaluated mechanism cohorts without stratified reporting [23–27]. All included studies were retrospective

observational analyses derived from large national trauma or administrative databases. The characteristics of the included studies are summarized in Table 1.

Baseline patient characteristics, including age, sex, injury severity score (ISS), and mechanism of injury, are summarized in Table 2.

Patients undergoing ET tended to be older across several studies; however, ISSs were inconsistently reported and could not be reliably compared between groups (Table 2).

Amputation

Across individual studies, amputation rates were broadly comparable between ET and OSR, although the magnitude and direction of effect varied by study population. The pooled analysis is presented in Figure 2. In the study focusing on popliteal artery injury with stratification by mechanism of injury, ET was associated with a reduced risk of amputation in pooled analysis, although subgroup analyses did not demonstrate consistent significance across all injury mechanisms [22]. Subgroup analyses demonstrated no significant difference in blunt popliteal artery injuries (RR 0.90; 95% CI 0.59–1.37) or penetrating injuries (RR 0.84; 95% CI 0.21–3.34).

In studies where the injury mechanism or arterial segment was not specified in detail, ET was associated with a significantly lower amputation risk compared with OSR (RR 0.46; 95% CI 0.29–0.73; Figure 2).

In the pooled meta-analysis of the five studies that reported amputation as an outcome [22,24–27], ET was associated with a reduced risk of amputation compared with OSR (RR 0.67; 95% CI 0.50–0.91; Figure 2). Statistical heterogeneity was negligible ($I^2 = 0\%$), indicating highly consistent effect estimates across studies. The overall effect was statistically significant ($Z = 2.58$; $p = 0.010$). Pooled estimates should be interpreted as overall amputation risk rather than time-specific outcomes.

Compartment Syndrome

The three included studies that reported compartment syndrome outcomes were incorporated into the pooled analysis [22–24]. Across all studies, ET was consistently associated with a lower incidence of compartment syndrome compared with OSR. Effect estimates from individual studies demonstrated a similar direction and magnitude of benefit, irrespective of differences in study design and patient populations. The pooled analysis is shown in Figure 3.

Pooled meta-analysis demonstrated a statistically significant reduction in the risk of compartment syndrome among patients treated with ET (RR 0.43, 95% CI 0.33–0.56; Figure 3). Importantly, no statistical heterogeneity was observed ($I^2 = 0\%$), indicating a highly consistent treatment effect across included studies.

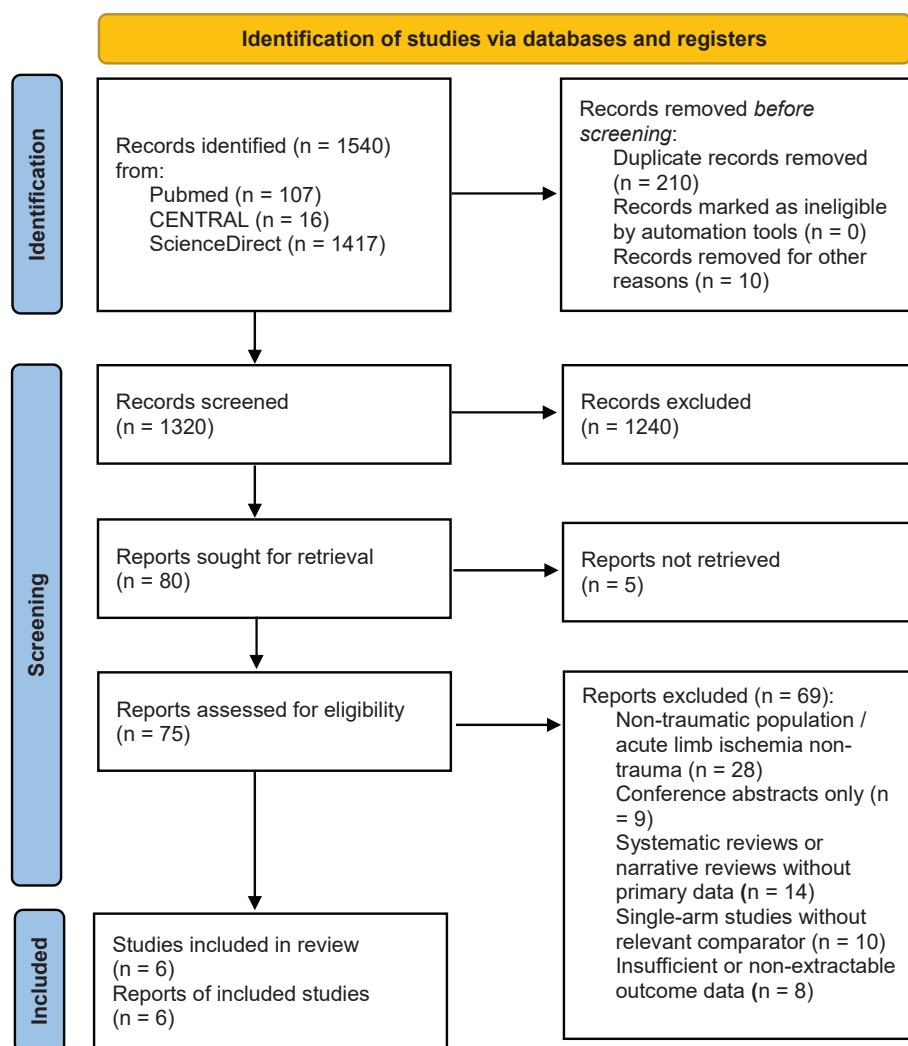


Figure 1 PRISMA flow diagram illustrating the study selection process. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only.

Source: Adapted from Page MJ, et al. *BMJ* 2021;372:n71. doi: <https://doi.org/10.1136/bmj.n71>. This work is licensed under CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>).

Table 1 Characteristics of studies included in the meta-analysis.

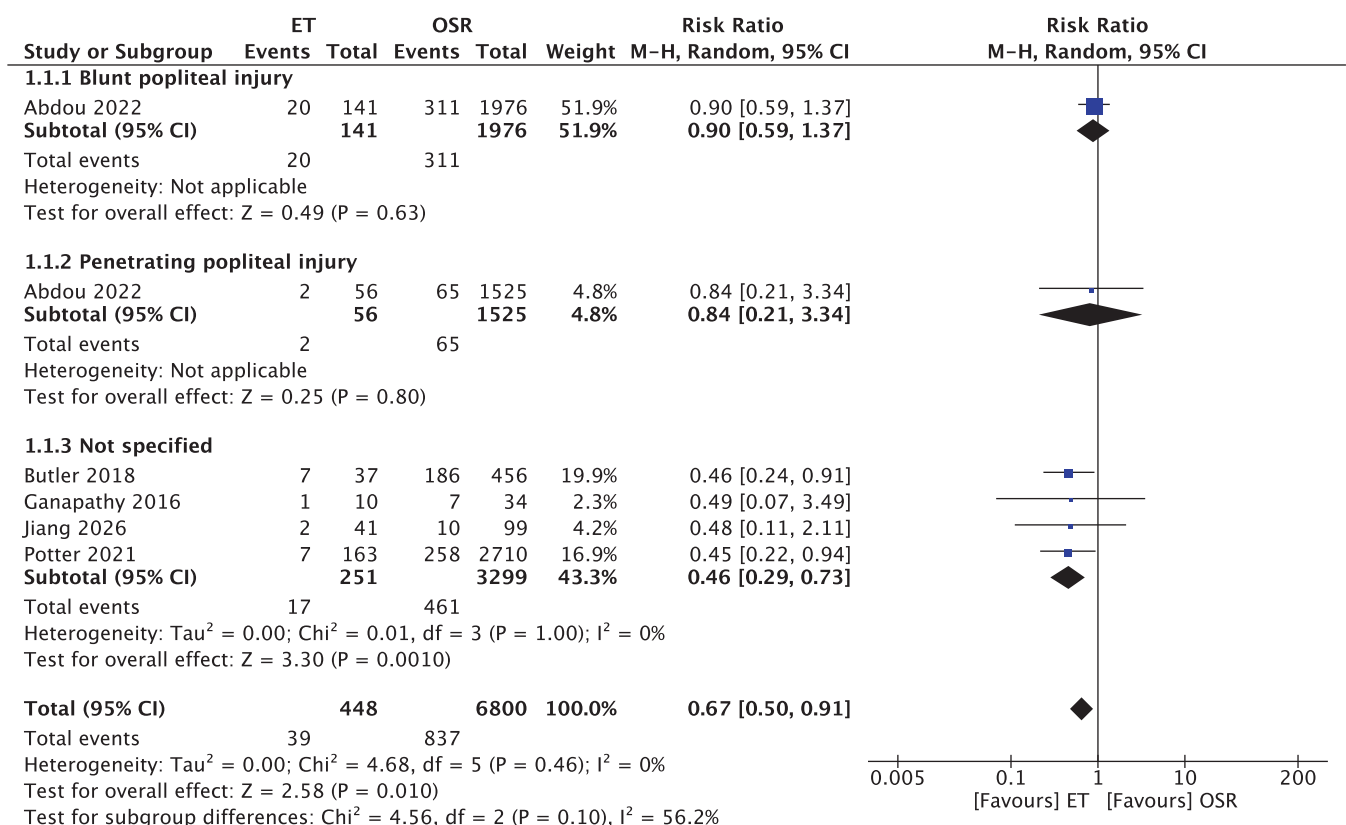
Study	Database	Artery	ET (n)	OSR (n)	Outcomes Reported
Abdou et al. [22]	USA / Trauma Database	Popliteal artery	Blunt: 141 Penetrating: 56	Blunt: 1,976 Penetrating: 1,525	Amputation; compartment syndrome
Degmetich et al. [23]	USA / National Inpatient Sample	Superficial femoral artery	390	1,865	Compartment syndrome; fasciotomy
Potter et al. [24]	USA / National Trauma Data Bank	Superficial femoral artery and/or popliteal artery	163	2,710	Amputation; compartment syndrome; fasciotomy
Ganapathy et al. [25]	USA / Duke University Medical Center Trauma Center	Superficial femoral artery, popliteal artery, tibioperoneal arteries	10	34	Amputation; fasciotomy
Butler et al. [26]	USA / California Office of Statewide Health Planning and Development	Popliteal artery	456	37	Amputation; fasciotomy
Jiang et al. [27]	China / The Third Hospital of Hebei Medical University	Popliteal artery	99	41	Amputation

Abbreviations: ET: endovascular therapy; OSR: open surgical repair.

Table 2 Baseline characteristics of patients undergoing endovascular therapy (ET) versus open surgical repair (OSR).

Study	Age (ET)	Age (OSR)	Male (%)	ISS (OSR)	Mechanism
Abdou et al. [22]	45	36	74.3	9	Blunt and penetrating
Degmetich et al. [23]	44.9	32.5	86.3	Not reported	Blunt, penetrating and unspecified
Potter et al. [24]	33	31	84	10	Blunt and penetrating
Ganapathy et al. [25]	38	25	41	Not reported	Penetrating and unspecified
Butler et al. [26]	50.9	36.3	80.4	12.5	Blunt, penetrating and unspecified
Jiang et al. [27]	44.8	42.1	79.2	Not reported	Blunt and penetrating

Abbreviations: ISS: injury severity score.

**Figure 2** Forest plot of amputation comparing endovascular therapy (ET) versus open surgical repair (OSR). Risk ratios with 95% confidence intervals (CIs) are presented using a random-effects model.

Squares represent study-specific estimates and horizontal lines indicate 95% CIs; the diamond represents the pooled effect estimate. Source: Prepared by the authors.

Fasciotomy

Four studies reported fasciotomy outcomes following vascular repair and were included in the quantitative synthesis [23–26]. Across included studies, ET was associated with a lower rate of fasciotomy compared with OSR; however, the magnitude of effect varied substantially between studies. The pooled analysis is shown in Figure 4.

Pooled meta-analysis demonstrated that ET was associated with a statistically significant reduction in the need for fasciotomy (RR 0.43, 95% CI 0.27–0.69; Figure 4). Notably, substantial statistical heterogeneity

was observed ($I^2 = 75\%$), indicating considerable variability in effect estimates across studies. The overall effect was statistically significant ($Z = 3.57$; $p = 0.0004$). This heterogeneity likely reflects differences in institutional thresholds for prophylactic fasciotomy, variations in injury severity and ischemia time, and database-specific reporting practices.

Other Prespecified Outcomes

Additional prespecified outcomes, including mortality, arterial patency, reintervention, thrombotic complications and follow-up, were variably reported across studies

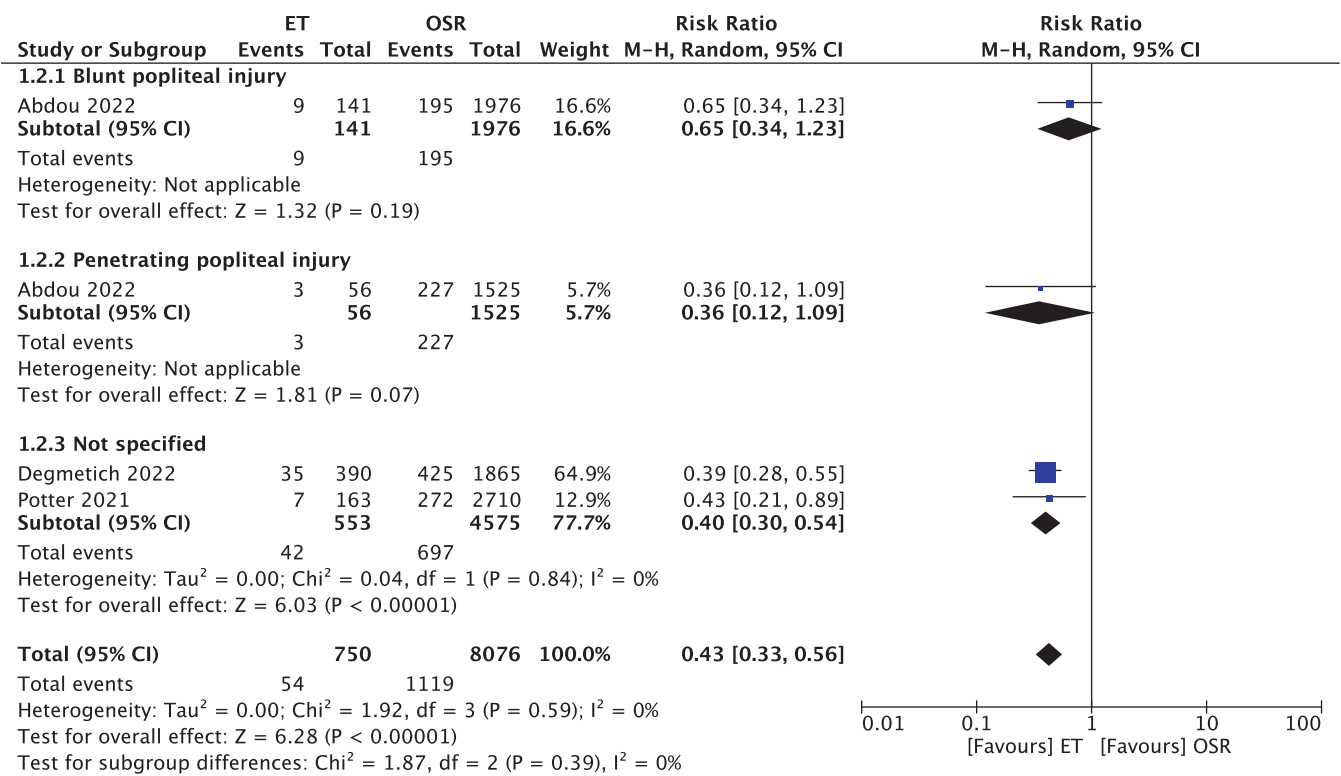


Figure 3 Forest plot of compartment syndrome comparing endovascular therapy (ET) versus open surgical repair (OSR). Risk ratios with 95% confidence intervals (CIs) are presented using a random-effects model.

Squares represent study-specific estimates and horizontal lines indicate 95% CIs; the diamond represents the pooled effect estimate. Source: Prepared by the authors.

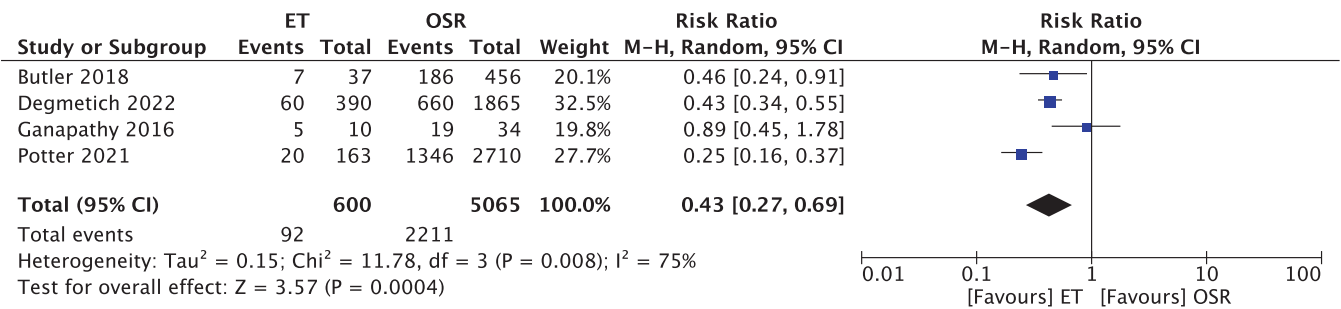


Figure 4 Forest plot of fasciotomy comparing endovascular therapy (ET) versus open surgical repair (OSR). Risk ratios with 95% confidence intervals (CIs) are presented using a random-effects model.

Squares represent study-specific estimates and horizontal lines indicate 95% CIs; the diamond represents the pooled effect estimate. Source: Prepared by the authors.

(Table 3). In-hospital mortality was reported in two large database studies, with comparable rates between ET and OSR in one study and higher mortality observed in the ET group in another [23, 24]. One population-based study additionally reported postdischarge mortality, demonstrating higher mortality in the ET cohort [26]. The availability of additional clinically relevant outcomes across included studies is summarized in Table 3.

Arterial patency and reintervention outcomes were reported in only one study with short-term follow-up

(up to six months) [27], precluding meaningful comparison or quantitative synthesis. Thrombotic complications were inconsistently reported and, when available [27], primarily reflected overall thromboembolic events rather than graft or stent thrombosis, further limiting interpretation of arterial repair durability.

Owing to heterogeneity in outcome definitions, reporting methods, and follow-up duration, these outcomes were not included in the quantitative meta-analysis.

Table 3 Availability of key outcomes across included studies.

Study	Mortality	Arterial Patency	Reintervention	Thrombotic complications	Follow-up
Abdou et al. [22]	Not reported	Not reported	Not reported	Not reported	Not reported
Degmetich et al. [23]	In-hospital ET: 15 (3.8%) OSR: 70 (3.8%)	Not reported	Not reported	Not reported	Not reported
Potter et al. [24]	In-hospital ET: 8 (5.1%) OSR: 27 (1.0%)	Not reported	Not reported	Not reported	Not reported
Ganapathy et al. [25]	Not reported	Not reported	Not reported	Not reported	Limb salvage: 30 (83%) No ambulation: 6 (18%)
Butler et al. [26]	All cause mortality ET: 3 (15%) OSR: 5 (2.4%)	Not reported	Not reported	Not reported	Amputation post-discharge ET: 4 (21.1%) OSR: 21 (10.4%)
Jiang et al. [27]	Not reported	One month: ET: 36 (87.8%) OSR: 90 (90.9%) Three month: ET: 34 (82.9%) OSR: 85 (85.8%) Six month: ET: 30 (73.17%) OSR: 78 (78.7%)	Not reported	ET: 3 (7.32%) OSR: 5 (5.05%)	6-month survival prognosis HR: 0.682 (95% CI 0.187–2.495, $p = 0.47$)

Abbreviations: ET: endovascular therapy; OSR: open surgical repair; HR: hazard ratio; CI: confidence interval.

Risk of Bias

Risk of bias across the included studies was assessed using the ROBINS-I framework [29]. All included studies were retrospective observational cohorts, primarily derived from trauma or administrative databases. Consequently, all studies were judged to have a serious risk of bias due to confounding, as treatment allocation was not randomized and likely influenced by injury severity, hemodynamic status, and anatomical suitability for ET. The overall risk of bias assessment is summarized in Figure 5.

Bias in the selection of participants was rated as moderate in most studies because inclusion was based on retrospective database identification. Classification of interventions was considered low risk, as ET and OSR were clearly identifiable procedural categories in the included databases.

Bias due to deviations from intended interventions was judged to be low, as the studies primarily evaluated procedural outcomes without crossover between treatment groups. Missing data bias was considered moderate owing to incomplete reporting of several clinical variables and outcomes across administrative datasets. Measurement of outcomes such as amputation, compartment syndrome, and fasciotomy was judged to be low risk, as these outcomes represent clearly documented clinical events. Selective reporting bias was considered moderate, given variability in outcome reporting across studies.

Overall, all included studies were judged to have a serious overall risk of bias, primarily driven by

confounding inherent to retrospective observational designs (Figure 5).

DISCUSSION

This systematic review and meta-analysis provides an updated synthesis of comparative evidence evaluating endovascular therapy versus open surgical repair for traumatic lower extremity arterial injury. The principal finding is that ET demonstrated a reduced risk of amputation in pooled analysis; however, subgroup analyses did not demonstrate consistent significance across all injury mechanisms [22]. These findings are clinically relevant in the context of evolving trauma systems that increasingly incorporate endovascular and hybrid treatment strategies. The limited number of included studies reflects the scarcity of contemporary comparative data directly evaluating endovascular and OSR techniques in traumatic lower limb vascular injuries. The search timeframe was restricted to contemporary studies (2016–2026) to reflect current endovascular techniques, device technology, and modern trauma system practices, as earlier studies might not accurately represent current clinical outcomes.

Endovascular Therapy and Limb Salvage

Historically, OSR has been regarded as the definitive treatment for traumatic lower extremity arterial injury, largely because of concerns regarding the durability and reliability of endovascular interventions in the acute trauma setting [1,2]. However, advances in endovascular

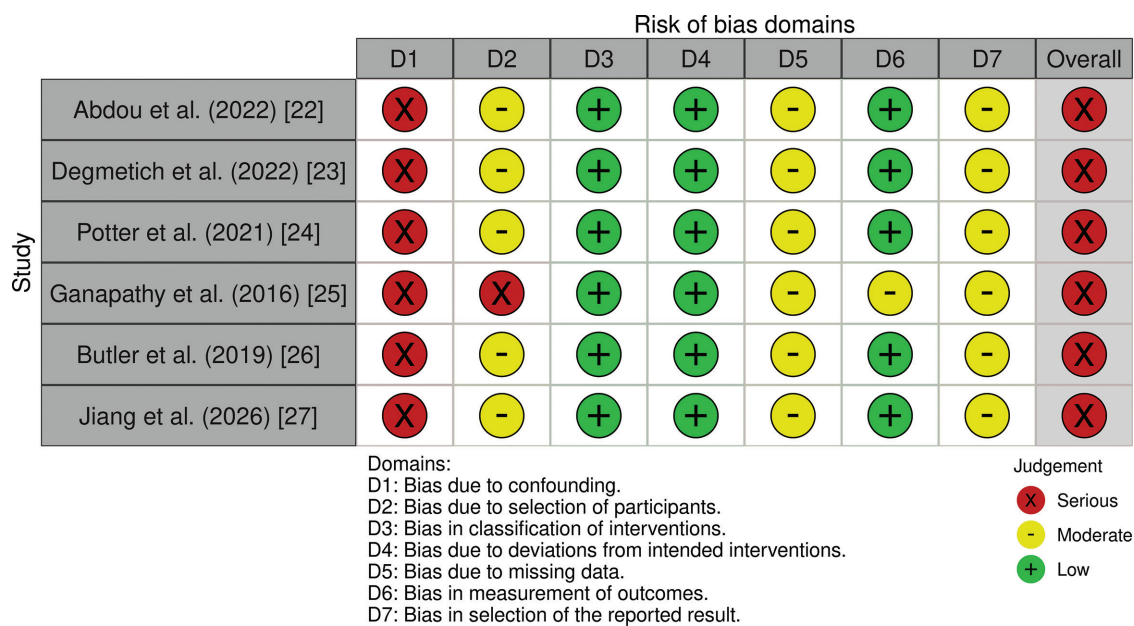


Figure 5 Risk of bias assessment using ROBINS-I (Risk Of Bias In Non-randomized Studies of Interventions).
Source: Prepared by the authors.

technology, improvements in imaging modalities, and increasing operator experience have progressively expanded the role of ET in contemporary trauma care [3–5]. In the present meta-analysis, ET was associated with a reduced risk of amputation in pooled analysis; however, subgroup analyses did not demonstrate consistent significance across all injury mechanisms, with negligible statistical heterogeneity ($I^2 = 0\%$), suggesting that endovascular approaches might not compromise limb salvage when applied in appropriately selected patients. Collectively, these findings suggest that ET might be associated with reduced amputation risk compared with traditional OSR in patients with traumatic lower extremity arterial injury.

These findings are consistent with contemporary database analyses and institutional series reporting non-inferior limb salvage outcomes following ET for femoral and popliteal artery injuries [11–14]. Importantly, the absence of an increased amputation risk in the ET group challenges earlier concerns regarding endovascular durability in trauma and suggests that early technical failure or device-related complications might not translate into worse definitive limb outcomes in the acute setting, particularly when timely conversion or adjunctive interventions are available [9].

Ischemia-related Morbidity and Compartment Syndrome

One of the most consistent findings of this meta-analysis is the reduction in postoperative compartment syndrome associated with ET (RR 0.43, 95%

CI 0.33–0.56; $I^2 = 0\%$). Compartment syndrome following vascular trauma is a well-recognized consequence of ischemia–reperfusion injury, prolonged ischemic time, extensive soft tissue dissection, and concomitant venous injury [6,11,14].

ET might attenuate these pathophysiologic mechanisms through rapid intraluminal revascularization, avoidance of prolonged arterial clamping, and relative preservation of collateral blood flow, compared with open surgical repair [9,18]. Prior studies have demonstrated that shorter ischemic durations and reduced soft tissue manipulation are independently associated with lower rates of compartment syndrome and secondary limb morbidity following vascular injury [5,16]. The absence of heterogeneity suggests relatively consistent findings across included studies, although residual confounding cannot be excluded.

Fasciotomy and Practice Variability

Similarly, ET was associated with a significantly lower requirement for fasciotomy compared with open surgical repair (RR 0.43, 95% CI 0.27–0.69), although substantial statistical heterogeneity was observed ($I^2 = 75\%$). The pooled analysis for fasciotomy demonstrated substantial heterogeneity, which limits the interpretability of this finding. Several factors might contribute to this variability, including differences in institutional protocols for prophylactic fasciotomy, variation in injury severity and ischemia duration, and inconsistencies in coding practices across trauma and administrative databases. In particular, the decision to perform fasciotomy

is often influenced by surgeon judgment and local practice patterns rather than standardized criteria, further contributing to heterogeneity. As a result, the observed reduction in fasciotomy associated with ET should be interpreted with caution, as it might not represent a consistent or reliable treatment effect across different clinical settings [7,14,28].

Previous studies have demonstrated considerable variation in fasciotomy practices following vascular trauma, even among high-volume trauma centers, underscoring the influence of surgeon judgment, institutional protocols, and local practice patterns [31,32]. Accordingly, the observed heterogeneity should be interpreted not as inconsistency in the direction of treatment effect, but rather as a reflection of real-world variability in clinical decision-making surrounding fasciotomy after vascular repair.

Summary of Findings

Overall, pooled analyses demonstrated that ET might provide limb salvage outcomes comparable to OSR, while being associated with significantly lower rates of ischemia-related morbidity, particularly postoperative compartment syndrome and the need for fasciotomy. Statistical heterogeneity was low for amputation outcomes and absent for compartment syndrome, indicating consistent effects across studies, whereas substantial heterogeneity was observed for fasciotomy outcomes, likely reflecting variability in injury severity, institutional practice patterns, and prophylactic fasciotomy thresholds.

Although several clinically important outcomes were reported in individual studies, including mortality, short-term patency, and thrombotic complications, these data were sparse and highly heterogeneous. Mortality was reported using different methodologies, including in-hospital mortality and postdischarge survival, while patency data were limited to a single study with follow-up restricted to six months. Importantly, reintervention and thrombosis outcomes were not consistently defined, and available thrombotic data largely reflected general thromboembolic events rather than graft- or stent-specific failure. As a result, these outcomes could not be meaningfully synthesized. These endpoints are particularly relevant for evaluating the durability of endovascular repair in traumatic vascular injury. As a result, although the present analysis suggests comparable limb salvage and lower ischemia-related morbidity with endovascular therapy, the long-term durability and functional outcomes of these approaches remain uncertain. Future studies with standardized reporting of patency, reintervention, and long-term limb function are necessary to better define the comparative effectiveness of endovascular and OSR strategies.

Relevance to Damage Control and Endovascular Resuscitation

From a trauma systems perspective, the findings of this study align closely with established principles of damage control surgery and endovascular resuscitation. Endovascular approaches facilitate rapid hemorrhage control and timely revascularization while minimizing additional physiologic insult, which is particularly relevant in polytrauma patients with limited physiologic reserve [3,20,21]. The observed reductions in ischemia-related morbidity, especially compartment syndrome and the need for fasciotomy, are consistent with these principles.

The increasing availability of hybrid operating rooms, portable fluoroscopic imaging, and trauma surgeons with endovascular expertise has further enabled the early integration of ET into vascular trauma management algorithms [17–19]. In this context, the present findings provide empirical support for the selective use of ET, particularly in hemodynamically stable or transiently responsive patients with anatomically suitable injuries, without compromising definitive limb salvage outcomes.

Risk of Bias and Methodological Considerations

All included studies were retrospective observational cohorts, introducing inherent risks of selection bias and unmeasured confounding (Figure 5). Although the study protocol prespecified risk-of-bias assessment using ROBINS-I, formal application was limited by incomplete reporting of key domains, particularly confounding, intervention classification, and outcome ascertainment, which are common limitations of large trauma and administrative databases [29,30]. Accordingly, a narrative assessment of methodological quality was undertaken to enhance transparency without assigning potentially misleading summary bias judgments. An important methodological consideration is confounding by indication. In clinical practice, ET is not randomly assigned but is typically selected for patients with more favorable anatomical and clinical characteristics. These might include more accessible vascular lesions, less severe soft-tissue destruction, preserved distal runoff, and shorter ischemia times.

Conversely, patients undergoing OSR are more likely to present with complex injuries, including extensive tissue damage, hemodynamic instability, or prolonged ischemia, which inherently increase the risk of adverse outcomes such as amputation and compartment syndrome. These differences in baseline injury characteristics might substantially influence the observed treatment effects. Therefore, the apparent benefits of ET, particularly in reducing ischemia-related morbidity, should be interpreted with caution, as they might partly reflect underlying differences in patient selection rather than

the intrinsic superiority of the intervention. Future studies incorporating detailed injury severity and ischemia duration are needed to better clarify the independent effect of treatment strategy.

Despite these limitations, the consistent direction of effect across outcomes, together with low or absent statistical heterogeneity for key endpoints, particularly compartment syndrome, supports the internal coherence and robustness of the observed findings.

Rationale for Not Applying GRADE

Although certainty-of-evidence assessment using GRADE was prespecified in the study protocol, it was not applied in the final analysis. Within the GRADE framework, observational studies begin at low certainty and are frequently downgraded further for risk of bias, imprecision, and inconsistency—especially in meta-analyses comprising a limited number of studies [33,34]. In the present context, formal GRADE classification was unlikely to provide additional discriminatory value and risked obscuring clinically relevant effect estimates. Instead, certainty of evidence was addressed narratively, an approach consistent with editorial expectations in trauma and surgical journals.

Clinical Implications and Patient Selection

The findings of this meta-analysis support ET as a complementary strategy, rather than a replacement, for OSR in traumatic lower extremity arterial injury. Appropriate patient selection remains critical. ET appears most suitable for focal arterial injuries with preserved distal runoff, limited soft tissue contamination, and relative hemodynamic stability, whereas OSR remains indispensable in cases of complex arterial disruption, extensive contamination, associated skeletal or soft tissue injury, or when endovascular resources and expertise are unavailable [2,7,35]. These results underscore the importance of institutional capability and multidisciplinary decision-making in optimizing vascular trauma outcomes.

Limitations

Several limitations of this study should be acknowledged. First, all included studies were retrospective observational analyses and are therefore susceptible to selection bias and residual confounding. Second, the reliance on large administrative and trauma databases limited the availability of detailed anatomic, physiologic, and procedural information. Third, although selected studies reported additional outcomes such as mortality and short-term patency, these were limited in number, inconsistently defined, and restricted to short follow-up durations, which limits conclusions regarding long-term durability (Table 3). Consequently,

future studies with more detailed reporting of arterial segment-specific outcomes are needed to better evaluate differences in prognosis and treatment patterns between SFA and popliteal artery injuries. Additionally, the pooled analysis for fasciotomy demonstrated substantial heterogeneity, which might reflect variations in institutional prophylactic fasciotomy protocols, injury severity, ischemia time, and database coding practices. Therefore, this finding should be interpreted cautiously and might not represent a consistent treatment effect across different settings. Finally, deviation from the prespecified ROBINS-I and GRADE assessments represents a methodological limitation, although this decision was prospectively justified and transparently reported. These limitations reflect a broader gap in the current trauma literature rather than a methodological shortcoming of the present study.

CONCLUSION

Despite these limitations, this meta-analysis suggests that ET might provide limb salvage outcomes comparable to OSR, while being associated with a significant reduction in ischemia-related morbidity, particularly postoperative compartment syndrome and the need for fasciotomy. These findings reinforce the expanding role of endovascular strategies in contemporary trauma care and highlight the importance of institutional readiness, endovascular expertise, and judicious patient selection in optimizing outcomes for patients with traumatic lower extremity vascular injury.

Acknowledgement

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Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Author Contributions

Conceptualization: all authors; protocol development: MRS, K; data extraction and analysis: MRS, K; manuscript drafting: MRS; critical revision: ED, NR; final approval: all authors.

Data Availability

All data generated or analyzed during this study are included in this published article and its supplementary materials. Additional data are available from the corresponding author upon reasonable request.

Declaration of the Use of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the authors used ChatGPT (OpenAI) to improve readability, structure, and language. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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Successful Endovascular Rescue of a Recurrent Hepatic Artery Graft Thrombosis after Liver Retransplantation

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Hepatic artery thrombosis (HAT) is a severe and potentially graft-threatening complication after liver transplantation, associated with biliary ischemia, graft failure, and high mortality. We report the case of a 43-year-old woman with primary sclerosing cholangitis who developed early HAT after orthotopic liver transplantation. An initial endovascular recanalization attempt was unsuccessful, and progressive ischemic cholangiopathy required liver color Doppler with aorto-hepatic arterial reconstruction. During follow-up, recurrent hepatic artery graft thrombosis was detected. Given the high surgical risk, an endovascular approach was undertaken. Successful intraluminal recanalization was achieved using percutaneous transluminal angioplasty and balloon-expandable stent placement, resulting in restoration of hepatic arterial flow. Follow-up imaging confirmed sustained graft patency and preserved liver perfusion. This case highlights the role of timely endovascular intervention as a viable graft-saving option in selected patients with complex post-transplant HAT.

Keywords: Hepatic Artery Thrombosis; Liver Transplantation; Endovascular Therapy; Stent; Angioplasty; Graft Rescue

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INTRODUCTION

Hepatic artery thrombosis (HAT) is one of the most severe vascular complications following liver transplantation, with reported incidence ranging from 2% to 9% in adult recipients and a well-established association with graft loss and biliary ischemic injury [1–3]. Although early diagnosis and prompt treatment might allow graft salvage, management remains challenging and no standardized therapeutic algorithm has been universally adopted [4]. Retransplantation is traditionally considered the definitive treatment; however, it is frequently limited by organ availability and by the clinical

instability of affected patients [1,5]. In selected cases, surgical revascularization may be attempted, but technical feasibility and outcomes depend on timing and local vascular conditions. Over the last decade, endovascular approaches—including intra-arterial thrombolysis, angioplasty, and stent placement—have emerged as less invasive alternatives with encouraging results in appropriately selected patients [1,4,6]. Patients undergoing liver retransplantation represent a particularly high-risk subgroup for vascular complications owing to previous arterial manipulation, complex anatomy, and the need for alternative inflow strategies such as aorto-hepatic reconstruction. Complications involving aorto-hepatic conduits are uncommon but technically demanding, and published experience remains limited. Isolated reports have described endovascular management of aorto-hepatic bypass thrombosis or conduit-related complications [7,8]; however, data specifically addressing recurrent HAT after retransplantation in the setting of aorto-hepatic reconstruction are exceedingly scarce. Herein, we report a complex case of recurrent HAT occurring after liver retransplantation with aorto-hepatic reconstruction successfully managed by endovascular recanalization. This case highlights the

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technical considerations and clinical decision-making process in an extremely challenging vascular scenario and underscores the potential role of endovascular therapy even in highly selected post-transplant settings [9].

CASE PRESENTATION

A 43-year-old woman with a 15-year history of primary sclerosing cholangitis presented in October 2024 with hepatic decompensation, including elevated serum transaminases, gamma-glutamyl transferase, and alkaline phosphatase. Imaging revealed chronic liver disease with cirrhotic nodular remodeling and progressive cholestasis. The patient underwent orthotopic liver transplantation in November 2024. Anticoagulation post-transplant included oral acetylsalicylic acid 100 mg/day and subcutaneous heparin 4000 IU/day. On postoperative day 5, color-Doppler ultrasound and computed tomography (CT) angiography demonstrated complete thrombosis of the hepatic artery graft; selective digital subtraction angiography (DSA) confirmed the finding (Figure 1*a,b*). An initial endovascular recanalization attempt was unsuccessful, due to complete graft thrombosis, and a conservative observational strategy was adopted. In the following weeks, the patient developed fever and progressive hyperbilirubinemia. CT revealed ischemic cholangiopathy with multiple intrahepatic bilomas and abscesses. Follow-up CT in January 2025 (Figure 2*a–c*) revealed two large bilomas in the left and right hepatic lobes, treated with percutaneous image-guided drainage, along with additional abscessed bilomas in segment VI. Persistent fever, right upper quadrant pain, and septic deterioration led to liver retransplantation in March 2025. During retransplantation, arterial inflow was reconstructed using a donor hepatic artery graft anastomosed to the

anterior abdominal aorta. The postoperative course was initially favorable until September 2025, when follow-up color-Doppler ultrasound and CT angiography (Figure 3*a,b*) demonstrated thrombosis of the hepatic artery graft with minimal opacification of intrahepatic branches. At this stage, anticoagulation included oral acetylsalicylic acid 100 mg/day, with subcutaneous heparin 4000 IU/day added after diagnosis of recurrent graft thrombosis. Given the high surgical risk, endovascular revascularization was performed via right common femoral artery access. DSA confirmed graft occlusion (Figure 4*a*). Using a 0.018-inch guidewire, successful intraluminal recanalization of the graft and intrahepatic branches was achieved. Sequential percutaneous transluminal angioplasty (PTA) (Figure 4*b,c*) and deployment of overlapping balloon-expandable stents restored arterial patency. During the procedure, intravenous heparin 2500 IU was administered. Final post-procedural DSA demonstrated technical success with complete graft revascularization (Figure 4*d*). Post-procedurally, dual antiplatelet therapy with clopidogrel 75 mg/day plus acetylsalicylic acid 100 mg/day was given for 30 days, followed by acetylsalicylic acid 100 mg/day alone from day 31 onwards, which the patient is advised to continue lifelong to prevent stent thrombosis. Early post-procedural CT two weeks after the intervention confirmed stent patency and adequate arterial perfusion. Subsequent color-Doppler ultrasounds (Figure 5*a–c*) at one, two, and three months demonstrated sustained graft patency with normal arterial waveforms. At four-month follow-up, CT angiography (Figure 6*a,b*) confirmed preserved stent and hepatic arterial tree patency, with homogeneous arterial enhancement of the liver parenchyma. The patient remains asymptomatic and in excellent clinical condition at the most recent follow-up.

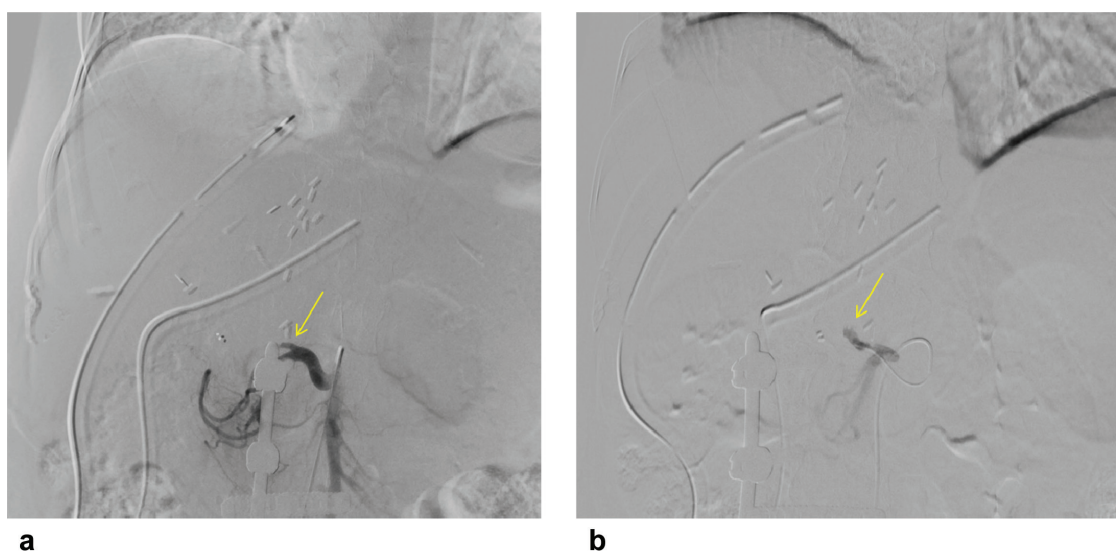


Figure 1 Digital subtraction angiography. Selective catheterization of the superior mesenteric artery (**a**) and super-selective catheterization (**b**) of the graft hepatic artery, after the first liver transplant, showing complete thrombosis (yellow arrows) of the hepatic artery graft.

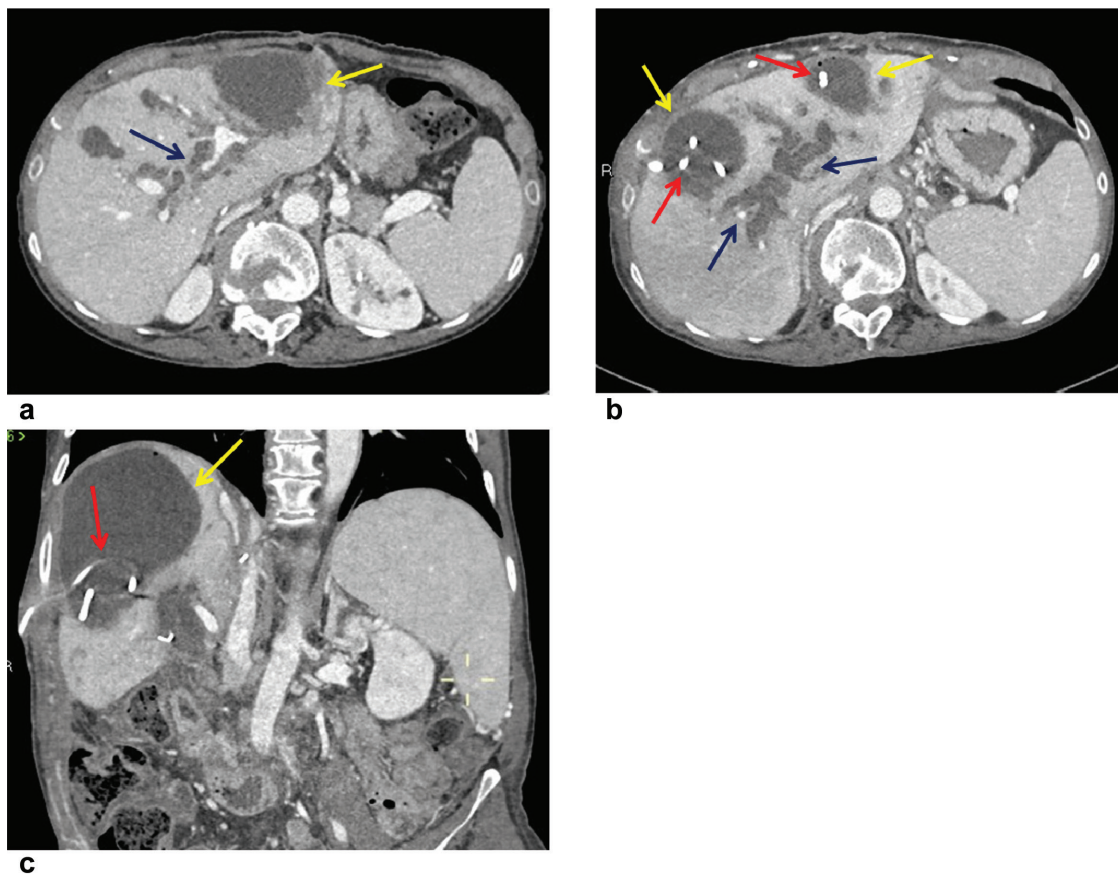


Figure 2 Computed tomography (CT) scan. CT scan showing in axial (**a,b**) and coronal (**c**) reconstruction showing ischemic cholangiopathy after the first liver transplant with evidence of biliary tree dilation (blue arrows) and development of two large bilomas (yellow arrows) measuring 71 mm × 47 mm in the left hepatic lobe and 89 mm × 74 mm in the right hepatic lobe, which were treated with percutaneous image-guided drainage (red arrows).

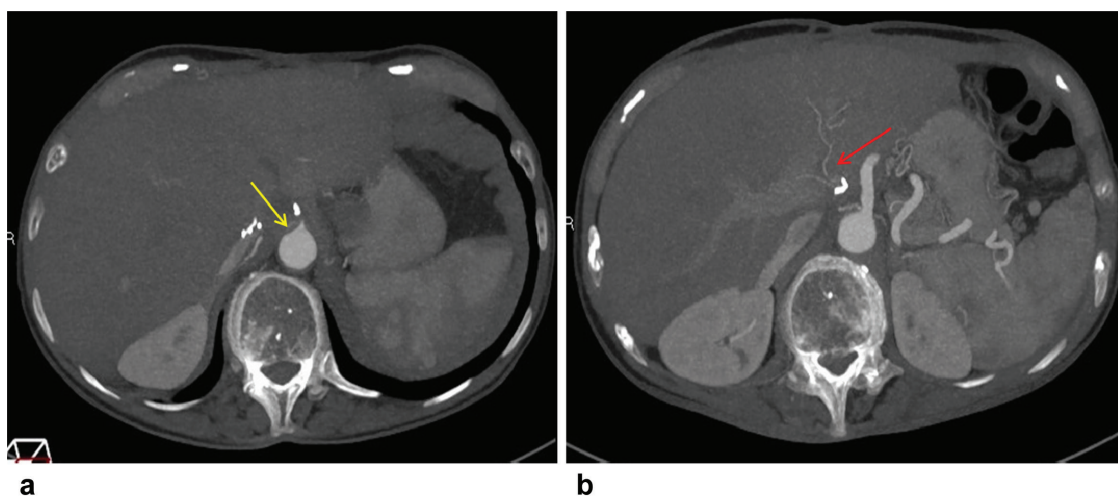


Figure 3 Computed tomography (CT) scan. CT scan after retransplantation showing in axial reconstructions (**a**) the complete thrombosis (yellow arrow) of the new hepatic artery graft anastomosed directly to the anterior wall of the abdominal aorta and (**b**) the faint opacification (red arrow) of the intrahepatic arterial branches.

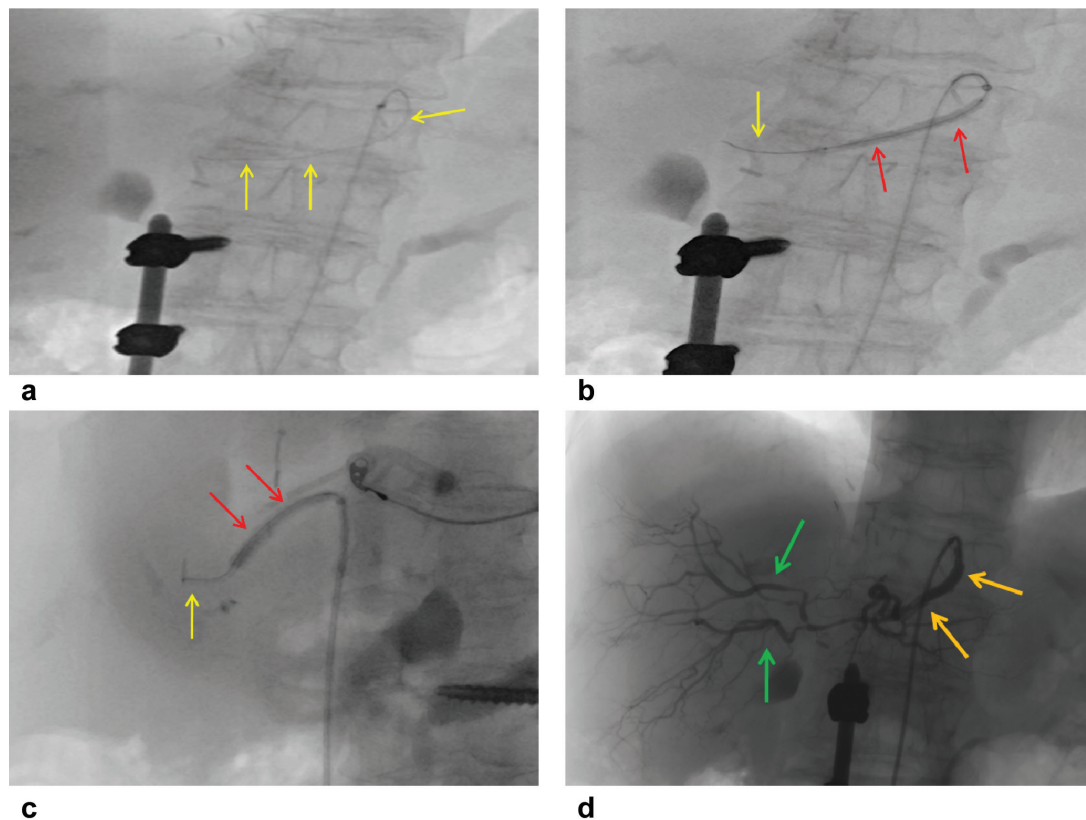


Figure 4 Digital subtraction angiography. Selective catheterization of the hepatic artery graft after retransplantation: recanalization of the lumen (a) employing a 0.018-inch guidewire (yellow arrows) and subsequent (b,c) angioplasty (red arrows) and release of two overlapping monorail balloon-expandable stents (5 mm × 19 mm). Final diagnostic angiography (d) showing patency of the main hepatic artery graft (orange arrows) and opacification of the intrahepatic arterial branches (green arrows).

Ethical Approval and Informed Consent

Ethical approval was not required. Informed consent was not required. The information has been anonymised.

DISCUSSION

HAT is a serious vascular complication following liver transplantation, associated with high rates of graft failure, biliary complications, and mortality, particularly when occurring early [10–12]. The biliary tree relies almost exclusively on arterial blood supply; thus, prolonged or complete hepatic arterial occlusion frequently results in ischemic cholangiopathy, including bile duct necrosis, biloma formation, recurrent infections, and sepsis, often necessitating retransplantation [13,14]. Early HAT is traditionally managed with urgent surgical revision or retransplantation; however, these strategies might be limited by technical complexity, poor patient condition, and donor organ availability [15]. Over the past two decades, endovascular techniques have emerged as alternative or rescue strategies, particularly in late-onset HAT or in patients at high surgical risk [16–18]. Reported endovascular approaches

include catheter-directed thrombolysis, PTA, and stent placement, with variable technical and clinical success depending on timing, vessel anatomy, and extent of thrombosis [19]. In the present case, the initial endovascular recanalization attempt after the first liver transplantation was unsuccessful. DSA demonstrated complete thrombosis of the hepatic arterial tree, which precluded guidewire passage and restoration of antegrade flow [16,19]. The patient subsequently developed severe ischemic cholangiopathy, emphasizing the biliary system's limited tolerance of prolonged arterial ischemia [10,18]. Following retransplantation with an aorto-hepatic arterial reconstruction, recurrent hepatic artery graft thrombosis occurred. CT imaging revealed weak opacification of the distal intrahepatic arterial branches. This distal arterial opacification was interpreted not only as a potential predictor of technical success [15,19] but also as indicative of a partial “filtering” thrombosis, in which the lumen was not completely occluded. This residual channel allowed the guidewire to reach the downstream vascular bed, which then became the target for restoring perfusion through sequential PTA and deployment of overlapping stents. This mechanistic insight provides a physiologic explanation for the

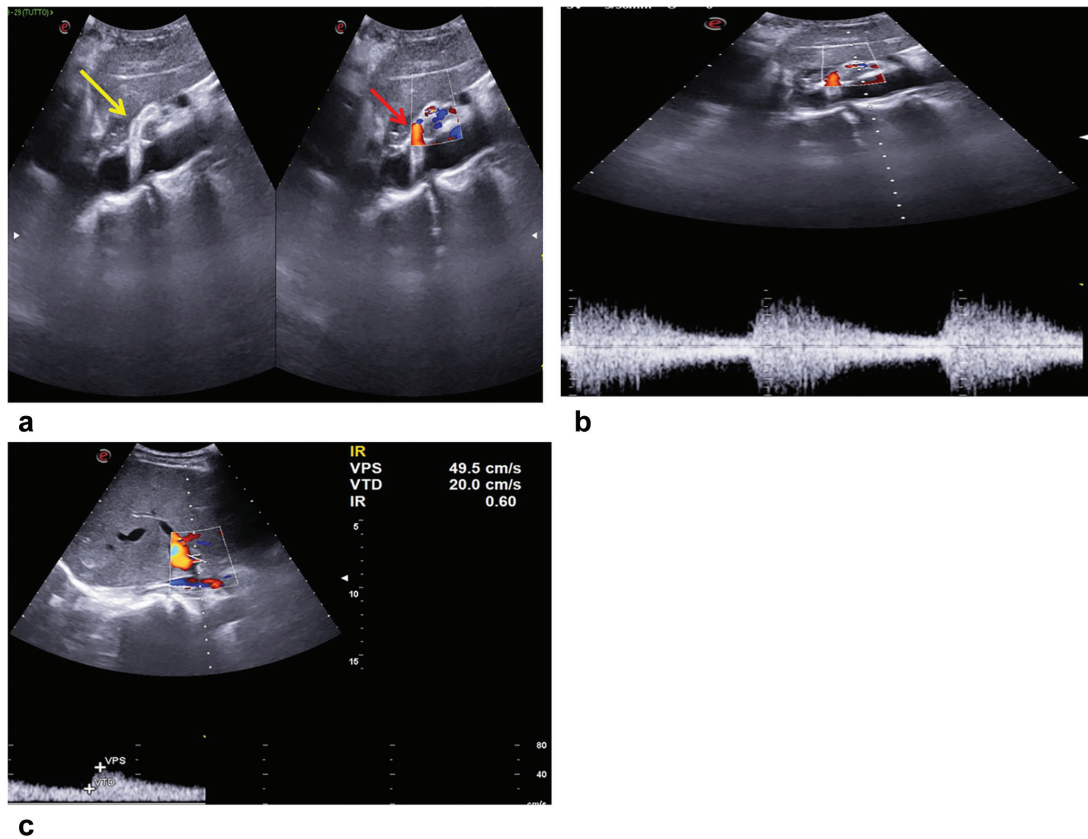


Figure 5 Color-Doppler ultrasound. Follow-up color-Doppler ultrasound after endovascular recanalization showing (a,b) presence of the two overlapping monorail balloon-expandable stents into the hepatic artery graft (yellow arrow), with evidence of regular intra-stent (a,b) (red arrow) and intrahepatic (c) arterial waveforms.

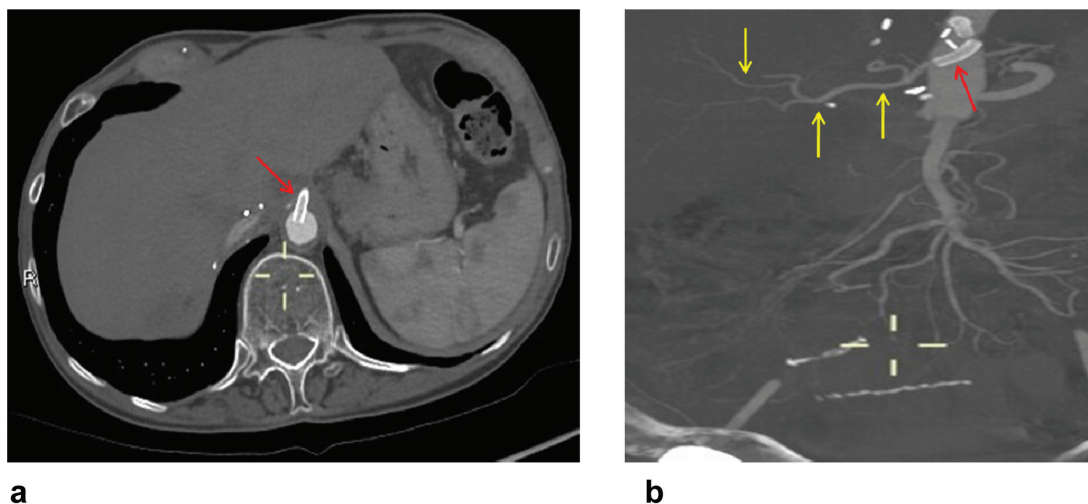


Figure 6 Computed tomography (CT) scan. Follow-up CT scan after endovascular recanalization confirming, in axial (a) and coronal maximum intensity projection (MIP) (b) reconstructions, patency of both the monorail balloon-expandable stents (red arrows) and of the intrahepatic arterial branches (yellow arrows).

angiographic finding and highlights a hypothesis-generating role for distal opacification in guiding endovascular intervention [15,16]. Through a right common femoral artery approach, recanalization of the hepatic

artery graft was achieved using a supportive 0.018-inch guidewire. Sequential PTA and overlapping stent deployment successfully preserved arterial patency and restored intrahepatic perfusion. This experience aligns

with prior reports describing endovascular management of complex hepatic arterial complications, including aorto-hepatic bypass thrombosis [7] and conduit-related stenosis or pseudoaneurysm [8]. Compared with these cases, our patient represents a particularly challenging scenario due to recurrent HAT after retransplantation, emphasizing both technical originality and clinical relevance. The case also underscores the critical role of multimodality imaging—color-Doppler ultrasound, CT angiography, and DSA—in the detection, characterization, and longitudinal monitoring of hepatic arterial complications [20]. Prompt recognition of HAT, careful assessment of distal arterial patency, and timely procedural planning are essential factors influencing both technical and clinical outcomes [21,22]. Sustained stent patency on follow-up imaging confirmed durable arterial perfusion, avoiding further open surgical intervention. Although long-term outcomes and optimal patient selection criteria remain to be fully defined, this case illustrates that endovascular approaches can serve as graft-saving strategies in carefully selected patients. In particular, in the presence of partial distal perfusion, endovascular recanalization may provide a minimally invasive alternative that reduces the need for immediate retransplantation, even after complex aorto-hepatic reconstructions [7,8,22].

CONCLUSION

Endovascular recanalization could represent a safe and effective minimally invasive alternative for managing HAT after liver transplantation, particularly when distal intrahepatic arterial flow is preserved. Careful imaging assessment, procedural planning, and timely intervention are essential to restore arterial perfusion, preserve graft patency, and achieve favorable outcomes. However, these observations are based on a single case, and broader recommendations cannot be drawn. This case illustrates that even complex post-transplant HAT may be successfully managed with minimally invasive endovascular techniques in selected patients.

Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Author Contributions

All of the authors substantially contributed to the study and manuscript writing.

Data Availability

The data supporting the findings of this study are not publicly available due to patient privacy and ethical restrictions.

Declaration of the Use of Generative AI and AI-assisted technologies in the writing process

No generative AI or AI-assisted technologies were used during the writing process of this manuscript.

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Imaging-Guided Management of a Bladder–Rectal Fistula after Gunshot Trauma: Implications of Delayed Imaging Phases in Trauma Decision-Making

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Colo-vesical fistula is a condition characterized by an abnormal connection between the colon and the urinary bladder. Traumatic rectovesical fistulas (RVFs) are rare entities, most commonly resulting from penetrating trauma, including gunshot injuries. Symptoms shown by these patients are commonly pneumaturia and fecaluria, highly suggestive of a pathological communication between the bowel and the bladder. However, localization of the fistulous tract typically requires cross-sectional imaging. Herein, we report the case of a 29-year-old man admitted to our Emergency Department with a RVF resulting from a gunshot injury. Initial imaging studies were inconclusive, while the definitive diagnosis of traumatic RVF was established using abdominal computed tomography with an ultra-delayed acquisition performed 35 minutes after contrast administration. Clinical symptoms remain a key guide in the diagnostic process, and when standard imaging fails to identify the fistulous tract, ultra-delayed imaging acquisitions should be considered to facilitate timely surgical management and improve patient outcomes.

Keywords: *Soft-Tissue Fistula; Gunshot Injury; Trauma Management; Ultra-Delayed Acquisition; Contrast-Enhanced Computed Tomography (CECT)*

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INTRODUCTION

A fistula is defined as an abnormal tract establishing communication between two distinct organs or surfaces. Nomenclature is determined by the structures involved; thus, a pathological connection between the colon and the bladder is termed colo-vesical fistula (CVF) [1].

While most enterovesical fistulas are related to inflammatory or neoplastic conditions, traumatic rectovesical fistulas (RVFs) are rare and often associated

with high-energy injuries, including gunshot wounds and other penetrating trauma [2–4].

In the acute trauma setting, these lesions can be difficult to recognize, as initial clinical and imaging findings can be non-specific or masked by associated injuries. Persistent symptoms such as fecaluria or pneumaturia should raise suspicion of pathological communications between the bowel and the urinary tract [5,6].

Cross-sectional imaging plays a central role in both diagnosis and management of pelvic trauma. Conventional computed tomography (CT) protocols might be insufficient to identify evolving or low-flow fistulas. In selected cases, adapting imaging timing and acquisition phases might be critical to clarify the diagnosis and guide management decisions [2–6].

We report the case of a 29-year-old man presenting with a traumatic bladder–rectal fistula after gunshot injury, focusing on the role of a tailored imaging strategy with delayed acquisition phases in trauma decision-making.

This case report was prepared in accordance with the CARE guidelines.

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CASE PRESENTATION

A 29-year-old man presented to the Emergency Department of our center (Ospedale Pellegrini, ASL Napoli 1, Naples, Italy) with a gunshot wound to the sacral region with no evidence of a bullet exit wound. His medical history was negative for previous pathologies.

On arrival, the patient was hemodynamically stable. His vital signs were: blood pressure 130/80 mmHg, heart rate 70 beats/min, respiratory rate 22 breaths/min, temperature 36.5°C, and oxygen saturation 98% on room air. Physical examination revealed a gunshot wound in the sacral region with no evidence of a bullet exit wound. The abdomen was treatable although painful on deep palpation in the pelvis and left groin region, and the patient showed no signs of neurological deficits in the lower limbs. After bladder catheterization, abundant hematuria was detected. Routine blood tests revealed normal hemoglobin (15 g/dL; range: 14–17 g/dL) and hematocrit (46%; range: 41–51%); all other blood values were also within normal limits.

The patient was transported to Radiology for an urgent abdominal contrast-enhanced CT (CECT). CECT scan was performed using a 64-slice CT scanner (Revolution EVO, GE, Boston, USA). Acquisition parameters were: rotation time 0.33 s, collimation 64 mm × 1 mm, slice thickness 1.0 mm, tube voltage 120 kVp, and tube current with automatic exposure modulation. Field of view included the area from above the diaphragm to the proximal portion of the thighs. Non-contrast, arterial, venous, and delayed phase were included in the emergency protocol. The intravenous contrast medium used was Iopromide 370 mg I/mL, 1.0–1.5 mL/kg, which was injected at 4.0 mL/s, followed by a 50 mL saline flush. A dedicated workstation was used for post-processing, obtaining multiplanar reconstructions, volume rendering 3D technique reconstructions, and maximum intensity projections. CECT

showed the bullet entry wound in the sacral region, resulting in a fracture of the first sacral metamer. The bullet's trajectory was postero-anterior, slanting from top to bottom through the pelvic cavity. The CECT revealed thickening of the perirectal adipose tissue and irregularity of the left wall of the rectum in the presence of perivisceral air (Figure 1a), suggesting a rectal laceration. The bladder appeared empty and catheterized, with irregularity of the left profile (Figure 1b), suggesting bladder laceration. The bullet was found on the posterior margin of the left rectus abdominis muscle.

The patient underwent urgent surgery laparotomy. Exploration of the abdominal cavity revealed an amount of blood in the pelvic cavity and the laceration of the left bladder wall. No obvious lesions were found in the rectum nor in the intestinal loops. A drainage tube was placed in the pelvic cavity.

On the fourth day after surgery, the patient presented with fecaluria, fever (37.8°C), and lower abdominal pain. The patient underwent retrograde cystography the following day, which did not reveal any extravascular spread of contrast medium.

The following day it was decided to perform a new CECT scan, which the radiologist (Picchi SG) supplemented with an ultra-delayed acquisition at approximately 35 min. The CECT showed the presence of a fistulous tract (thickness of 10 mm and extension of 35 mm) between the left posterior wall of the bladder and the left anterior wall of the rectum, with contextual gas coefficients. In the ultra-delayed acquisition phase, the fistulous tract and the rectum were filled with iodinated urine (Figure 2).

It was therefore decided to undertake conservative treatment with a urinary catheter and to perform a sigmoidoscopy on the patient.

In the following days, the patient's clinical condition improved, presenting as afebrile, without abdominal

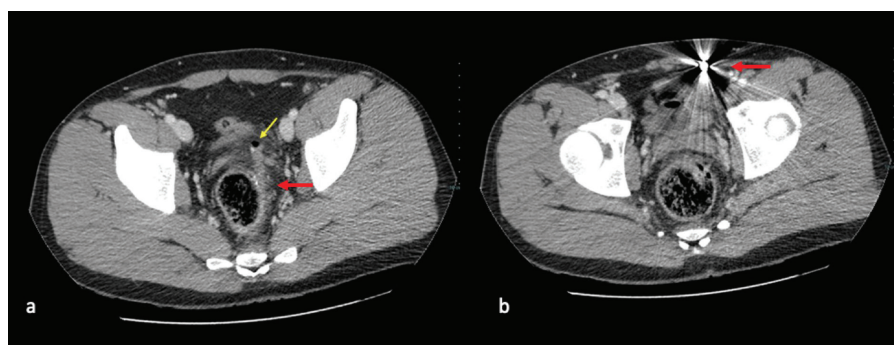


Figure 1 Contrast-enhanced computed tomography (CECT) images with portal phase of the axial plane. (a) CECT showed thickening of the perirectal adipose tissue (red arrow), irregularity of the left wall of the rectum, and the presence of perivisceral air (yellow arrow). (b) The bladder was empty and catheterized, with irregularity of the left lateral profile and thickening of the surrounding adipose tissue. The bullet was located on the posterior margin of the left rectus abdominis muscle, anterior to the bladder (red arrow).

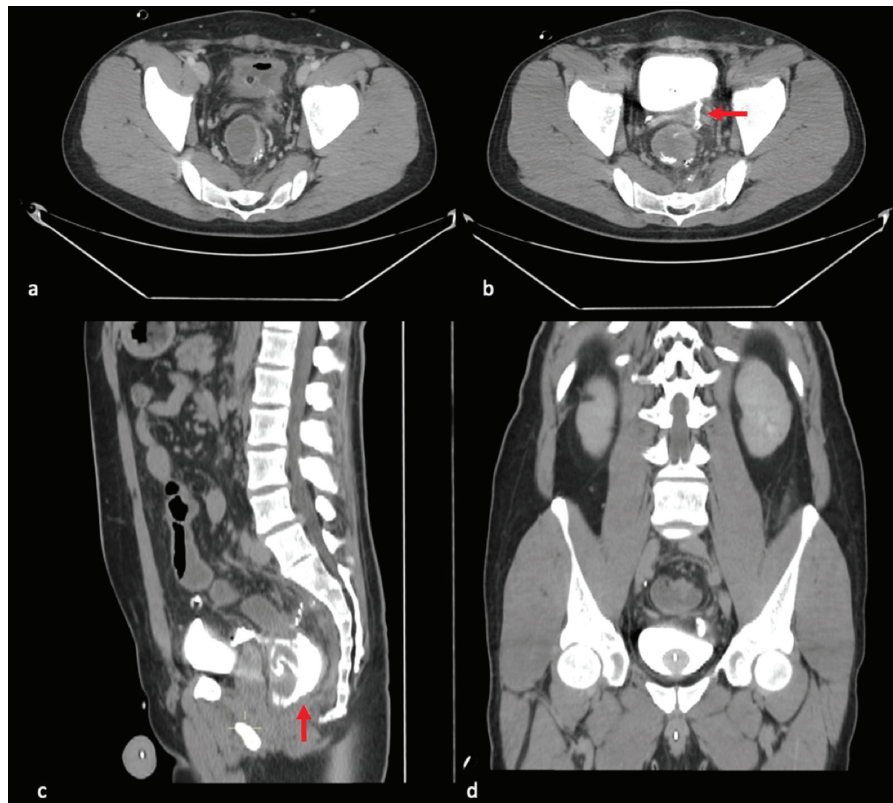


Figure 2 Contrast-enhanced computed tomography (CECT) images with portal phase of the axial plane. (a,b) Ultra-delayed phase, multiplanar. In the ultra-delayed acquisition phase at 35 minutes, the fistulous tract was filled with iodinated urine, also visible in the rectum lumen (red arrow). (c,d) CECT showed the presence of a fistulous tract (thickness: 10 mm and extension: 35 mm) between the left posterior wall of the bladder and the left anterior wall of the rectum (red arrow), with evidence of perivisceral air.

pain and without fecaluria, with clear urine in the catheter bag. A new cystography showed no extraluminal contrast leakage from the bladder. The patient was therefore discharged with instructions to keep the urinary catheter for another 15 days. At the last follow-up examination, the patient showed no signs of fecaluria or other clinical symptoms, and routine laboratory tests were normal.

Ethical Approval and Informed Consent

Ethical approval was not required as all data were anonymized. The patient signed an informed consent and endorsed the description of his clinical course for educational purposes.

DISCUSSION

CVF represents a clinically significant condition and a notable concern in surgical management. Most frequently the cause is diverticulitis, which accounts for over two-thirds of cases. Other etiologies include colorectal adenocarcinoma, Crohn's disease, prior pelvic

radiotherapy, and, less commonly, iatrogenic injuries from surgical procedures, abdominal trauma, or infections such as tuberculosis [1].

The typical age of onset for CVF is between 55 and 75 years. It occurs more commonly in males (male:female ratio 3:1), probably because of the anatomical barrier provided by the uterus and adnexal structures. In fact, usually when a CVF is diagnosed in a female patient, it often follows a hysterectomy [2,5].

Among malignant causes, colonic adenocarcinoma is the most frequently implicated in CVF formation. In these cases, direct tumor invasion into the bladder wall results in the establishment of an abnormal communication between the colon and the urinary tract.

In patients with Crohn's disease, the development of fistulas is a well-recognized complication due to chronic, transmural inflammation. Approximately 35% of individuals affected by Crohn's disease develop fistulous tracts but most commonly involving the small intestine (entero-enteric, entero-colonic, and entero-cutaneous fistulas). Less frequently, fistulas can extend to the bladder or the vagina, resulting in colo-vesical or colo-vaginal fistulas [1].

The classic symptoms suggestive of a CVF include pneumaturia, fecaluria, and recurrent urinary tract infections. In more severe cases, patients might present with hematuria, signs of peritonitis or an acute abdomen. However, the presentation is commonly variable, which can complicate and delay diagnosis [2].

In contrast to the more common inflammatory or neoplastic causes, this case presented involves a rare instance of a RVF resulting from a traumatic gunshot injury. In this report, we describe a traumatic RVF secondary to a gunshot wound. Initially, imaging did not clearly reveal the fistulous communication; however, the presence of fecaluria strongly raised clinical suspicion for RVF. Genitourinary tract injuries are frequently associated with rectal trauma. Bladder involvement is reported in approximately 30% of rectal trauma cases.

Accurate pre-operative assessment of the number, size, and location of the fistulous tract is essential for optimal surgical planning. A detailed physical examination remains a critical step in evaluating the perineal region and identifying the fistulous opening and surrounding tissue changes [7].

A multimodal imaging strategy is fundamental in diagnosing CVFs and RVFs. CECT, either with oral or rectal contrast, provides excellent visualization of the fistulous tract, while cystography adds further anatomical detail of the bladder involvement. Colonoscopy is also important to assess mucosal integrity, identify associated colonic pathologies, and rule out malignancy. In the literature, for abdomen X-ray a detection rate of 90–100% was reported [8]. Additional imaging, such as retrograde and voiding cystourethrography, can be useful to delineate the urinary tract anatomy. Elevated creatinine levels in discharged fluid might also help confirm urinary leakage. Nevertheless, intravenous pyelography and cystograms might fail to demonstrate associated genital tract anomalies [7].

Ultrasound can aid early detection of CVFs in selected cases. Sometimes the fistulous tract is directly visualized; however, this imaging approach has its limits. It is useful to the point that applying abdominal compression during a transabdominal scan can enhance visualization by revealing an echogenic “beak sign,” which connects the peristaltic bowel loop to the urinary bladder. Additionally, anorectal or transrectal ultrasound can help identify deeper or more complex fistulous tracts [9].

Although conventional radiography is not routinely diagnostic, an upright abdominal X-ray might incidentally reveal an air–fluid level within the bladder, raising a strong suspicion for an underlying enterovesical fistula (EVF) [9]. Barium enemas (BE) have a limited role in diagnosing EVFs because of their low sensitivity (almost 30%) [10]. The procedure starts with the introduction of a barium-based contrast agent into the rectum via a

small tube, followed by X-ray imaging in multiple positions to visualize the colon and rectum. A double-contrast enema, which includes air, might enhance image detail. With this imaging technique, the Bourne test may be performed to increase the diagnostic yield of BE. The test consists of radiographic evaluation of a centrifuged first urine sample obtained immediately after a non-diagnostic BE [11].

CT is the gold standard for EVF diagnosis, with a diagnostic accuracy of 90–100%. It not only detects fistulae but also provides detailed information about surrounding anatomical structures. CT should be performed after oral contrast but before intravenous contrast, allowing detection of diluted oral contrast in the bladder. Key CT findings suggestive of EVF include intravesical air (if there is not recent urologic procedures in anamnesis), oral contrast in the bladder, colonic diverticula, thickening of the adjacent bladder and bowel walls, and rectovesical masses or adhesions between pelvic organs. The detection of intravesical air is regarded as a pathognomonic finding and significantly increases the diagnostic accuracy [9,12]. So, to avoid false positives, CT should be performed before any transurethral manipulation, which can introduce iatrogenic bladder air [13]. CT also serves as a valuable pre-operative roadmap for surgeons and offers guidance for diagnostic and therapeutic interventional procedures [14]. Multidetector CT cystography is now considered the modality of choice for detecting and classifying traumatic bladder injuries. The procedure begins with the bladder emptying using a Foley catheter (with the patient in the supine position on the CT scanner table). After, through this catheter, a diluted contrast medium at least 300 mL is introduced into the bladder (pressure injection or manual squeezing of the contrast bag is discouraged to avoid worsening any existing bladder injury). Once the bladder is adequately distended, a volumetric pelvic CT scan is performed. Especially when a neoplastic or inflammatory process is suspected, intravenous contrast must also be administered [12].

Although CT is highly effective in detecting features suggestive of CVF, the actual fistulous tract is only occasionally visualized. Usually, only magnetic resonance imaging (MRI) can detect and describe the fistulous tract because it offers superior soft tissue contrast and multiplanar imaging capability, making it a useful adjunct in cases where CT findings are inconclusive. The appearance of a fistula on MRI depends on its content (fluid, air, or both), which affects signal characteristics. MRI is the modality of choice for local staging of pelvic malignancies because of its superior soft-tissue contrast and multiplanar imaging capabilities. Within the comparative limitations of different imaging modalities, our findings are consistent with the MRI results previously reported, such as the thickening of the perirectal adipose tissue [15,16].

CONCLUSION

Although uncommon, gunshot injuries can result in lacerations to both the bowel wall and the bladder, potentially leading to the formation of RVF. In trauma patients with suggestive clinical signs, a high degree of suspicion should be maintained. Clinical symptoms remain a key guide in the diagnostic process, and when standard imaging fails to identify the fistulous tract, ultra-delayed imaging acquisitions should be considered to detect the fistula and expedite and optimize surgical planning and consequently improve patient outcomes.

Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest

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Author Contributions

All the authors made a substantial contribution to the manuscript and participated sufficiently in submission to take public responsibility for its content. Publication was seen and approved by all authors and by the responsible authorities where the work was carried out.

Data availability

The data supporting the findings of this study are not publicly available due to privacy and ethical restrictions. The datasets are securely stored by the first author (S.G. Picchi) and are available from the first author upon reasonable request.

Declaration of the Use of Generative AI and AI-assisted technologies in the writing process

The authors declare that no generative AI or AI-assisted technologies were used in the writing, editing, or preparation of this manuscript. After using this tool/service,

the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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Case Study on the Interdisciplinary Approach to the Management of an Atypical Variant of Popliteal Artery Entrapment Syndrome

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Popliteal Artery Entrapment Syndrome (PAES) is a rare condition involving compression of the popliteal artery, affecting about 0.17% to 3.5% of the population. A young male athlete experienced worsening right foot pain and paleness of the area during exercise, leading to the diagnosis of Type I PAES due to an abnormal tendinous slip of the medial head of the gastrocnemius muscle. After surgical decompression, the athlete recovered smoothly and returned to sports within three months, reporting no symptoms at his one-year follow-up. Diagnosing PAES is challenging owing to non-specific symptoms like exercise-induced leg pain, often confused with common issues. This results in underdiagnosis and misclassification of PAES. Diagnosing PAES can be complex, particularly in young athletes, because its nonspecific symptoms are often overlooked. Enhanced clinical awareness and refined diagnostic strategies are crucial for timely recognition and improved patient outcomes.

Keywords: *Interdisciplinary; Approach; Artery; Entrapment; Provocation; Angiography; Duplex; Athletic; Flexion*

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INTRODUCTION

Popliteal Artery Entrapment Syndrome (PAES) is an uncommon, non-atherosclerotic vascular compression disorder predominantly affecting young, physically active individuals. Despite its relative rarity, PAES is frequently overlooked or misdiagnosed in clinical settings, resulting in delays in the provision of appropriate treatment [1].

The condition is characterized by vascular compression in the popliteal fossa, typically exhibiting a gradual and progressive course. Classic symptoms include exertional calf pain and escalating exercise intolerance, or claudication, which ameliorate with rest. These manifestations, particularly pain and cramping in the calf

during physical activity, can considerably hinder athletic performance and might clinically resemble peripheral arterial occlusive disease (PAOD).

Accurate differential diagnosis often requires targeted and interdisciplinary diagnostic coordination [2].

Pathophysiologically, PAES arises from extrinsic compression of the popliteal artery by adjacent musculotendinous structures, most frequently the medial head of the gastrocnemius muscle, and less commonly the plantaris or popliteus muscle. This mechanical obstruction leads to a hemodynamically significant reduction in perfusion to the lower limb during physical exertion. Chronic compression might lead to structural alterations in the vessel wall, including intimal damage, endothelial injury, thrombus formation, and, in some instances, aneurysmal degeneration [3].

Recent advancements in radiologic imaging have markedly improved the visualization of anatomical structures and enhanced the sensitivity of PAES diagnostics. Magnetic resonance angiography (MRA) is regarded as one of the most precise diagnostic methods for identifying PAES [4].

The treatment of uncomplicated PAES typically necessitates surgical exploration, accompanied by fasciotomy, myotomy, or decompression of the popliteal artery through the transection of fibrotic connective tissue. In

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selected cases, particularly those involving significant vascular damage or persistent symptoms despite decompression, vascular reconstruction might be warranted.

Classification

The currently recognized classification system for PAES differentiates six subtypes (I–VI; Table 1), based on the underlying anatomical or functional deviations:

Types I–V: These subtypes are determined by anatomically identifiable abnormalities in the course of the popliteal artery concerning the surrounding muscular structures. The prevalence of anatomical variants of PAES is estimated to range from 0.62% to 3.5% within the general population.

Type VI (Functional PAES (FPAES)): In contrast to the anatomical subtypes, this variant is characterized by the absence of structural malformations. Initially described by Rignault et al. in 1985 [5].

The functional subtype is attributed to muscular hypertrophy, primarily of the medial head of the gastrocnemius muscle, and dynamic neurovascular irritation during movement [1].

In the following case, we will outline our treatment strategy, emphasizing our cooperative, interdisciplinary approach that encompasses early diagnosis, surgical management, and follow-up care.

This case report was meticulously prepared and documented following the CARE guidelines, ensuring comprehensive adherence to standardized reporting practices for case reports.

CASE PRESENTATION

A 14-year-old male patient presented with a four-month history of exercise-induced pain in the right foot. The patient is an active football player and reported that, following physical activity, the foot exhibited symptoms of pain, pallor, coldness, and cyanosis in the forefoot. These symptoms improved with rest and by extending the leg.

Table 1 Classifications of popliteal artery entrapment syndrome (PAES).

Type I	Normal course of MHGM, popliteal artery medially displaced.
Type II	Laterally displaced MHGM, normal course of popliteal artery.
Type III	Compression of the popliteal artery by an additional slip of the gastrocnemius muscle.
Type IV	Compression of the popliteal artery by the popliteus muscle.
Type V	Compression of the popliteal vein.
Type VI (Functional)	Functional entrapment of the popliteal artery without any anatomical abnormality.

MHGM: medial head of gastrocnemius muscle.

Clinical Examination

Physical examination revealed palpable pedal pulses on the left side; however, they were absent on the right side. Provocation testing, which involved both dorsal and plantar flexion, resulted in the right foot demonstrating lividity and trophic changes during prolonged dorsiflexion.

Vascular Diagnostics

The ankle–brachial index (ABI) measured at 1.0 on the left and 0.6 on the right.

Duplex sonography of the right popliteal artery indicated a bi-triphasic flow pattern with the leg extended, which transitioned to a monophasic signal during foot flexion (Figure 1).

No arterial wall abnormalities or cystic changes were observed along the course of the right popliteal artery.

To further investigate the condition, a 4D MRA (3 Tesla magnetic resonance imaging (MRI)) was performed, revealing a high-grade stenosis approximately 15 mm in length at the distal segment of the superficial femoral artery (SFA) extending into the P1 segment of the popliteal artery during plantarflexion. Conversely, during dorsiflexion, complete occlusion was noted over an extent of approximately 30 mm (Figure 2).

An additional native MRI of the soft tissue in the popliteal fossa confirmed an extrinsic medial course of the popliteal artery, which passed medial to the medial head of the gastrocnemius muscle, corroborating the findings from the angiography (Figure 3).

Interdisciplinary Management and Surgical Findings

After an interdisciplinary consultation involving radiologists and orthopedic surgeons, the decision was made that surgical decompression of the popliteal artery would constitute the most appropriate course of treatment.

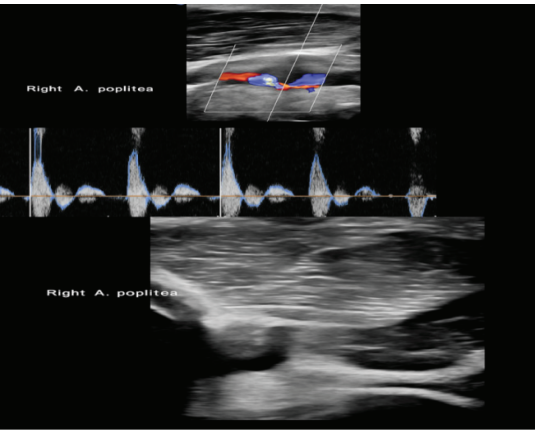


Figure 1 Preoperative duplex findings. Prior to surgery, duplex sonography demonstrated a monophasic flow pattern in the right popliteal artery during dorsiflexion of the foot.

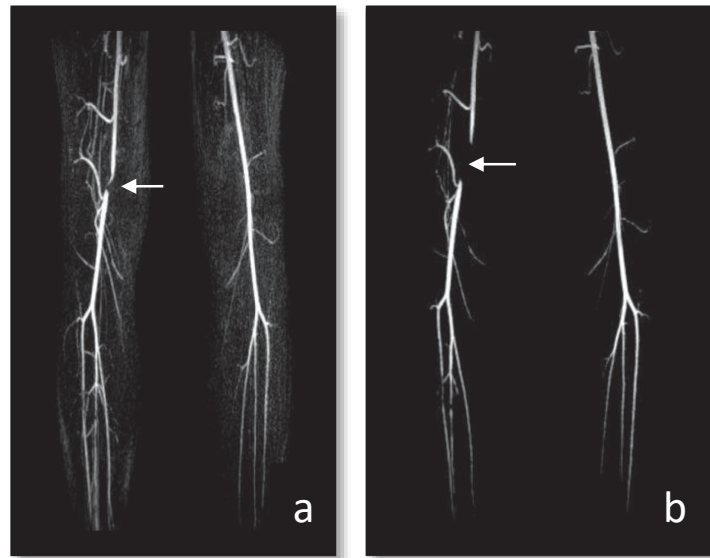


Figure 2 Preoperative magnetic resonance angiography (MRA) findings. (a) 4D MRA demonstrated a high-grade stenosis located at the distal segment of the right superficial femoral artery and extending into the P1 segment of the right popliteal artery during plantarflexion (arrow). (b) Conversely, during dorsiflexion, a complete occlusion was observed (arrow).

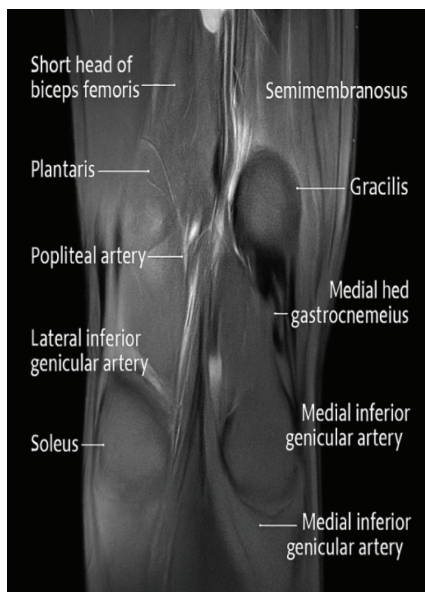


Figure 3 Preoperative duplex findings. Magnetic resonance imaging of the soft tissue within the popliteal fossa indicated an extrinsic medial trajectory of the popliteal artery, resulting from compression by the medial head of the gastrocnemius muscle.

During the surgical procedure, it was determined that the popliteal artery was compressed by an aberrant tendinous slip of the medial head of the gastrocnemius muscle (Figure 4a). The mechanical compression was clearly identified intraoperatively. Under dynamic provocation (both plantar and dorsiflexion), a dense, constrictive tendinous

structure proximal to the femoral condyles was recognized as the source of mechanical narrowing of the artery.

This case illustrated a combined form of PAES in the young patient—a hybrid presentation between Type I and Type III—attributed to the additional muscular slip of the gastrocnemius muscle.

The aberrant anatomical structure was meticulously exposed and surgically divided. Subsequently, the artery was repositioned to ensure complete alleviation of compression within the popliteal fossa (Figure 4b).

In order to prevent recurrent vascular entrapment, the medial head of the gastrocnemius muscle was repositioned and secured with 3-0 Vicryl® suture (Ethicon, Johnson & Johnson) for stabilization.

This surgical intervention facilitated the establishment of a decompressed region surrounding the neurovascular bundle in the popliteal fossa.

Intraoperative duplex sonographical assessment confirmed the establishment of a triphasic signal in the pedal arteries during both plantar and dorsiflexion, thereby verifying the successful decompression of the vessel.

During diagnostic evaluations and intraoperative assessment, the wall of the popliteal artery exhibited no abnormalities. Consequently, in light of the significant improvement in perfusion, vascular reconstruction was deemed unnecessary.

The postoperative course was smooth, and the patient was discharged on the third day after surgery. Partial mobilization and physiotherapy were effectively initiated on the ward. The young patient regained full range of motion and resumed full weight-bearing activities,

allowing a return to daily activities with minimal complaints shortly after discharge.

After a period of two weeks, the patient's mobilization had returned to a state comparable to his preoperative condition. By four to six weeks post-surgery, he gradually reintegrated into light athletic activities, and after approximately three months, he was once again fully engaged in his preferred hobby (playing football) without the recurrence of previous foot symptoms.

A one-year follow-up was conducted, during which the patient expressed high levels of satisfaction with

the outcome and reported freedom from any symptoms during physical activity or exertion. Duplex sonographic examination indicated a normal triphasic flow pattern in both the right popliteal artery and the pedal arteries, with a palpable foot pulse (Figure 5).

In addition, a psychosocial evaluation was conducted utilizing the German version of the SF-36 questionnaire [6].

To assess postoperative outcomes, this evaluation was performed one year post-surgery, empowering the examination of long-term effects and providing a comprehensive insight into the patient's overall health status. The results are summarized as follows:

- (1) The young patient exhibited remarkable recovery as indicated by the questionnaire results.
- (2) He reported no restrictions in activities of daily living or athletic pursuits due to pain, signifying a complete restoration of functional capacity.
- (3) His emotional well-being remained stable, characterized by frequent experiences of energy and happiness, with no reported instances of anxiety or depressive symptoms.
- (4) Social functioning was intact, and he self-assessed his overall health status as satisfactory.
- (5) The patient successfully resumed participation in football without any complaints, demonstrating both physical and psychological aspects of comprehensive recovery.

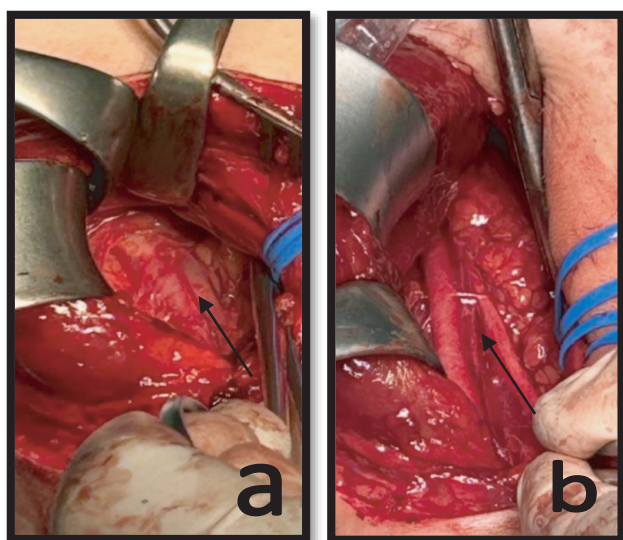


Figure 4 Intraoperative findings. (a) As shown in the image on the left, the arrow points to an abnormal tendinous slip of the medial head of the gastrocnemius muscle, which compresses the popliteal artery. (b) The image on the right illustrates, as indicated by the arrow, that the tendinous slip has been divided, resulting in the complete alleviation of compression on the artery.

Ethical Approval and Informed Consent

Informed consent was not required. According to the German law and in written agreement with the rules of the Medical Ethical Board of the Ärztekammer Niedersachsen in Hannover Germany, no ethical approval was needed for this study (exemption because of study type and content).

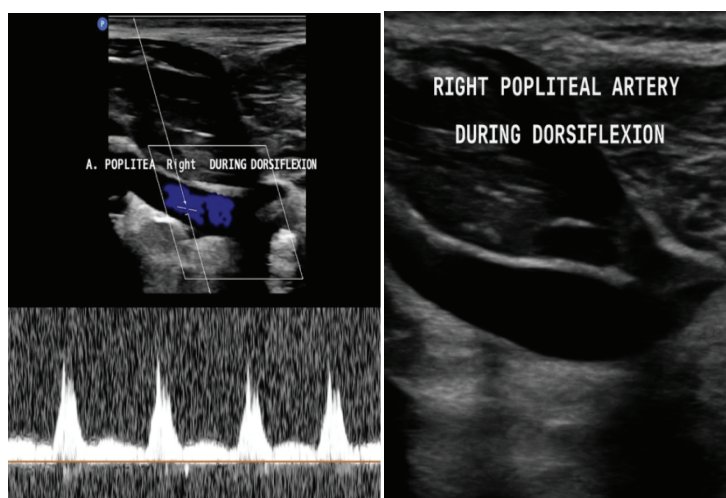


Figure 5 Postoperative duplex findings. A duplex sonographic follow-up conducted one year post surgery revealed an unobstructed course of the right popliteal artery, with a triphasic flow signal observed during foot dorsiflexion.

DISCUSSION

PAES is a rare but important differential diagnosis in young, physically active patients presenting with exertional ischemic symptoms of the lower extremities, particularly in the absence of classic risk factors for atherosclerotic vascular disease [7,8].

This case highlights the importance of a systematic diagnostic approach in evaluating suspected PAES. The diagnostic process commenced with clinical suspicion, followed by a dynamic duplex ultrasound conducted by an outpatient vascular surgeon. Subsequently, the patient was referred to the vascular surgery department of a hospital for further evaluation and treatment.

Functional duplex sonography during plantarflexion and dorsiflexion serves as an established first-line investigation for identifying dynamic alterations in arterial blood flow and has exhibited high sensitivity in suspected PAES cases. In the presented case, the examination revealed notable changes in blood flow contingent upon joint position, thereby reinforcing the clinical suspicion.

Following an interdisciplinary consultation with the radiology department, a targeted dynamic MRA was conducted [9].

The utilization of 4D MRA emerged as a crucial diagnostic modality for evaluating vascular anatomy and dynamic arterial compression. Prior studies have demonstrated that this technique facilitates the reliable identification of both functional stenoses and complete occlusions during provocation maneuvers. Consequently, dynamic magnetic resonance under provocation is now regarded as the gold standard in imaging for diagnosing PAES [10].

Furthermore, MRI of the soft tissue and muscular structures within the popliteal fossa enables the differentiation of various anatomical PAES subtypes, thereby supporting precise classification [11].

Upon confirmation of the suspected diagnosis through radiological findings, an interdisciplinary case discussion was convened with the orthopedic department.

A subsequent surgical intervention was collaboratively planned and executed by both vascular and orthopedic surgeons.

This case exemplifies the essential role of interdisciplinary collaboration in the diagnosis and management of PAES. Effective treatment necessitates an integrated approach that amalgamates the expertise of vascular surgery, radiology, and orthopedics to formulate a tailored surgical strategy based on the patient's unique anatomical presentation.

By leveraging specialized competencies, a comprehensive treatment plan can be formulated that not only optimizes surgical outcomes but also facilitates postoperative recovery and rehabilitation. This interdisciplinary model ensures optimal patient care throughout the entire treatment continuum, encompassing preoperative

planning, surgical intervention, rehabilitation, and long-term follow-up.

CONCLUSION

Diagnosing PAES can be complex, particularly in young athletes, because its nonspecific symptoms are often overlooked. Enhanced clinical awareness and refined diagnostic strategies are crucial for timely recognition and improved patient outcomes.

Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Author Contributions

All authors contributed to the conception, data collection, analysis, and manuscript preparation. All authors reviewed and approved the final version of the manuscript.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declaration of the Use of Generative AI in the Writing Process

No generative AI or AI-assisted tools were used in the writing or editing of this manuscript.

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Erosive Bleeding After Battlefield Vascular Reconstruction: A Case Report and Practical Lessons

Yuliia Nahaliuk

National Military Medical Clinical Center, Kyiv, Ukraine

Vascular injuries in modern warfare are frequently complex and contaminated and are associated with a high risk of secondary complications. Erosive bleeding after vascular reconstruction represents a limb- and life-threatening condition. We report a case of combined gunshot and shrapnel injury to both upper extremities in a soldier, initially treated with temporary vascular shunting and subsequent autovenous reconstruction. The postoperative course was complicated by erosive bleeding at the graft site, requiring urgent reoperation and staged wound management. Limb perfusion was successfully preserved. This case illustrates the importance of shunting, repeated surgical assessment, aggressive infection control and staged reconstruction strategies in contaminated combat-related vascular injuries.

Keywords: *Vascular Injury; Autovenous Bypass; Erosive Bleeding; Combat Trauma; Limb Salvage; Negative Pressure Wound Therapy*

Received: 25 October 2025; Accepted: 23 April 2026

INTRODUCTION

Vascular injuries and hemorrhage remain among the most critical challenges in trauma care and are the leading preventable cause of death in combat casualties. In modern warfare, these injuries are increasingly complex owing to high-energy weapons, body armor, and blast mechanisms, resulting in combined and contaminated wounds. Experience from previous wars has shaped modern diagnostic and treatment strategies [1,2]. Compared with earlier conflicts, contemporary battlefields are characterized by a higher incidence of combined and complex injuries, driven by changes in weapon systems and combat tactics. These factors have significantly altered both the anatomical distribution and clinical presentation of vascular trauma. Extremity vascular injuries are particularly demanding because

they are often associated with extensive soft-tissue damage, fractures, ischemia, and contamination. Early diagnosis, rapid hemorrhage control, temporary or definitive revascularization, and strict infection control remain key determinants of outcome [3–6].

Despite technically successful vascular reconstruction, secondary complications such as infection, graft thrombosis, and erosive bleeding might occur and threaten both limb and patient survival. We present a case of a complex upper-extremity vascular injury complicated by erosive bleeding after autovenous reconstruction, successfully managed with repeated surgery and staged wound treatment.

This case series has been prepared in accordance with the CARE (CAse REport) guidelines.

CASE PRESENTATION

This is the case of a 20-year-old male patient wounded during enemy shelling on 24 January 2024. On admission to the National Military Medical Clinical Center, he was diagnosed with blind gunshot shrapnel wounds to both upper extremities, including a gunshot shrapnel wound of the right forearm complicated by injury to the vascular bundle. On the day of injury, the patient received first aid on the battlefield with application of a tourniquet. At the first evacuation stage, primary wound debridement was performed along with fasciotomy of the right forearm and placement of a temporary vascular shunt in the brachial/forearm arterial segment.

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The day after, the temporary shunt thrombosed. It was removed, a brachial artery thrombectomy was performed, and arterial reconstruction was carried out using an autologous venous graft. Four days later the patient was evacuated and admitted to our center for specialized vascular care. Five days post-injury, sudden erosive bleeding occurred from the graft area (Figure 1). Urgent surgical exploration revealed tissue necrosis and graft erosion. Hemostasis was achieved and repeat reconstruction of the brachial artery was performed (Figure 2).

During subsequent care, multiple wound revisions and debridements were performed. The graft was covered with a muscle flap and managed with negative pressure wound therapy (Figure 3).

The patient received broad-spectrum antibiotics, anticoagulation, analgesics, and anti-inflammatory agents. Additional therapy included probiotics, prokinetics, antisecretory medications, and supportive care. At discharge, both upper extremities were warm with satisfactory perfusion. Distal pulses were palpable, with good flow in the reconstructed brachial artery. Persistent motor and sensory deficits remained in the

right forearm. All wounds were closed or appropriately covered, with satisfactory healing.

Ethical Approval and Informed Consent

Ethical approval to report these cases was given by the Local Ethics Committee of the National Military Medical Clinical Center. Written informed consent was obtained from the patients.

DISCUSSION

Vascular trauma remains a major contributor to morbidity and mortality in modern warfare. The incidence of vascular injury in contemporary conflicts is significantly higher than in earlier wars and reflects changes in weapon systems, protective equipment, and combat patterns [7]. Extremity injuries account for the majority of battlefield trauma and generate a substantial surgical workload. Early revascularization, temporary shunting, and damage-control vascular surgery are now well-established strategies [8]. However, contaminated wounds, delayed definitive care, and massive soft-tissue



Figure 1 Episode of erosive bleeding from the graft site.

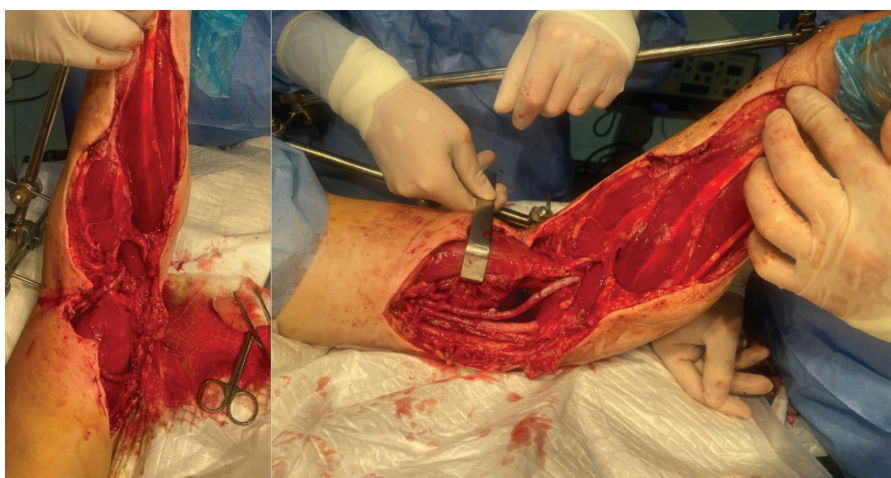


Figure 2 Repeat autovenous brachial artery reconstruction.

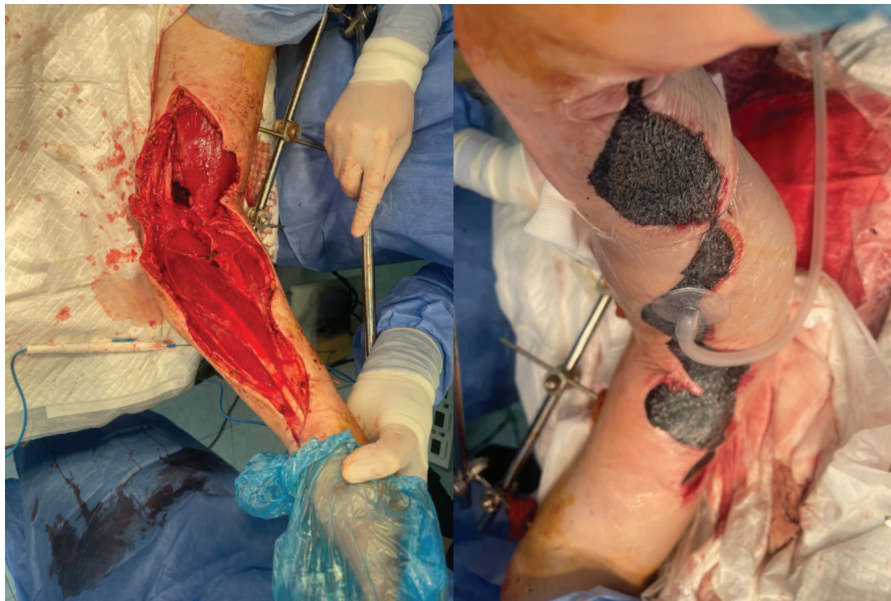


Figure 3 Muscle coverage of the vascular reconstruction and application of negative pressure wound therapy.

destruction continue to expose vascular reconstructions to a high risk of infection-related complications.

This case illustrates that a technically successful vascular reconstruction does not mark the end of treatment. In contaminated combat wounds, repeated wound inspection and staged surgical management should be considered mandatory. Erosive bleeding is not a random event but usually a sign of underlying infection, tissue necrosis, or insufficient soft-tissue coverage of the graft. Once it occurs, immediate surgical exploration is required, as delay might result in catastrophic hemorrhage or loss of the limb. Adequate soft-tissue coverage, preferably with muscle, is a critical component of vascular reconstruction in open extremity injuries. In this context, negative pressure wound therapy has become a valuable adjunct for temporary wound management, allowing control of contamination and protection of the vascular repair until definitive closure is possible [9].

Experience from the ongoing war in Ukraine, with a large number of complex vascular injuries, confirms that limb salvage in such cases is rarely achieved by a single definitive operation. Instead, a staged strategy with repeated debridement, reassessment of the reconstruction, and gradual wound closure should be regarded as standard practice in heavily contaminated battlefield injuries.

PRACTICAL RECOMMENDATIONS

Immediate hemorrhage control on the battlefield is essential, with timely and correct use of tourniquets and local hemostatic agents. Temporary vascular shunting can be used as a damage control measure when

evacuation or definitive repair is delayed, with close monitoring of shunt patency and readiness for prompt revision if thrombosis or worsening perfusion occurs. Key time intervals should be documented, including time of injury, time to tourniquet application, time to shunt placement, and time to definitive repair, to support clinical decision making and outcome analysis. In contaminated wounds, serial debridement is necessary, along with adequate soft tissue coverage—preferably using muscle—over vascular grafts during reconstruction. Negative pressure wound therapy can be used as a temporary adjunct to prepare wounds for definitive coverage and help control contamination, but it should not replace timely surgical revision when infection is suspected. Erosive bleeding must be treated as an indication for urgent surgical exploration, requiring rapid operative revision, debridement of necrotic or infected tissue, and restoration or replacement of the vascular repair as needed.

Antimicrobial therapy should be initiated early and adjusted according to culture results, with empiric regimens reflecting the high contamination risk of combat wounds. Anticoagulation should be individualized based on the balance between bleeding risk and the need to maintain graft patency, with clear documentation of timing and rationale.

Management should follow a locally adapted algorithm for vascular injury, taking into account available resources and evacuation pathways, and involving a multidisciplinary team. Finally, limitations of single case reports should be acknowledged, with a need for larger case series or registry data to support and validate these practices [10].

CONCLUSION

Combat-related vascular injuries are complex and prone to secondary complications. Erosive bleeding after reconstruction is a limb- and life-threatening event that requires immediate reoperation. This case demonstrates that limb salvage is possible through aggressive staged surgery, strict infection control, and appropriate soft-tissue management.

Acknowledgment

None.

Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The author declares that they have no conflicts of interest.

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Author Contributions

The author confirms sole responsibility for the following: study conception and design, data collection, surgical treatment, analysis and interpretation of results, and manuscript preparation.

Data Availability

The data supporting the findings of this study are not publicly available due to privacy or ethical restrictions.

Declaration of the Use of Generative AI in the Writing Process

The authors declare that no AI or AI-assisted technologies were used in the preparation of this work, including the writing process, data analysis, or generation of images.

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Errata: Disclosure of Editorial Roles – Journal of Endovascular Resuscitation and Trauma Management

Tal Hörer¹ and David McGreevy²

¹Editor-in-Chief

²Senior editor

The following errata provide formal disclosure of editorial roles for authors who were members of the Journal of Endovascular Resuscitation and Trauma Management (JEVTM) editorial board at the time of manuscript acceptance. These statements ensure transparency and appropriate indexing in bibliographic databases.

VOLUME 1, ISSUE 1 (2017)

Article: The Journal of Endovascular Resuscitation and Trauma Management: A Timely Endeavor

Author: Joseph DuBose

DOI: <https://doi.org/10.26676/jevtm.v1i1.23>, pp. 1–2

Erratum Statement: At the time this manuscript was accepted, Joseph DuBose served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Journal of Endovascular Resuscitation and Trauma Management (JEVTM)

Author: Todd E. Rasmussen

DOI: <https://doi.org/10.26676/jevtm.v1i1.32>, p. 3

Erratum Statement: At the time this manuscript was accepted, Todd E. Rasmussen served as Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Contemporary Management of Blunt Thoracic Aortic Injury: Results of an EAST, AAST, and SVS Survey by the Aortic Trauma Foundation

Authors: Erik DeSoucy, Melissa Loja, Joseph J. DuBose, Anthony Estrera, Ben Starnes, and Ali Azizzadeh

DOI: <https://doi.org/10.26676/jevtm.v1i1.8>, pp. 4–8

Erratum Statement: At the time this manuscript was accepted, Joseph DuBose served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: “What’s in a Name?” A Consensus Proposal for a Common Nomenclature in the Endovascular Resuscitative Management and REBOA Literature

Authors: Timothy K. Williams, Austin Johnson, Luke Neff, Tal M. Hörer, Laura Moore, Megan Brenner, Joe DuBose, John Holcomb, and Todd Rasmussen

DOI: <https://doi.org/10.26676/jevtm.v1i1.7>, pp. 9–12

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Brenner, Joseph DuBose and Tod Rasmussen served as Editors of the journal. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Practice Preferences Using Resuscitative Endovascular Balloon Occlusion of the Aorta for Traumatic Injury Before and After the 2017 EndoVascular and Hybrid Trauma and Bleeding Management Symposium

Authors: Erik DeSoucy, Melissa Loja, Anders Davidson, Edwin Faulconer, Rachel Russo, Meryl Simon, and Joseph DuBose

DOI: <https://doi.org/10.26676/jevtm.v1i1.13>, pp. 13–21

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Article: Endovascular Solutions for Iliac and Lower Extremity Junctional Injuries

Authors: Edwin Faulconer, Rachel Russo, Anders Davidson, Meryl Simon, Erik DeSoucy, Melissa Loja, Timothy K. Williams, James Sampson, Joseph Galante, and Joseph DuBose

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Article: Trauma Pan-Scan in Resuscitative Endovascular Occlusion: A Novel Strategy for Hemodynamically Unstable Polytrauma Patients

Authors: Yosuke Matsumura and Junichi Matsumoto

DOI: <https://doi.org/10.26676/jevtm.v1i1.3>, pp. 28–33

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Article: A Hybrid Bleeding Control Method for Retro-Peritoneal or Inguinal Bleeding After Endovascular Procedures

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Article: Use of Endovascular Balloons May Simplify Proximal and Distal Control in Complicated Vascular Trauma

Authors: Offer Galili, Dan Hebron, Joseph DuBose, Tal M. Hörer, Eitan Heldenberg, Sheizaf Gefen, and Boris Kessel

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Article: Endovascular Resuscitation with Aortic Balloon Occlusion in Non-Trauma Cases: First Use of ER

Authors: David McGreevy, Emanuel Dogan, Asko Toivola, Linda Bilos, Artai Pirouzram, Kristofer Nilsson, and Tal M. Hörer

Guest Editor Commentary: Boris Kessel

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Erratum Statement: At the time this manuscript was accepted, Artai Pirouzram, Kristofer Nilsson, Tal M. Hörer and Boris Kessel served as Editors of the journal. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Penetrating Injury to the Proximal Descending Aorta: Can We Do Better in the Endovascular Era?

Authors: Aurwa Younis, Offer Galili, Eitan Heldenberg, Yair Glick, and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.v1i1.4>, pp. 50–52

Erratum Statement: At the time this manuscript was accepted, Boris Kessel served as Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: A Case of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) Use in Penetrating Abdominal Aortic Injury

Authors: Meryl Simon, Rachel Russo, Anders Davidson, Edwin Faulconer, Erik DeSoucy, Melissa Loja, M. Austin Johnson, Timothy K. Williams, Joseph J. DuBose, and David Dawson

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Article: Vascular Damage Control Approach Using Direct Deployment of Self-Expanding PTFE Stent Graft as an Alternative to Intra-Arterial Shunt

Authors: Brittany Bankhead-Kendall, Anish Patel, Jeffrey Taylor, and Pedro G. R. Teixeira

DOI: <https://doi.org/10.26676/jevtm.v1i1.27>, pp. 63–67

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Article: Introduction to the Second Edition of JEVTM

Author: Megan L. Brenner

DOI: <https://doi.org/10.26676/jevtm.v2i1.53>, p. 1

Erratum Statement: At the time this manuscript was accepted, Megan L. Brenner served as Managing Editor of the journal. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Bare Metal Stents Can Maintain Arterial Patency in Traumatic Occlusion

Authors: Viktor A. Reva, Jonathan J. Morrison, Alexey V. Denisov, Alexey B. Seleznev, Gennady G. Rodionov, Stepan G. Grigoriev, Igor S. Zheleznyak, and Igor M. Samokhvalov

DOI: <https://doi.org/10.26676/jevtm.v2i1.34>, pp. 2–9

Erratum Statement: At the time this manuscript was accepted, Viktor A. Reva and Jonathan J. Morrison served as members of the Editorial Board and Managing Editor, respectively. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Creating an Educational Program in the Endovascular and Hybrid Intervention; Experiences from the Japanese Society of Diagnostic and Interventional Radiology in Emergency, Critical Care, and Trauma (DIRECT)

Authors: Tomohiro Funabiki, Yosuke Matsumura, Hiroshi Kondo, Koji Idoguchi, and Junichi Matsumoto

DOI: <https://doi.org/10.26676/jevtm.v2i1.36>, pp. 10–16

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura and Junichi Matsumoto served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Successful and Unsuccessful Blind Placement of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) Catheters Through Damaged Arteries: A Report of Three Cases

Authors: Philip J. Wasicek, William A. Teeter, Peter Hu, Deborah M. Stein, Thomas M. Scalea, and Megan L. Brenner

DOI: <https://doi.org/10.26676/jevtm.v2i1.43>, pp. 17–22

Erratum Statement: At the time this manuscript was accepted, Megan L. Brenner served as Managing Editor of the journal. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Effect of Severe Traumatic Hemorrhage on Large Arterial Diameter as Determined by Computed Tomography

Authors: Philip J. Wasicek, Kathirnamanathan Shanmuganathan, Shiming Yang, Thomas M. Scalea, and Megan L. Brenner

DOI: <https://doi.org/10.26676/jevtm.v2i1.45>, pp. 23–29

Erratum Statement: At the time this manuscript was accepted, Megan L. Brenner served as Managing Editor of the journal. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: First Use of the Manta Closure Device in Ruptured Abdominal Aortic Aneurysm Patients and Its Potential Usage for Urgent Endovascular Procedures: A Short Report

Authors: Tal M. Hörer, David McGreevy, Linda Bilos, Asko Toivola, and Artai Pirouzram

DOI: <https://doi.org/10.26676/jevtm.v2i1.42>, pp. 30–32

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief, and David McGreevy and Artai Pirouzram served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Onyx Embolization in IA Endoleak to Prevent Rupture After Aortic Repair with the Nellix System

Author: Tal M. Hörer

DOI: <https://doi.org/10.26676/jevtm.v2i1.38>, pp. 37–38

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

VOLUME 2, ISSUE 2 (2018)

Article: The Onyx Liquid Embolic System: Another Chance in the Management of Peripheral Bleeding

Authors: Anna Maria Ierardi, Marco Femia, Mario Petrillo, Salvatore Alessio Angileri, Tal M. Hörer, and Gianpaolo Carrafiello

DOI: <https://doi.org/10.26676/jevtm.v2i2.46>, pp. 49–56

Erratum Statement: At the time this manuscript was accepted, Anna Maria Ierardi served as a member of the Editorial Board and Tal M. Hörer served as Editor-in-Chief of the journal. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Acute Kidney Injury Following Resuscitative Endovascular Balloon Occlusion of the Aorta: A Systematic Review

Authors: Guillaume L. Hoareau, Patrick A. Cassiday, Ian J. Stewart, Amy C. Studer, Joseph J. DuBose, Lucas P. Neff, Timothy K. Williams, and M. Austin Johnson

DOI: <https://doi.org/10.26676/jevtm.v2i2.50>, pp. 57–65

Erratum Statement: At the time this manuscript was accepted, Joseph J. DuBose served as Managing Editor and Timothy K. Williams served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Resuscitation: The Emergency Physician Has a Key Role to Play

Author: Zaffer Qasim

DOI: <https://doi.org/10.26676/jevtm.v2i2.60>, pp. 66–67

Erratum Statement: At the time this manuscript was accepted, Zaffer Qasim served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Be Aware: REBOA May Increase Liver Bleeding

Authors: Yaakov Daskal, Tal M. Hörer, Dan Hebron, Yael Shvili, and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.v2i2.44>, pp. 68–71

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief and Boris Kessel served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Femoral Arterial Closure After REBOA Using the Fascia Suture Technique: First Experiences in a Military Setting

Authors: Viktor A. Reva, Tal M. Hörer, Igor M. Samokhvalov, and Thomas Larzon

DOI: <https://doi.org/10.26676/jevtm.v2i2.48>, pp. 72–76

Erratum Statement: At the time this manuscript was accepted, Viktor A. Reva and Thomas Larzon served as members of the Editorial Board, and Tal M. Hörer served as Editor-in-Chief of the

journal. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Blunt Abdominal Aortic Injury: A Hybrid Approach to Combined Injuries

Authors: Ohad Guetta, Gad Shaked, George Greenberg, Gilbert Sebbag, and David Czeiger

DOI: <https://doi.org/10.26676/jevtm.v2i2.56>, pp. 81–85

Erratum Statement: At the time this manuscript was accepted, Gad Shaked served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

VOLUME 2, ISSUE 3 (2018)

Article: Stepwise Reperfusion After Zone 1 REBOA: Is Repositioning to Zone 3 a Useful Maneuver?

Authors: Emily M. Tibbits, Guillaume L. Hoareau, Meryl A. Simon, Anders J. Davidson, Erik S. DeSoucy, E. Robert Faulconer, Lucas P. Neff, Kevin Grayson, M. Austin Johnson, and Timothy K. Williams

DOI: <https://doi.org/10.26676/jevtm.v2i3.61>, pp. 95–102

Erratum Statement: At the time this manuscript was accepted, Timothy K. Williams served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Severe Venous Injury in Acute Trauma Setup – Is There a Role for Endovascular Treatment?

Authors: E. Heldenberg, Y. Daskal, J. J. DuBose, G. Sheizaf, Z. Aizer, and B. Kessel

DOI: <https://doi.org/10.26676/jevtm.v2i3.67>, pp. 111–116

Erratum Statement: At the time this manuscript was accepted, Joseph J. DuBose served as Managing Editor and Boris Kessel served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Isolated Abdominal Injury of Blunt Aortic Trauma: Two Case Reports and Review of the Literature

Authors: Barak Raguean, Ali Shnaker, and Simone Fajer

DOI: <https://doi.org/10.26676/jevtm.v2i3.63>, pp. 123–126

Erratum Statement: At the time this manuscript was accepted, Simone Fajer served as a member of the Editorial Board. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Resuscitation for Ruptured Abdominal Aortic Aneurysms with Main Stent-Graft and REBOA via Single-Sided Access

Authors: David T. McGreevy, Tal M. Hörer, and Artai Pirouzram

DOI: <https://doi.org/10.26676/jevtm.v2i3.68>, pp. 127–130

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VOLUME 3, ISSUE 1 (2019)

Article: JEVTM February 2019

Authors: Joseph J. DuBose, Megan Brenner, and Tal M. Hörer

DOI: <https://doi.org/10.26676/jevtm.v3i1.82>, pp. 1–2

Erratum Statement: At the time this manuscript was accepted, Joseph J. DuBose and Megan Brenner served as Managing Editors, and Tal M. Hörer served as Editor-in-Chief of the journal. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: A Novel Automated Endovascular Variable Aortic Control Device to Expand Function of Standard REBOA Catheters

Authors: Timothy K. Williams, Lucas P. Neff, Emily M. Tibbits, Guillaume L. Hoareau, Meryl A. Simon, Anders J. Davidson, Erik S. DeSoucy, E. Robert Faulconer, and M. Austin Johnson
DOI: <https://doi.org/10.26676/jevtm.v3i1.65>, pp. 3–10

Erratum Statement: At the time this manuscript was accepted, Timothy K. Williams served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Prompt Procedures to Hemodynamically Unstable Patients with Pelvic Fractures

Authors: Kumiko Tanaka, Yosuke Matsumura, and Junichi Matsumoto
DOI: <https://doi.org/10.26676/jevtm.v3i1.75>, pp. 11–14

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura and Junichi Matsumoto served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Comparison of 7 and 11–French Access for REBOA: Results from the AAST Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery (AORTA) Registry

Authors: Joseph J. DuBose, Jonathan Morrison, Megan Brenner, Laura J. Moore, John B. Holcomb, Kenji Inaba, Jeremy Cannon, Mark Seamon, David Skarupa, Ernest Moore, Charles Fox, Joseph Ibrahim, and Thomas M. Scalea
DOI: <https://doi.org/10.26676/jevtm.v3i1.79>, pp. 15–21

Erratum Statement: At the time this manuscript was accepted, Joseph J. DuBose and Megan Brenner served as Managing Editors; Laura J. Moore, John B. Holcomb, Kenji Inaba, Ernest E. Moore, and Charles J. Fox served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Unstable Without a Source: The Non-Diagnostic Triad in Hypotensive Blunt Trauma Victims

Authors: Robert Reily, Tyler Simpson, Morgan Evans, Alison Smith, and Juan Duchesne
DOI: <https://doi.org/10.26676/jevtm.v3i1.83>, pp. 22–26

Erratum Statement: At the time this manuscript was accepted, Juan Duchesne served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Resuscitation and Trauma Management in the Hybrid Emergency Room System: Ideal Solution for Surgical, Endovascular, and Radiological Trinity

Authors: Yosuke Matsumura, Junichi Matsumoto, Kaori Ito, Hiroyuki Ohbe, Takahiro Kinoshita, Kei Hayashida, Tomohiro Funabiki, Kazuma Yamakawa, Shigeki Kushimoto, Satoshi Fujimi, and the Japanese Association for Hybrid Emergency Room System (JA-HERS) Scientific Promotion Committee
DOI: <https://doi.org/10.26676/jevtm.v3i1.80>, pp. 27–31

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura and Junichi Matsumoto served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Emergency Embolization of a Ruptured Renal Artery Aneurysm

Authors: S. Yen M. Chan, Grigoris Athanasiadis, Athanasios Pantos, Stavros Spiliopoulos, and Alasdair Wilson
DOI: <https://doi.org/10.26676/jevtm.v3i1.69>, pp. 32–33

Erratum Statement: At the time this manuscript was accepted, Stavros Spiliopoulos served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: The Non-Diagnostic Triad in a Hypotensive Blunt Trauma Victim: What Is the Role of REBOA?

Authors: Robert Reily, Mwamba Mvula, Chrissy Guidry, and Juan Duchesne
DOI: <https://doi.org/10.26676/jevtm.v3i1.70>, pp. 38–41

Erratum Statement: At the time this manuscript was accepted, Juan Duchesne served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: REBOA Enables Operative Management of the Peripartum Trauma Patient in Hemorrhagic Shock

Authors: Kelvin Allenson and Laura J. Moore
DOI: <https://doi.org/10.26676/jevtm.v3i1.78>, pp. 42–44

Erratum Statement: At the time this manuscript was accepted, Laura J. Moore served as a member of the Editorial Board. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Management following Unintentional Subclavian Artery Injury during Central Venous Catheter Placement

Author: David T. McGreevy
DOI: <https://doi.org/10.26676/jevtm.v3i1.88>, pp. 51–53

Erratum Statement: At the time this manuscript was accepted, David T. McGreevy served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

VOLUME 3, ISSUE 2 (2019)

Article: Contemporary Utilization of Zone III REBOA for Temporary Control of Pelvic and Lower Junctional Hemorrhage Reliably Achieves Hemodynamic Stability in Severely Injured Patients

Authors: Jason D. Pasley, Megan Brenner, Amelia Pasley, Laura J. Moore, Thomas M. Scalea, Joseph J. DuBose, and AAST AORTA Study Group
DOI: <https://doi.org/10.26676/jevtm.v3i2.89>, pp. 56–52

Erratum Statement: At the time this manuscript was accepted, Megan Brenner and Joseph J. DuBose served as Managing Editors, and Laura J. Moore served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Gossypiboma: Is It Always What It Appears to Be? A Rare Complication in Everyday Practice

Authors: Daniel Sheffer, Yaakov Daskal, Alaa Zahalka, Arie Arishe, Yoram Klein, Rabea Hasadia, Dan Hebron, and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.v3i2.90>, pp. 77–79

Erratum Statement: At the time this manuscript was accepted, Boris Kessel served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

VOLUME 3, ISSUE 3 (2020)

Article: JEVTM: Standing on the Shoulders of Giants

Authors: Charles J. Fox MD, FACS

DOI: <https://doi.org/10.26676/jevtm.v3i3.101>, pp. 93–94

Erratum Statement: At the time this manuscript was accepted, Charles J. Fox served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: The Trauma-Vascular Surgeon: A Global Necessity

Authors: Ernest E. Moore MD

DOI: <https://doi.org/10.26676/jevtm.v3i3.102>, pp. 95–96

Erratum Statement: At the time this manuscript was accepted, Ernest E. Moore served as Senior Advisor to the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Approximation of Pediatric Morphometry for Resuscitative Endovascular Balloon Occlusion of the Aorta

Authors: Erik S. DeSoucy, A. Francois Trappey, Andrew M. Wishy, Meryl A. Simon, Anders J. Davidson, Joseph J. DuBose, Timothy K. Williams, M. Austin Johnson, and Jacob T. Stephenson

DOI: <https://doi.org/10.26676/jevtm.v3i3.95>, pp. 97–103

Erratum Statement: At the time this manuscript was accepted, Joseph J. DuBose served as Managing Editor and Timothy K. Williams served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Is Time of the Essence: A Retrospective Analysis of Operating Room Procedure Length for First Phase Damage Control Trauma Surgery

Authors: Alison Smith, Lyrn Hakki, Jessica Friedman, Rebecca Schroll, Chrissy Guidry, Patrick McGrew, Danielle Tatum, and Juan Duchesne

DOI: <https://doi.org/10.26676/jevtm.v3i3.97>, pp. 104–110

Erratum Statement: At the time this manuscript was accepted, Juan Duchesne served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Embolization and its Limits: Tips and Tricks

Authors: Anna Maria Ierardi, Filippo Pesapane, Tal M. Hörer, Victor Reva, and Gianpaolo Carrafiello

DOI: <https://doi.org/10.26676/jevtm.v3i3.96>, pp. 120–130

Erratum Statement: At the time this manuscript was accepted, Anna Maria Ierardi and Victor (Viktor) Reva served as members of the Editorial Board, and Tal M. Hörer served as Editor in Chief. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Successful Fluoroscopy-Free Extremity Endovascular Revascularization in an Austere Environment

Authors: Viktor A. Reva, Jonathan J. Morrison, and Igor M. Samokhvalov

DOI: <https://doi.org/10.26676/jevtm.v3i3.100>, pp. 133–138

Erratum Statement: At the time this manuscript was accepted, Viktor A. Reva served as a member of the Editorial Board and Jonathan J. Morrison served as former Managing Editor. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Resuscitation with Aortic Balloon Occlusion in Pediatric Trauma

Authors: Mitra Sadeghi, David T. McGreevy, Rickard Lindgren, Kjell Ågren, and Tal M. Hörer

DOI: <https://doi.org/10.26676/jevtm.v3i3.99>, pp. 139–142

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VOLUME 4, ISSUE 1 (2020)

Article: Trauma Management During and After COVID-19

Authors: Federico Coccolini, Fausto Catena, Emiliano Gamberini, Anna Maria Ierardi, Massimo Sartelli, Mirco Nacoti, and Massimo Chiarugi

DOI: <https://doi.org/10.26676/jevtm.v4i1.125>, pp. 5–7

Erratum Statement: At the time this manuscript was accepted, Federico Coccolini and Anna Maria Ierardi served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Commentary: Trauma Management During and After COVID-19

Authors: Boris Kessel, D. Sheffer, and V. Zilbermint

DOI: <https://doi.org/10.26676/jevtm.v4i1.127>, pp. 8–9

Erratum Statement: At the time this manuscript was accepted, Boris Kessel served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Extracorporeal Membrane Oxygenation in Coronavirus Disease 2019: Experience from a Single Italian Center

Authors: Emiliano Gamberini, Federico Coccolini, Alessandro Circelli, Emanuele Russo, Marco Benni, Gustavo Iacono, Emanuela Giampalma, and Vanni Agnoletti

DOI: <https://doi.org/10.26676/jevtm.v4i1.124>, pp. 10–11

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Article: Extra Corporeal Membrane Oxygenation (ECMO) for Patients with COVID-19

Authors: David T. McGreevy and Jenny Seiltz

DOI: <https://doi.org/10.26676/jevtm.v4i1.128>, pp. 12–14

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Article: Hate to Burst Your Balloon: Successful REBOA Use Takes More Than a Course

Authors: Christina M. Theodorou, Edgardo S. Salcedo, Joseph J. DuBose, and Joseph M. Galante

DOI: <https://doi.org/10.26676/jevtm.v4i1.106>, 21–29

Erratum Statement: At the time this manuscript was accepted, Joseph J. DuBose served as Managing Editor. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: A Novel Technique for the Damage Control of Huge Diaphragmatic Injuries

Authors: Boris Kessel, Viktor Reva, Daniel Sheffer, and Tal Hörer

DOI: <https://doi.org/10.26676/jevtm.v4i1.113>, pp. 30–32

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Article: Glue or Onyx: A Guide to Choice – Tips and Techniques

Authors: Enrico Maria Fumarola, Anna Maria Ierardi, Filippo Piacentino, and Gianpaolo Carrafiello

DOI: <https://doi.org/10.26676/jevtm.v4i1.114>, pp. 33–39

Erratum Statement: At the time this manuscript was accepted, Anna Maria Ierardi served as a member of the Editorial Board. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: The Role of Endovascular Stents in an Experimental Model of Traumatic Arterial Occlusion – the Temporary Endo-Shunt

Authors: Viktor A. Reva, Marta J. Madurska, Igor M. Samokhvalov, Alexey V. Denisov, Sergey Yu Telicky, Alexey B. Seleznyev, Igor S. Zheleznyak, Valery N. Adamenco, and Kenji Inaba

DOI: <https://doi.org/10.26676/jevtm.v4i1.116>, pp. 40–48

Erratum Statement: At the time this manuscript was accepted, Viktor A. Reva and Kenji Inaba served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Scalpel or Sheath? Outcomes Comparison Between Pre-Peritoneal Pelvic Packing and Angioembolization for Definitive Hemorrhage Control After REBOA

Authors: Megan Brenner, Laura Moore, Bishoy Zakhary, Alexander Schwed, Alexis Cralley, Anna Romagnoli, Charles Fox, Thomas Scalea, and Clay Cothren Burlew

DOI: <https://doi.org/10.26676/jevtm.v4i1.119>, pp. 49–55

Erratum Statement: At the time this manuscript was accepted, Megan L. Brenner served as Managing Editor; Laura J. Moore and Charles J. Fox served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: The Treatment of Post-Partum Bleeding With Embolization

Authors: Anna Maria Ierardi, Enrico Maria Fumarola, Antonio Pinto, Mariano Scaglione, and Gianpaolo Carrafiello

DOI: <https://doi.org/10.26676/jevtm.v4i1.110>, pp. 56–62

Erratum Statement: At the time this manuscript was accepted, Anna Maria Ierardi served as a member of the Editorial Board. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Extracorporeal Cardio-Pulmonary Resuscitation (E-CPR) in Traumatic Cardiac Arrests Caused by Penetrating Thoracic Injuries: A Series of Two Cases

Authors: Viktor A. Reva, David T. McGreevy, Eduard A. Sinyavskiy, Daniil A. Shelukhin, Alexander N. Petrov, Alexander A. Rud, Evgeny N. Ershov, Grigory E. Lysenko, and Igor M. Samokhvalov

DOI: <https://doi.org/10.26676/jevtm.v4i1.121>, pp. 63–68

Erratum Statement: At the time this manuscript was accepted, Viktor A. Reva served as a member of the Editorial Board and David T. McGreevy served as Resident Corner Editor. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: The Interventional Radiology Service During the COVID-19 Pandemic: Steps to Managing the Risk of Infection

Authors: Anna Maria Ierardi, Aldo Carnevale, Melchiorre Giganti, and Gianpaolo Carrafiello

DOI: <https://doi.org/10.26676/jevtm.v4i1.126>, pp. 69–73

Erratum Statement: At the time this manuscript was accepted, Anna Maria Ierardi served as a member of the Editorial Board. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

VOLUME 4, ISSUE 2 (2021)

Article: DCR and EVT: The Future of Trauma Research and Training

Authors: Mansoor Ali Khan, Bryan Cotton, Tal Hörer, and Juan Duchesne

DOI: <https://doi.org/10.26676/jevtm.v4i2.163>, pp. 75–76

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Article: ECMO in Trauma Patients Requiring Total Pulmonectomy: Could This be a New Approach in the Era of Hybrid Management?

Authors: Hannelore Raemen, Maya Paran, Mickey Dudkiewicz, and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.v4i2.138>, pp. 77–79

Erratum Statement: At the time this manuscript was accepted, Maya Paran and Boris Kessel served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: To Ultrasound or Not to Ultrasound: A REBOA Femoral Access Analysis from the ABOTrauma and AORTA Registries

Authors: Juan Duchesne, David McGreevy, Kristofer Nilsson, Joseph DuBose, Todd E. Rasmussen, Megan Brenner, Tomas Jacome, Tal Hörer, and Danielle Tatum

DOI: <https://doi.org/10.26676/jevtm.v4i2.139>, pp. 80–87

Erratum Statement: At the time this manuscript was accepted, Juan Duchesne and Kristofer Nilsson served as members of the Editorial Board, David McGreevy served as Resident Corner Editor, Joseph J. DuBose served as Managing Editor, Todd E. Rasmussen served as a member of the Editorial Board, Megan L. Brenner served as Managing Editor, and Tal M. Hörer served as Editor-in-Chief. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Pediatric Sized REBOA Catheter Testing in a Pulsatile Aortic Flow Model

Authors: Erik S. DeSoucy, A. F. Trappey, Anders J. Davidson, Joseph J. DuBose, Timothy K. Williams, M. A. Johnson, and Jacob T. Stephenson

DOI: <https://doi.org/10.26676/jevtm.v4i2.141>, pp. 94–100

Erratum Statement: At the time this manuscript was accepted, Joseph J. DuBose served as Managing Editor and Timothy K. Williams served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Hybrid Trauma Management: Is It the Way We Are Heading?

Authors: Maya Paran and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.v4i2.135>, pp. 101–108

Erratum Statement: At the time this manuscript was accepted, Maya Paran and Boris Kessel served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Versus Open: Emergency Department Resuscitative Endovascular Balloon Occlusion of the Aorta or Thoracotomy for Management of Post-Injury Noncompressible Torso Hemorrhage

Authors: Derek J. Roberts, Bryan A. Cotton, Juan Duchesne, Paula Ferrada, Tal M. Hörer, David Kauvar, Mansoor Khan, Andrew W. Kirkpatrick, Carlos Ordoñez, Bruno Pereira, Artai Pirouzram, and Megan L. Brenner

DOI: <https://doi.org/10.26676/jevtm.v4i2.136>, pp. 109–119

Erratum Statement: At the time this manuscript was accepted, Juan Duchesne and Mansoor Khan served as members of the Editorial Board; Tal M. Hörer served as Editor-in-Chief; Artai Pirouzram served as a member of the Editorial Board; and Megan L. Brenner served as Managing Editor. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Open Balloon Tamponade and Hepatic Angiography for Hemorrhage Control of Transepatic Gunshot Wounds in a Hybrid Trauma Operating Room Environment

Authors: Melike Harfouche, Jonathan Morrison, Rishi Kundi, Joseph J. DuBose, and Thomas M. Scalea

DOI: <https://doi.org/10.26676/jevtm.v4i2.131>, pp. 120–125

Erratum Statement: At the time this manuscript was accepted, Jonathan J. Morrison served as former Managing Editor and Joseph J. DuBose served as Managing Editor. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Venous Chimney Procedure: A Novel Technical Solution to Prevent Iatrogenic Budd–Chiari Syndrome Following Retrohepatic Vena Cava Injury

Authors: Dan Hebron, Ofer Galili, Boris Kessel, Itay Zoarets, Yoram Klein, Aiya Assif, and Eitan Heldenberg

DOI: <https://doi.org/10.26676/jevtm.v4i2.132>, pp. 126–130

Erratum Statement: At the time this manuscript was accepted, Boris Kessel served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Development of a Custom Extracorporeal Circuit for Endovascular Resuscitation Research

Authors: Hossam Abdou, Michael Richmond, Marta J. Madurska, Noha Elansary, and Jonathan J. Morrison

DOI: <https://doi.org/10.26676/jevtm.v4i2.160>, pp. 131–135

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VOLUME 5, ISSUE 1 (2021)

Article: JEVTM 10th Edition

Authors: Tal M. Hörer

DOI: <https://doi.org/10.26676/jevtm.v5i1.192>, pp. 1–2

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: REBOA or Preperitoneal Packing in Patients with Pelvic Fractures: Why Not Both?

Authors: Maya Paran, Boris Kessel, and Eyal Hashavia

DOI: <https://doi.org/10.26676/jevtm.v5i1.166>, pp. 3–5

Erratum Statement: At the time this manuscript was accepted, Maya Paran served as a member of the Editorial Board and Boris Kessel served as Associate Editor. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Vascular Access Training for Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) Placement: A Feasibility Study in Emergency Physicians

Authors: Suzanne M. Vrancken, Rayner C.L.A. Maayen, Boudewijn L.S. Borger van der Burg, Daniël Eefting, Thijs T.C.F. van Dongen, Ingvar T.B. Berg, Mark W. Bowyer, and Rigo Hoencamp

DOI: <https://doi.org/10.26676/jevtm.v5i1.193>, pp. 6–12

Erratum Statement: At the time this manuscript was accepted, Daniël Eefting and Rigo Hoencamp served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Indications for the Appropriate Use of Damage Control Surgery and Damage Control Interventions in Civilian Trauma Patients

Authors: Derek J. Roberts, Juan Duchesne, Megan L. Brenner, Bruno Pereira, Bryan A. Cotton, Andrew W. Kirkpatrick, and Mansoor Khan for the Damage Control Resuscitation Committee

DOI: <https://doi.org/10.26676/jevtm.v5i1.168>, pp. 13–23

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Article: CT-Guided Placement of a Neuromonitoring Suite in Swine for Trauma and Resuscitation Research

Authors: Janet Bonin, Hossam Abdou, Joseph Edwards, Neerav Patel, Michael Richmond, Noha Elansary, Kelly Poe, and Jonathan J. Morrison

DOI: <https://doi.org/10.26676/jevtm.v5i1.171>, pp. 24–27

Erratum Statement: At the time this manuscript was accepted, Jonathan J. Morrison served as former Managing Editor. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Challenging Cases Managed by Interventional Radiology

Authors: Anna Maria Ierardi and Gianpaolo Carrafiello

DOI: <https://doi.org/10.26676/jevtm.v5i1.189>, p. 28

Erratum Statement: At the time this manuscript was accepted, Anna Maria Ierardi served as a member of the Editorial Board. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Management of Unintentional Thoracic Aorta Injury

Authors: A. Arrichiello, Anna Maria Ierardi, S.A. Angileri, L. Di Meglio, and G. Carrafiello

DOI: <https://doi.org/10.26676/jevtm.v5i1.179>, pp. 45–46

Erratum Statement: At the time this manuscript was accepted, Anna Maria Ierardi served as a member of the Editorial Board. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Embolization of Type 1 Endoleak Due to Migration of Nellix Endograft System: Clinical Photos of Interest

Authors: Tal M. Hörer and David T. McGreevy

DOI: <https://doi.org/10.26676/jevtm.v5i1.191>, pp. 75–76

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief and David T. McGreevy served as Resident Corner Editor. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

VOLUME 5, ISSUE 2 (2021)

Article: Contemporary Management of Axillo-Subclavian Arterial Injuries Using Data from the AAST PROOVIT Registry

Authors: Grahya Guntur, Joseph J. DuBose, Tiffany K. Bee, Timothy Fabian, Jonathan Morrison, David J. Skarupa, Kenji Inaba, Rishi Kundi, Thomas Scalea, David V. Feliciano, and the AAST PROOVIT Study Group

DOI: <https://doi.org/10.26676/jevtm.v5i2.201>, pp. 77–82

Erratum Statement: At the time this manuscript was accepted, Joseph J. DuBose served as Managing Editor, Jonathan Morrison served as former Managing Editor, and Kenji Inaba served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Zone III REBOA and the COBRA-OS™: Safety of Inadvertent Iliac Artery Device Deployment

Authors: Adam Power, Asha Parekh, Tyler Beveridge, Adam Groh, and Laura J. Moore

DOI: <https://doi.org/10.26676/jevtm.v5i2.202>, pp. 83–87

Erratum Statement: At the time this manuscript was accepted, Adam Power and Laura J. Moore served as members of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: A Practical Approach to Introducing Pre-hospital Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA), the Problems Encountered and Lessons Learned

Authors: Manik Chana, Zane Perkins, Robbie Lendrum, and Samy Sadek

DOI: <https://doi.org/10.26676/jevtm.v5i2.207>, pp. 88–95

Erratum Statement: At the time this manuscript was accepted, Samy Sadek served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Chimney Grafts in Acute Endovascular Aortic Repair Due to Ruptured Abdominal Aorta Aneurysm

Authors: Tal M. Hörer

DOI: <https://doi.org/10.26676/jevtm.v5i2.200>, pp. 96–97

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Bioengineered Acellular Vessel Implantation in a Patient with Chronic Limb-Threatening Ischemia: A Case Report and Discussion of Implications for Trauma

Authors: Alexis L. Lauria, Joseph M. White, Alexander J. Kersey, Paul W. White, and Todd E. Rasmussen

DOI: <https://doi.org/10.26676/jevtm.v5i2.197>, pp. 115–118

Erratum Statement: At the time this manuscript was accepted, Todd E. Rasmussen served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

VOLUME 5, ISSUE 3 (2021)

Article: Morphometric Analysis of the Aorto-Esophageal Relationship in Swine for Trans-Esophageal Aortic Blood Flow Occlusion

Authors: Samuel G Savidge, Hossam Abdou, Joseph Edwards, Neerav Patel, Michael J Richmond, Rebecca Treffalls, Joseph Rabin and Jonathan J Morrison

DOI: <https://doi.org/10.26676/jevtm.v5i3.186>, pp. 129–134

Erratum Statement: At the time this manuscript was accepted, Jonathan J Morrison was listed as Former Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Instead of Open Surgical Repair of Axillosubclavian Artery Injuries: An Evolving Paradigm Shift

Authors: Shreya Jalali, Derek J Roberts, Megan L Brenner, Joseph J DuBose, Laura J Moore and Adam H Power

DOI: <https://doi.org/10.26676/jevtm.v5i3.187>, pp. 135–142

Erratum Statement: At the time this manuscript was accepted, Megan L Brenner and Joseph J DuBose served as Managing Editors of the journal. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Hybrid Management of Acute Portal Vein Thrombosis Complicated by Mesenteric Ischemia

Authors: Sayuri P Jinadasa, Mira Ghneim, Brittany O Aicher, Rishi Kundi, John Karwowski, Jose J Diaz and Joseph J DuBose

DOI: <https://doi.org/10.26676/jevtm.v5i3.188>, pp. 143–146

Erratum Statement: At the time this manuscript was accepted, Joseph J DuBose served as a Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Hemoperitoneum Due to Penetrating Intercostal Artery Injury: A Case Report of a Rare and Still Understudied Entity

Authors: Maya Paran, Sivan Barkai, Gerardo Camarillo, Boris Kessel and Alexander Korin

DOI: <https://doi.org/10.26676/jevtm.v5i3.189>, pp. 149–151

Erratum Statement: At the time this manuscript was accepted, Boris Kessel served as Associate Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular and Hybrid Open and Endovascular Management of Blunt and Penetrating Zone III Carotid Artery Injuries

Authors: Shira A Strauss, Adam Power, Sudhir K Nagpal, Michael K Tso, Megan L Brenner, Joseph J DuBose and Derek J Roberts

DOI: <https://doi.org/10.26676/jevtm.v5i3.190>, pp. 152–160

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VOLUME 6, ISSUE 1 (2022)

Article: Trends in Aortic Occlusion and How to Minimize the Risk of Complications in REBOA

Authors: Yosuke Matsumura and Tomohiro Funabiki

DOI: <https://doi.org/10.26676/jevtm.v6i1.231>, pp. 4–7

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Indication of Resuscitative Endovascular Balloon Occlusion of the Aorta in Trauma Patients

Authors: Kenichiro Ishida, Satomi Seno, Takaaki Maruhashi, and Yosuke Matsumura

DOI: <https://doi.org/10.26676/jevtm.v6i1.221>, pp. 8–13

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Indication of Resuscitative Endovascular Balloon Occlusion of the Aorta in Non-Traumatic Hemorrhage

Authors: Ken Shinozuka, Makoto Aoki, Kenichiro Ishida, Takaaki Maruhashi, and Yosuke Matsumura

DOI: <https://doi.org/10.26676/jevtm.v6i1.225>, pp. 14–18

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Resuscitative Thoracotomy and Aortic Cross-Clamp and Resuscitative Endovascular Balloon Occlusion of the Aorta

Authors: Futoshi Nagashima, Takayuki Irahara, Kenichiro Ishida, Takaaki Maruhashi, and Yosuke Matsumura

DOI: <https://doi.org/10.26676/jevtm.v6i1.234>, pp. 19–26

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: A Guide to Femoral Arterial Access for Resuscitative Endovascular Balloon Occlusion of the Aorta

Authors: Futoshi Nagashima, Yuri Kon, Takuya Sugiyama, Kenichiro Ishida, Takaaki Maruhashi, and Yosuke Matsumura

DOI: <https://doi.org/10.26676/jevtm.v6i1.233>, pp. 27–40

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Techniques for Performing Resuscitative Endovascular Balloon Occlusion of the Aorta

Authors: Satomi Seno, Takaaki Maruhashi, Ryoichi Kitamura, and Yosuke Matsumura

DOI: <https://doi.org/10.26676/jevtm.v6i1.195>, pp. 41–49

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Present Strategy for REBOA Management After Catheter Placement: A Current Suggestion from the Japanese Society of DIRECT

Authors: Yutaro Kurihara, Satoshi Tamura, Takaaki Maruhashi, and Yosuke Matsumura

DOI: <https://doi.org/10.26676/jevtm.v6i1.196>, pp. 50–56

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Partial Resuscitative Endovascular Balloon Occlusion of the Aorta and Intermittent Resuscitative Endovascular Balloon Occlusion of the Aorta

Authors: Suguru Hitomi, Yutaro Kurihara, Takaaki Maruhashi, and Yosuke Matsumura

DOI: <https://doi.org/10.26676/jevtm.v6i1.197>, pp. 57–60

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Resuscitative Endovascular Balloon Occlusion of the Aorta Complications and its Management

Authors: Takuya Sugiyama, Keisuke Tomita, Kenichiro Ishida, Takaaki Maruhashi, and Yosuke Matsumura

DOI: <https://doi.org/10.26676/jevtm.v6i1.198>, pp. 61–66

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Endovascular Strategy in Obstetrics

Authors: Yosuke Matsumura and Ken Shinozuka

DOI: <https://doi.org/10.26676/jevtm.v6i1.199>, pp. 67–71

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission.

Article: Proactive Use of Whole-Body Computed Tomography and Resuscitative Endovascular Balloon Occlusion of the Aorta in Hemodynamically Unstable Trauma Patients

Authors: Ryosuke Miyauchi, Midori Komita, Yosuke Matsumura, and Junichi Matsumoto

DOI: <https://doi.org/10.26676/jevtm.v6i1.200>, pp. 72–76

Erratum Statement: At the time this manuscript was accepted, Yosuke Matsumura served as Managing Editor and Junichi Matsumoto served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission.

VOLUME 6, ISSUE 2 (2022)

Article: EndoVascular Resuscitation and Trauma Management Specialists in Training – The Future of EVTm Education

Authors: David T. McGreevy, Daniel Sheffer, Maya Paran, Anna Stene Hurtsén, Camilla Cremonini, Enrico Ciuttin, and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.v6i2.259>, pp. 77–78

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Article: Resuscitative Endovascular Balloon Occlusion of the Aorta as a Bridge to Organ Donation after Blunt Trauma

Authors: Joshua J. Sumislawski, Dylan P. Foley, Ernest E. Moore, Ernest B. Moore, and Hunter B. Moore

DOI: <https://doi.org/10.26676/jevtm.v6i2.211>, pp. 102–105

Erratum Statement: At the time this manuscript was accepted, Ernest E. Moore served as Senior Advisor to the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission. This erratum provides formal disclosure of his editorial role.

Article: The Use of a Single Proglide for Large Sheath Delivery Systems

Authors: David T. McGreevy, Tal M. Hörer, and Claes Forssell

DOI: <https://doi.org/10.26676/jevtm.v6i2.257>, pp. 116–118

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief and David T. McGreevy served as EVTm-ST Section Editor. Neither was involved in any aspect of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest statement did not include these editorial roles; this erratum provides formal disclosure.

VOLUME 6, ISSUE 3 (2022)

Article: Why Don't Trauma Surgeons Use Resuscitative Endovascular Balloon Occlusion of the Aorta: Evidence, Holy Grail or Fear?

Authors: Mansoor Khan and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.263>, pp. 119–120

Erratum Statement: At the time this manuscript was accepted, Mansoor Khan served as a member of the Editorial Board and Boris Kessel served as Managing Editor of the journal. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest statement did not note these editorial roles; this erratum provides formal disclosure.

Article: Place the Sheath: Emergent 7 French Femoral Sheath Placement is Low Risk During Initial Trauma Resuscitation

Authors: Alexis L. Cralley, Margot DeBot, Jamie Hadley, Fredric M. Pieracci, Barry K. Platnick, Eric Campion, Ernest E. Moore, Mitchell J. Cohen, Charles J. Fox, and Ryan A. Lawless

DOI: <https://doi.org/10.26676/jevtm.269>, pp. 127–133

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Article: Percutaneous Imaging Guided Puncture and Embolization of Visceral Pseudoaneurysms

Authors: Anna Maria Ierardi, Jacopo Tintori, Anas Shehab, Maurizio Papa, and Gianpaolo Carraffello

DOI: <https://doi.org/10.26676/jevtm.265>, 134–139

Erratum Statement: At the time this manuscript was accepted, Anna Maria Ierardi served as Managing Editor and Anas Shehab served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest statement did not include these editorial roles; this erratum provides formal disclosure.

Article: A Prospective Meta-Analysis (PMA) Could Harmonize the Studies Focusing on Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA)

Authors: Mohammad Hossein Taghiri, Rohan Borazjani, David McGreevy, Shahram Paydar, and Shahin Mohseni

DOI: <https://doi.org/10.26676/jevtm.261>, pp. 148–150

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VOLUME 7, ISSUE 1 (2023)

Article: Would Changing the Term “REBOA” to Intra-luminal Aortic Control Potentially Increase the Adoption of the Procedure?

Authors: Mansoor Khan and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.292>, pp. 1–2

Erratum Statement: At the time this manuscript was accepted, Boris Kessel served as Managing Editor of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest statement reported no conflicts and did not note this editorial role; this erratum provides formal disclosure.

Article: Hybrid Management for Traumatic Iliac Arteriovenous Fistula

Authors: Adenauer Marinho de Oliveira Góis Junior, Matheus Oliveira Feijó, and Fernanda Beatriz Araújo de Albuquerque

DOI: <https://doi.org/10.26676/jevtm.279>, pp. 3–7

Erratum Statement: At the time this manuscript was accepted, Adenauer Marinho de Oliveira Góis Junior served as a member of the Editorial Board. He was not involved in any aspect

of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest statement declared no conflicts and did not note this editorial role; this erratum provides formal disclosure.

Article: Use of Intermittent Aortic Balloon Occlusion: Report from the ABO Trauma Registry

Authors: Johan Buitendag, Saffiya Variawa, Aashish Diyavar, Pieter Snyders, Pieter Rademan, Nabeel Allopi, David Thomas McGreevy, Tal Martin Hörer, George Oosthuizen, and the ABO Trauma Registry Group

DOI: <https://doi.org/10.26676/jevtm.275>, pp. 8–14

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief, David T. McGreevy served as EVTm-ST Senior Editor, and George Oosthuizen served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission. The conflict-of-interest section of the article disclosed Tal M. Hörer's editorial role but did not include the others; this erratum provides complete disclosure.

Article: Comparison of Outcomes Relating to REBOA Inflation Zones: Report from the ABO Trauma Registry

Authors: Johan Buitendag, Saffiya Variawa, Aashish Diyavar, Pieter Snyders, Pieter Rademan, Nabeel Allopi, David Thomas McGreevy, Tal Martin Hörer, George Oosthuizen, and the ABO Trauma Registry Group

DOI: <https://doi.org/10.26676/jevtm.276>, pp. 15–21

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief, David T. McGreevy served as EVTm-ST Senior Editor, and George Oosthuizen served as a member of the Editorial Board. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest section disclosed Tal M. Hörer's role as Editor-in-Chief; this erratum provides complete disclosure of all editorial affiliations.

Article: REBOA in Bleeding and Cardiac Arrest in Pre-Hospital Care by Helicopter Emergency Medical Service: The RIBCAP-HEMS Project

Authors: Peter Hilbert-Carius, Jörg Braun, Jesse Davis, Matthias Beese, Jörn Tongers, Daniel Ebert, Carolin Gräbsch, Fridolin Streibert, and David Baer

DOI: <https://doi.org/10.26676/jevtm.278>, pp. 22–32

Erratum Statement: At the time this manuscript was accepted, Peter Hilbert-Carius served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission. The conflict-of-interest section disclosed David Baer's employment with Prytime Medical but did not mention any editorial affiliations; this erratum provides formal disclosure.

Article: Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) After Traumatic Brain Injury

Authors: Kristen D. Nordham, Scott Nikonoway, Ayman Ali, Jacob M. Broome, Scott McCraney, John T. Simpson, Danielle Tatum, Olan Jackson-Weaver, Sharven Taghavi, Patrick McGrew, and Juan Duchesne

DOI: <https://doi.org/10.26676/jevtm.284>, pp. 33–38

Erratum Statement: At the time this manuscript was accepted, Juan Duchesne served as a member of the Editorial Board. He was not involved in any aspect of the peer review or editorial

decision-making process related to this submission. The conflict-of-interest section did not include this editorial role; this erratum provides formal disclosure.

Article: Reduction of Distal Ischemia with pREBOA-PRO in a Trauma Laparotomy Requiring Extended Occlusion Time

Authors: Katherine I. Foley, John P. Hunt, Alan B. Marr, Lance Stuke, Patrick Greiffenstein, Jonathan Schoen, and Alison A. Smith

DOI: <https://doi.org/10.26676/jevtm.277>, pp. 39–40

Erratum Statement: At the time this manuscript was accepted, Alison A. Smith served as a member of the Editorial Board. She was not involved in any aspect of the peer review or editorial decision-making process related to this submission. The conflict-of-interest statement reported no conflicts and did not note this editorial role; this erratum provides formal disclosure.

Article: Alternative Methods for Endovascular and Hybrid Bleeding Control

Authors: Tal Hörer and David T. McGreevy

DOI: <https://doi.org/10.26676/jevtm.290>, pp. 43–44

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief and David T. McGreevy served as EVTm-ST Senior Editor. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest section declared no conflicts and did not include these editorial roles; this erratum provides formal disclosure.

Article: Using Double Wires as a Stability Solution

Authors: Tal Hörer and David T. McGreevy

DOI: <https://doi.org/10.26676/jevtm.291>, p. 45

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief and David T. McGreevy served as EVTm-ST Senior Editor. They were not involved in any aspect of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest section declared no conflicts and did not include these editorial roles; this erratum provides formal disclosure.

VOLUME 7, ISSUE 2 (2023)

Article: Permissive Hypotension and Permissive Haemorrhage – Are They Necessary Evils of Trauma? (*Kessel-Khan Corner*)

Authors: Mansoor Khan and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.307>, pp. 47–48

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Article: Damage Control Strategies for Vascular Injuries – A Report from the Amazon

Authors: Adenauer Marinho de Oliveira Goes Junior and Emily Saboia Moura Rodrigues

DOI: <https://doi.org/10.26676/jevtm.306>, pp. 67–71

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VOLUME 7, ISSUE 3 (2023)

Article: Enhancing Oxygen Uptake in Hypovolemic Shock: Exploring the Role of Oxygen-Increasing Drugs (*Kessel-Khan Corner*)

Authors: Mansoor Khan and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.19507>, pp. 79–80

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Article: REBOA: A Device to Gain Time

Authors: Carolina Lanza, Salvatore Alessio Angileri, Jacopo Fumagalli, Pierpaolo Biondetti, Serena Carriero, Velio Ascenti, Anna Maria Ierardi, Hayato Kurihara, and Gianpaolo Carrafiello

DOI: <https://doi.org/10.26676/jevtm.18304>, pp. 93–97

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VOLUME 8, ISSUE 1 (2024)

Article: Endovascular Management of Pelvic Trauma: The Interventional Radiology Point of View

Authors: Velio Ascenti, Carolina Lanza, Pierpaolo Biondetti, Jean Marc Pernes, Matteo Renzulli, Costantino Del Giudice, Gianpaolo Carrafiello, and Anna Maria Ierardi

DOI: <https://doi.org/10.26676/jevtm.19180>, pp. 6–11

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Article: REBOA in Severe Brain Injury: Fatal Combination or Another Treatment Alternative? (*Khan-Kessel Corner*)

Authors: Mansoor Khan and Boris Kessel

DOI: <https://doi.org/10.26676/jevtm.23242>, pp. 17–18

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Article: REBOA to the Rescue: Successful Endovascular Resuscitation of Methemoglobinemia-Induced Cardiac Arrest

Authors: Lucas P. Bowen, Nakia U. Armendariz, Jadeyn M. King, Laura J. Moore, and Anna K. Mydlowska

DOI: <https://doi.org/10.26676/jevtm.20305>, pp. 19–22

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VOLUME 8, ISSUE 2 (2024)

Article: EndoVascular Resuscitation and Trauma Management (EVTM) – Where Do We Go?

Author: Tal Hörer

DOI: <https://doi.org/10.26676/jevtm.26305>, pp. 27–28

Erratum Statement: At the time this manuscript was accepted, Tal M. Hörer served as Editor-in-Chief of the journal. He was not involved in any aspect of the peer review or editorial decision-making process related to this submission. The article's conflict-of-interest statement did not include this editorial role; this erratum provides formal disclosure.

VOLUME 8, ISSUE 3 (2024)

Article: Endovascular Evolution: Transforming rAAA and Trauma Care through Innovation and Collaboration

Author: David T. McGreevy

DOI: <https://doi.org/10.26676/jevtm.41338>, pp. 63–64

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Article: Trans Arterial Embolization of Spontaneous Abdominal Muscle Bleeding

Authors: Pierpaolo Biondetti, Gaetano Valerio Davide Amato, Carolina Lanza, Serena Carriero, Velio Ascenti, Chiara Grilli, Edon Xhepa, Salvatore Alessio Angileri, Anna Maria Ierardi, and Gianpaolo Carrafiello

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Article: Stent Graft Treatment of Traumatic Arteriovenous Fistula in a 35-Year-Old: What Is the 10-Year Outcome?

Author: Per Skoog

DOI: <https://doi.org/10.26676/jevtm.33220>, pp. 90–91

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VOLUME 9, ISSUE 1 (2025)

Article: Establishing a Swine Model of Acute Respiratory Distress Syndrome Secondary to Ischemia-Reperfusion Injury Following Acute Limb Ischemia

Authors: Grzegorz Jodlowski, Rebecca Treffalls, May Dvir, Silvana N. Wilken, Jonathan J. Morrison, and Patrick F. Walker
DOI: <https://doi.org/10.26676/jevtm.49156>, pp. 12–18

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Article: Aortic Graft Enteric Erosion Following EVAR: A Multidisciplinary Approach to Repair

Authors: William Duong, Benjamin DiPardo, Marvin Chau, Karen Woo, Vincent Rowe, and Megan Brenner

DOI: <https://doi.org/10.26676/jevtm.41278>, pp. 19–24

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CONFLICT OF INTEREST DECLARATIONS

For the following papers, the authors declare no conflict of interest related to the content of the article:

Introduction to the Sixth Edition of the JEVTM. Igor M Samokhvalov. JEVTM 3(2).

DOI: <https://doi.org/10.26676/jevtm.v3i2.93>, p. 55

Pediatric Blunt Trauma and REBOA. Alexis D Smith. JEVTM 3(3).

DOI: <https://doi.org/10.26676/jevtm.v3i3.103>, p. 143

Post-traumatic Lung Embolization as a Bridge to Surgery in a Jockey Injured by a Fall from a Horse. Filippo Piacentino, Christian Ossola, Federico Fontana, Marco Curti, Marta Duvia, Giada Zorzetto and Massimo Venturini. JEVTM 5(1).

DOI: <https://doi.org/10.26676/jevtm.v5i1.178>, pp. 29–31

EVTM After COVID. Rishi Kundi, Jonathan Morrison and Thomas Scalea. JEVTM 5(3).

DOI: <https://doi.org/10.26676/jevtm.v5i3.243>, p. 119

REBOA for Inter-Hospital Transfer: Are We Walking in the Dark?. Maya Paran, Mickey Dudkiewicz and Boris Kessel. JEVTM 5(3).

DOI: <https://doi.org/10.26676/jevtm.v5i3.235>, pp. 120–121

Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) After Traumatic Brain Injury. Kristen D Nordham, Scott Ninokawa, Ayman Ali, Jacob M Broome, Scott McCraney, John T Simpson, Danielle Tatum, Olan Jackson-Weaver, Sharven Taghavi, Patrick McGrew and Juan Duchesne. JEVTM 7(1).

DOI: <https://doi.org/10.26676/jevtm.284>, pp. 33–38

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Education



EndoVascular resuscitation and Trauma Management – Specialists in Training (EVTM-ST) is a group within the EVTSM Society and EVTSM Council who represent the interests of trainees, especially with regards to training, education, research and exchange programmes.

One of the main EVTSM-ST events is the monthly multidisciplinary international case discussions on Zoom. An appreciated concept with focus on allowing the participating trainees to discuss a presented EVTSM case, with only one consultant present for guidance. Participants are from all around the world, from various disciplines and with different levels of experience. We have great discussions, exchange of knowledge and hear about different local experiences that everyone can learn from.

If you are interested in joining the EVTSM-ST case discussions,

please email: david.mcgreevy@regionorebrolan.se

EndoVascular resuscitation bleeding and Trauma Management (EVTM)

Multidisciplinary Workshop



Örebro, Sweden, 10–11 September 2026

Endovascular and hybrid solutions for the bleeding and resuscitation patient;
Aortic balloon occlusion (*REBOA*) usage, Vascular Access, Embolization,
Imaging, Endografts, Endo-embolectomy, ECMO, SAAP and modern
techniques in Resuscitation

EVTM instructors (preliminary)
TBA

Dept. of Cardiothoracic and Vascular Surgery, Dept. of General Surgery,
Dept. of Anesthesia and Intensive Care, Örebro University Hospital, Sweden

Local team: David McGreevy, Tal Hörer, TBA

Target: Surgeons, Vascular, Trauma, IR, ED, Intensivists/ICU and Military with interest in
trauma/bleeding/resuscitation, emergency & pre-hospital teams

Date: TBA **Place:** Örebro University Hospital experimental Lab

Workshop Directors: Dr. Tal Hörer, MD, PhD, Dr. David McGreevy, MD, PhD

Workshop Secretary / Registration: Åsa Strandberg (asa.strandberg@regionorebrolan.se)

Cost (cover expenses only): 500€, 400€ for EVTM Society members, ESVS/SSVS members

Partners: Örebro University Hospital; EVTM society; Limedic Ltd; TBA

The aim of this two days' workshop is to stimulate discussion, mutual learning and sharing of experiences while practicing EndoVascular resuscitation and Trauma Management (EVTM) using a multidisciplinary team approach. "No ego, just good science and cooperation" is the main motion of the event. It is built on an individual, professional level and we will together explore different methods for resuscitation, bleeding control and trauma management. Some methods are used clinically world-wide while some are under development and have been used in selected patients.

- Vascular access:
 - Different methods (blind, doppler, ultrasound, fluoroscopy and cut down)
 - Its use in hemodynamic unstable patients
- Aortic Balloon Occlusion (REBOA) basic and advanced methods and SAAP
- ECMO access and complications
- Basic and advanced endograft and embolization methods
- Bleeding control methods
- Damage Control EVTM and Bailout methods
- Basic and advanced postoperative considerations
- Up-to-date research and clinical experience
- Knowledge of basic material and new technologies on the market
- Intensive training on live tissue
- ICU and ECMO aspects
- Basics for building an "EVTM service"
- Advanced experimental methods in resuscitation

The workshop is designed for experienced physicians but is individually tailored during the practical parts. Participants will get basic training and knowledge of REBOA placement as part of the EVTM concept. The workshop has been certificated by the EACCME and acknowledged by collaboration with societies like the European Society for Trauma and Acute Care Surgery, the European vascular society and others.

Program at the animal lab training & research center, Örebro University Hospital

Detailed schedule and program: TBA

Day 1 (Start lunch): Clinical and research data, guidelines and case presentations with discussions. Models.

Start 12:00 with Lunch at the lab.

17:00–18:00 Clinical Scenarios & Group Model Discussion

Day 2 (whole day): Workshop on live tissue

Practical training points in the animal lab:

Every station is led by a highly experienced instructor with one-to-one training on live tissue as well as group scenario discussions (Lunch and coffee will be served in the lab). Changing stations according to interest is encouraged. The team is a multidisciplinary one with vascular, IR, Trauma, Thorax, ICU and ED experts.

1. Material usage in bleeding patients, general considerations and management scenarios
2. Vascular Access
 - Basic principles/advanced methods
 - Cut down techniques
 - Endoshunts (and shunts)
 - Hybrid procedures
stentgrafts and more
 - Puncture methods
 - Seldinger technique
 - The failing access – alternatives
 - Venous access and Ultrasound
3. Upgrading/introducers/guide wires
4. REBOA
 - Material and REBOA kit
 - Deflation and re-positioning
 - Intermittent/Partial inflation (MAP as target – iREBOA/pREBOA)
 - Ongoing bleeding practice
 - CPR procedures and pending arrest
5. ECMO practical use with tips and tricks (own station)
6. Endo-embolectomy
7. Embolization – from coils to fluid embolization, with hands on practice
8. Endografts for bleeders with practical use
9. Balloon in alternate locations (Iliac, Subclavian, Brachiocephalic trunk/Zone 1 neck)
10. Aortography and Angiography considerations (type, volume etc.)
11. Bailouts in endovascular and hybrid surgery
12. Open thorax and abdominal methods and hybrid solutions

“No ego, just good science and cooperation”

Coming Meetings

EVTM Multidisciplinary Workshop, September 2026, Örebro, Sweden
<https://jevtm.com/workshop/>

ESVS 40th Annual Meeting, 6–9 October 2026, Belgrade, Serbia
<https://esvs.org/event/esvs-40th-annual-meeting/>

EVTM Asia 2026, 8–10 October 2026, Tokyo Bay Makuhari Hall, Chiba, Japan
<https://supportoffice.jp/evtm/>

VEITH Symposium 2026, 17–21 November 2026, New York, USA
<https://www.veithsymposium.org/>

11th EVTAM Pan American Symposium, November 2027, Atlanta, GA, USA

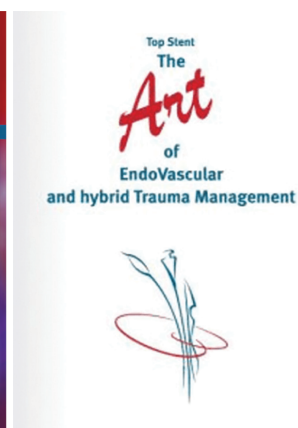
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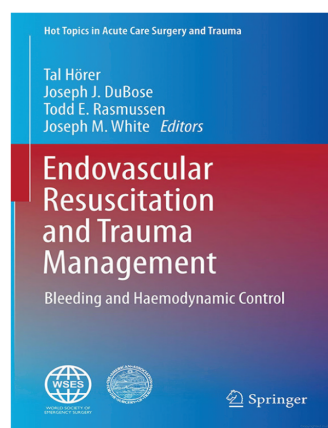
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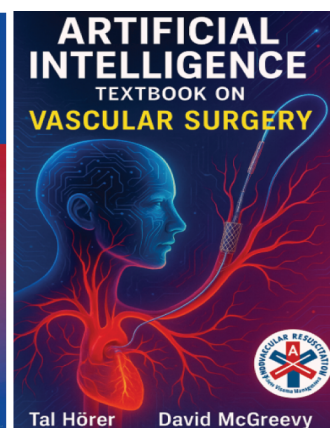
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EVTM Asia²⁰²⁶

8-10 October, 2026

TKP Tokyo Bay Makuhari Hall, Chiba, Japan



Dr. Thomas M. Scalea,
The Legend of Trauma,
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Congress Vice Chair

Professor of Trauma center,
Department of Thoracic and Cardiovascular surgery,
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EndoVascular resuscitation and Trauma Management

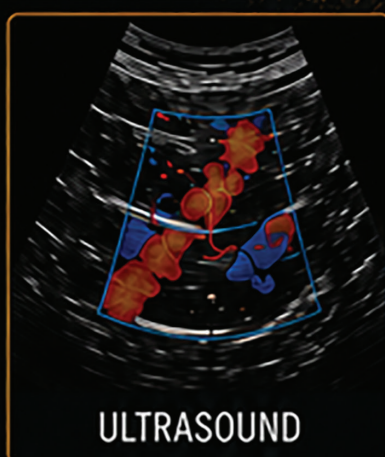
EXOTIC ANIMAL TRAUMA

AND THE ROLE OF ENDOVASCULAR & HYBRID TRAUMA MANAGEMENT

BRIDGING TRADITIONAL SURGERY
AND EVTm IN THE WORLD'S MOST
UNUSUAL INJURIES



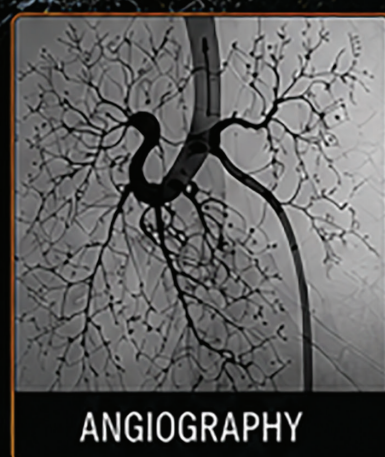
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