

Successful Use of Angiographic Embolization to control Hemorrhage from Blunt Pelvic Trauma in a Pediatric Patient

Z. A. Qasim, R. Masood, M. A. Mateen

Section of Pediatric Surgery, Department of Surgery, Aga Khan University Hospital, Karachi.

Introduction

In adults, the role of angioembolization in blunt pelvic trauma is fairly well established.¹ However, its role in pediatric practice is not clearly defined. We present the case of a child, initially operated for blunt abdominal and pelvic trauma, later treated successfully by angioembolization. Its role as a safe and effective treatment modality in appropriately selected cases is discussed.

Case Report

A 10-year-old boy, involved in a motor vehicle accident was transferred to our Emergency Department. On arrival, he was in grade III shock. Examination revealed a distended abdomen, with bruising over the suprapubic region and blood at the urethral meatus. Both lower extremities showed extensive abrasions. He was immediately resuscitated and intubated in accordance with established advanced trauma life support (ATLS) protocols.

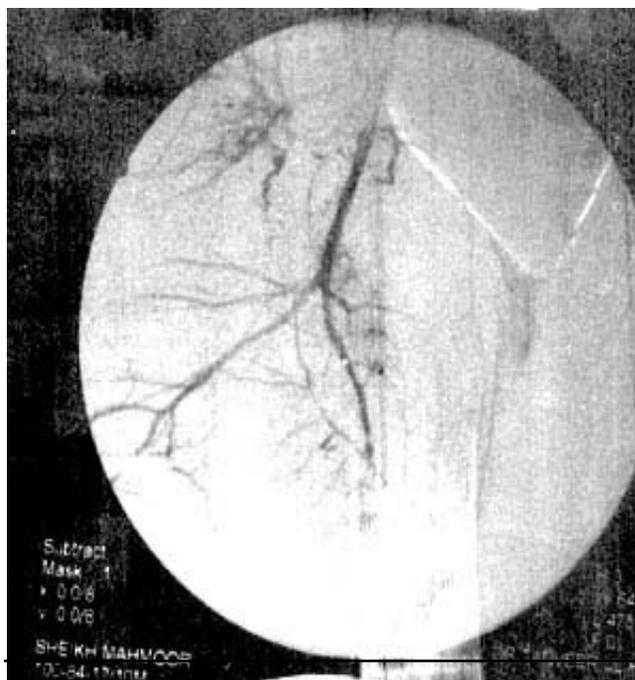
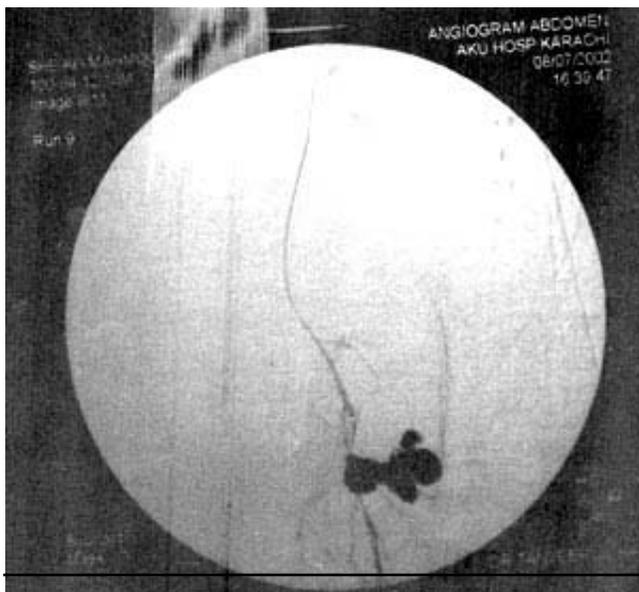
Initial x-rays demonstrated extensive pelvic and lower limb fractures involving the right sacroiliac joint, right acetabular fracture, right pubic rami, right femur, and

right tibia and fibula. As he remained hypotensive and tachycardic despite fluid resuscitation, and no other obvious bleeding site was found, he was taken to the operating room for abdominal exploration.

Laparotomy revealed 500 milliliters of blood in the peritoneal cavity, no solid or hollow viscus injury, presence of massive retroperitoneal hematomas, and a distended and contused urinary bladder. Suprapubic tube cystostomy was performed, and external fixators were applied to the right leg.

Postoperatively in the intensive care unit, the child remained hemodynamically unstable and required massive blood transfusion. Angiography was performed 17 hours after surgery, which showed contrast extravasation from branches of the right internal pudendal artery (Figure 1). These bleeding points were successfully embolized using 2mm x 2.5mm platinum coils (Trufill-Cordis, USA) and Poly vinyl alcohol particles (Cordis, USA) (Figure 2).

The child's condition improved following



angioembolization. The remainder of his hospital stay was unremarkable, and he was discharged home, with close follow-up and rehabilitation in the outpatient clinic. He has remained well and is awaiting delayed repair of his urethral injury.

Discussion

Trauma is the leading cause of childhood morbidity and mortality², the majority being blunt trauma secondary to motor vehicle accidents.³ The appropriate management of these injured children involves adhering to well-established protocols such as those set out by the American College of Surgeons in its ATLS Manual.⁴

Blunt pelvic trauma in the pediatric population comprises a small but very significant portion of injuries. Exsanguination from associated vascular injury carries a mortality of 5-45%.⁵ It represents a complex clinical decision-making situation, especially in the face of a hemodynamically unstable child with concomitant injury to other organ systems.

Advances in imaging technology have altered the diagnostic and therapeutic interventions available for use by the pediatric trauma team. An example is the use of emergency department ultrasound, which has now replaced the more conventional diagnostic peritoneal lavage in determining the presence of free fluid in the abdomen.⁶

Likewise, interventional radiology has made a dramatic contribution to the field of trauma surgery, allowing an alternative to open surgical exploration and repair of significant vascular injuries.⁷

The success of angioembolization in the adult trauma victim ranges from 85-100%.^{1,8,9} In children, angioembolization has proven to be useful in managing patients with hepatic hemangiomas, vascular malformations, renal artery stenosis, and congenital heart disease.¹⁰ Its use in pediatric trauma, however, has not been clearly defined. The main reasons include the lack of appropriate size coils and catheters, as well as the fact that few interventional radiologists have sufficient expertise in carrying out procedures in children.¹⁰ However, there are no such limitations now.

In addition to the presence of trained personnel, specific considerations include the maintenance of adequate room temperature, proper dosage of sedative medications and contrast material, and proper pre- and postprocedure care, including attention to fluid status.¹⁰ Particular care is needed to ensure the minimum amount of radiation exposure to the child, and this may involve recalibrating equipment normally used on adults, if a dedicated pediatric

facility is not available.

Techniques used in pediatric angioembolization are modifications of those used in adults.¹⁰ Coils and catheters are now available in varying sizes as required. As with adults, pediatric anesthesia and surgery teams should be available in-house, should the need arise.

General complications are similar to those seen in the adult population, and include complications with catheter placement, bleeding, and infarction. In experienced hands, however, these risks are almost negligible.¹⁰ Careful preprocedure screening and correction of coagulopathy if present minimizes the risk of bleeding during the procedure. The use of smaller catheters and more refined techniques allows selective angioembolization to be done, allowing the most distal bleeding site to be embolized, thus minimizing the risk of infarction.⁷

Angioembolization has been used successfully in the pediatric patient to treat numerous pathologies. Although it is a single case report, but it shows that if performed appropriately in selective group of trauma patients, angioembolization is a safe and effective modality in controlling bleeding associated with pelvic fractures in this population. Adequate patient selection, delineating concomitant injuries, proper initial resuscitation, and a multidisciplinary approach allow improved survival. A properly conducted trial will be necessary to provide further solid evidence of the benefits of angioembolization in the pediatric trauma patient.

References

1. Velmahos GC, Toutouzas KG, Vassiliu P, et al. A prospective study on the safety and efficacy of angiographic embolization for pelvic and visceral injuries. *J Trauma* 2002;52:303-8.
2. Stafford PW, Blinman TA, Nance ML. Practical points in evaluation and resuscitation of the injured child. *Surg Clin North Am* 2002;82:273-301.
3. Nguyen TD, Raju R, Lee S. Considerations in pediatric trauma. *E Med* 2001;2:11 (www.emedicine.com)
4. *Advanced Trauma Life Support Student Manual*. 6th ed. Chicago: American College of Surgeons 1997, pp. 353-376.
5. Junkins EP, Nelson DS, Carroll KL, et al. A prospective evaluation of the clinical presentation of pediatric pelvic fractures. *J Trauma* 2001;51:64-8.
6. Fabian TC, Croce MA, Minard G, et al. Current Issues in trauma. *Curr Probl Surg* 2002;39:1160-1244.
7. Scalea TM, Sclafani S. Interventional techniques in vascular trauma. *Surg Clin North Am* 2001;81:1281-97.
8. Wong YC, Wang LJ, Ng CJ, et al. Mortality after successful transcatheter arterial embolization in patients with unstable pelvic fractures: rate of blood transfusion as a predictive factor. *J Trauma* 2000;49:71-4.
9. Agolini SF, Shah K, Jaffe J, et al. Arterial embolization is a rapid and effective for controlling pelvic fracture hemorrhage. *J Trauma* 1997;43:395-9.
10. Culham JAG. Pediatric Interventional Angiography. In: Baum S, Abrams HL ed. *Abram's Angiography: vascular and interventional radiology*. 4th ed. London: Little, Brown and Co. 1996 pp. 903-21.