Case Report

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Reduction of Distal Ischemia with pREBOA-PRO in a Trauma Laparotomy Requiring Extended Occlusion Time

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INTRODUCTION

The partial Resuscitative Endovascular Balloon Occlusion of Aorta (pREBOA)-PRO system is utilized to temporize non-compressible truncal hemorrhage in the setting of trauma. Since the first reported instance of the use of aortic balloon occlusion in the 1950s in a battlefield setting, much progress has been made in development of this minimally invasive portable technology with the goal of reducing loss of life due to hemorrhage [1]. In practice, immense variation exists in the range of specific locations and occlusion times of the pREBOA-PRO system. Current guidelines suggest that a Zone 1 occlusion time greater than 30 minutes is considered extended and carries a higher risk of both distal ischemia and catastrophic reperfusion injury. This particular limitation of the REBOA has been the subject of discussion in the field of endovascular trauma, with the aim of ultimately broadening the utilization of pREBOA [2]. Studies have looked at associations between occlusion time and increased lactate as well as the sequelae of occlusions at Zones 1–3 [3].

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The objective of this case report is to present a clinic scenario in which extended Zone 1 occlusion time allowed for successful operative intervention and did not result in clinically significant distal ischemia.

Ethical Approval and Informed Consent

Ethical approval was not required. Informed consent was not possible and the information has been anonymized.

CASE REPORT

A 23-year-old male patient status post unrestrained motor vehicle collision with ejection was brought to a Level 1 trauma center. Upon arrival, the patient was hypotensive. An arterial line was placed. The patient initially responded to blood transfusion and he was taken to the computerized tomography (CT) scanner, which revealed grade V kidney laceration as well as grade III splenic laceration. He remained hemodynamically stable and was then admitted to the trauma Intensive Care Unit (ICU). He began to decompensate in the ICU and bilateral tube thoracostomies were performed as well as placement of pREBOA-PRO, which was slowly inflated until the patient's blood pressure stabilized. He was transferred to the OR for nephrectomy. Sixty minutes of partial occlusion of Zone 1 was required and the balloon was deflated and removed in the operating room following successful nephrectomy. No intraoperative signs of ischemia were noted. The patient suffered no immediate complications and no other intra-abdominal injuries were noted. Postoperatively the patient returned to the ICU in a stable condition with peak creatinine of 1.6 mg/dL.

DISCUSSION

In this patient who was acutely decompensating in the ICU, pREBOA-PRO was effective in temporizing blood pressure for transfer to the operating room for definitive treatment of life-threatening injuries. Although this particular case required an extended Zone 1 partial occlusion time of 60 minutes, there was no subsequent evidence of end organ damage. This is particularly notable in the setting of nephrectomy.

CONCLUSION

Future directions in animal models and clinical research involving the pREBOA-PRO system are focused on allowing for both pre-hospital placement as well as in-hospital modifications in order to temporize non-truncal hemorrhage in the trauma setting and ultimately decrease morbidity from this cause. Circumstances such as the one discussed in this case report in which extended Zone 1 partial occlusion time does not result in distal ischemia or reperfusion injury are important in the ongoing discussions of research goals and in the development of guidelines and clinical practice for the pREBOA-PRO system.

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

Alison A. Smith is a paid consultant for Prytime Medical. The remaining authors have no conflicts of interest to disclose.

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