

# Supporting Cardiac Perfusion by pREBOA with Reduced Visceral Ischemia Despite Extended Occlusion

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## INTRODUCTION

Partial resuscitative endovascular balloon occlusion of the aorta (pREBOA) has been shown to have less distal organ injury when compared to complete occlusion, thus safely allowing longer occlusion times. Its use is gaining momentum as an adjunct for patients with noncompressible truncal hemorrhage. Current clinical guidelines recommend avoiding REBOA in polytrauma where proximal chest injuries are suspected [1]. However, there is an increasing interest in the use of REBOA as an adjunct to surgical treatment in polytrauma patients due to the nature of their injuries. The objective of this case report was to present the successful use of pREBOA to Zone 1 in a patient with hemorrhagic shock secondary to a blunt cardiac injury that did not result in visceral ischemia despite an extended partial occlusion time of 3 hours.

## CASE REPORT

A 28-year-old male restrained driver was involved in a motor vehicle collision with multiple traumatic injuries. Systolic blood pressure (SBP) was unattainable on arrival

and thus the massive transfusion protocol (MTP) was activated and pREBOA was placed at 48 cm in Zone 1. A left chest tube was placed after chest X-ray and large volume bloody output immediately returned. The patient was not stable enough for imaging and he was taken directly to the operating room for surgical exploration. A median sternotomy was performed and an injury to the left ventricle was found and repaired. Partial REBOA remained in Zone 1 for a total of 3 hours (proximal SBP 80s, distal SBP 30–60s). The patient had on-going hypotension when the REBOA balloon was deflated, and subsequently an exploratory laparotomy was performed which revealed hemoperitoneum from a mesenteric injury. The abdomen was packed and the REBOA balloon was deflated followed by catheter removal in the Operating Room. The patient was transferred to the Intensive Care Unit for on-going resuscitation and eventual abdominal closure two days after his initial surgery. No lab marker indications of renal hypoperfusion were found post-operatively, nor any other markers of ischemic sequelae to viscera were noted in the post-operative period.

## Ethical Approval and Informed Consent

Ethical approval was not required. Informed consent was not possible because of the retrospective nature, the information has been anonymised.

## DISCUSSION

For patients with impending cardiac arrest from circulatory collapse, REBOA offers a less invasive alternative to the traditional resuscitative thoracotomy, with aortic cross clamping as a temporizing measure to increase

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coronary and cerebral perfusion pressures, decrease the workload on the heart, and get the patient to definitive repair [2].

While aortic occlusion increases coronary and cerebral blood flow, this also means increased blood flow to any injury above the point of REBOA deployment, thus worsening hemorrhage and hemodynamic collapse [3]. This can be detrimental if not quickly followed by a definitive intervention, and thus current recommendations do not support the use of REBOA in the management of proximal thoracic injuries.

Our findings challenge this recommendation, as the hemodynamic support provided by pREBOA allowed the patient to be taken for definitive repair of his proximal injury that otherwise would not have been possible. Furthermore, partial occlusion to Zone 1 was safely utilized in our patient for an extended time of 180 minutes without any resultant hypoperfusion-related injury to downstream viscera as previously described with complete occlusion.

## CONCLUSION/LEARNING POINTS

We present the successful utilization of pREBOA in Zone 1 to bridge a critically ill polytrauma patient to the operating room for definitive management after blunt injury. Use of pREBOA supported coronary perfusion throughout the operation, and controlled bleeding from a mesenteric injury without causing any resulting ischemic damage. Our findings suggest that pREBOA can be sustained for as long as 180 minutes without negative distal sequelae and can be used as an adjunct to surgery in the management of proximal blunt thoracic injuries.

## 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

Dr Smith is on the advisory board for Prytime Medical. The authors have no other disclosures nor conflicts of interest.

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## Author Contributions

All authors have substantially contributed to the case report.

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