

Is endovascular management of penetrating trauma now the primary treatment option?

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Background

We share our experience at the Sheffield Vascular Institute of penetrating trauma managed with a primary interventional approach in favour of open surgical exploration with a selection of clinical cases. CT angiography in all trauma patients facilitates the swift identification of bleeding vessels. With a Consultant Vascular Interventional Radiologist on the trauma team and appropriate facilities, the culprit bleeding blood vessel(s) can be treated with an elegant endovascular solution. This can be done quickly via a minimally invasive approach in most cases if the optimum support services are in place.

Cases

Case One: 36-year-old male presented to our ED (NGH) with multiple stab injuries. CT demonstrated pseudoaneurysm of inferior artery, active bleeding in the area of the left axilla within the body of latissimus dorsi and active bleeding from a right intercostal artery. The right inferior gluteal artery, the circumflex humoral and finally the right T12 intercostal arteries were embolised with a combination of histoacryl glue and coils. The patient stabilized and self-discharged shortly after.

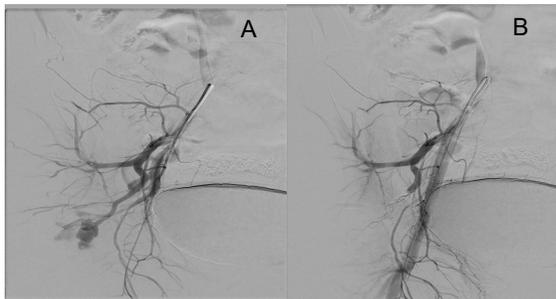


Figure One: A: Inferior gluteal pseudoaneurysm B: Postrepair (Case One)

Case Two: 33-year-old male was transferred to the NGH ED following an alleged stabbing with a screwdriver with multiple wounds. CT demonstrated active bleeding from the left subclavian artery only. Via a combined femoral and brachial approach a crossing wire technique was utilised. An 8x60mm fluency stent (Bard) was deployed across the pseudoaneurysm with cessation of bleeding. Ultrasound follow at 18 months showed no complication and tri-phasic flow in the stent graft

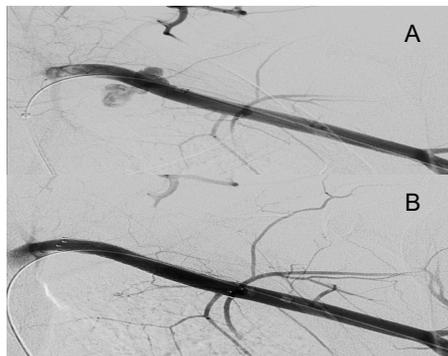


Figure Two: A: Subclavian artery pseudoaneurysm B: with Subclavian artery stent graft (Case Two)

Sheffield Unstable Trauma Protocol

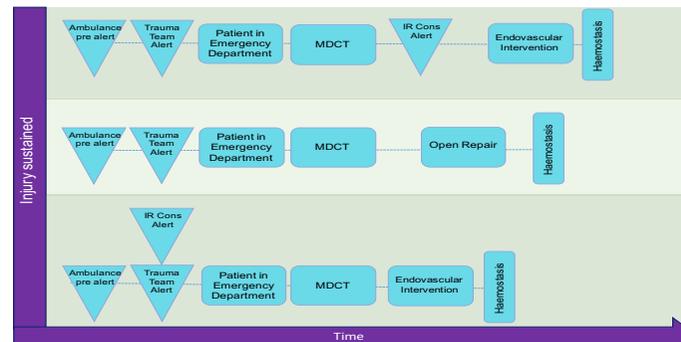


Figure Three: Flow diagram illustrating the IR team (consultant nurse and radiographer) integrated as a core member of the unstable trauma team; typically contacted prior to patient arrival. The IR consultant is the first reader of the Trauma CT whilst the angiography staff prepare angiography suite to reduce time to intervention. Adapted from (11).

Case Three: 21-year-old male presented following an alleged stabbing to the right flank. CT revealed a laceration of 2.5cm in the lower pole of the right kidney with extravasation of contrast medium and a peri-renal haematoma. Coil embolisation was performed using 3x6 and 4x11 (Boston Sci Interloc coils). Stopping the bleeding and preserving the majority of the renal parenchyma. He was discharged the following day with normal renal function and did not attend follow up.

Case Four: 28-year-old haemodynamically unstable male presented to the ED with a stab wound to the right thigh. Intra-osseous access was gained and the patient was resuscitated per the massive transfusion protocol. CT angiography demonstrated active contrast extravasation from the right SFA. Manual compression did not control the bleeding. In the angiography suite a 5mm PTA balloon was inflated across the bleeding site leading to stasis. The patient was transferred to theatre for in-line repair with proximal GSV. He was discharged two days later without complication but did not attend follow up.

Case Five: 46-year-old male with an alleged stabbing to the neck with a glass bottle. The patient was haemodynamically stable but intubated and ventilated. CT demonstrated injury to both the left internal jugular vein and common carotid artery. A 9mm Atrium stent graft (Marquet) was sited following CT. Haemostasis was achieved within 30 minutes of commencing the intervention. He was discharged on life-long clopidogrel 75mg OD. His stent-graft is patent and he made an excellent recovery with no disability.



Figure Four: A: Common Carotid and IJV vessel damage B: Post repair (Case Five)

Results

Swift achievement of haemostasis in all five patients without significant disturbance to physiology, overlying structures or prolonged hospital admission. Median inpatient stay 2 nights. Follow up arrangements were made with all patients. Unfortunately only two patients returned for review despite exhaustive attempts at contact.

Discussion

Endovascular repair of arterial injury is increasingly favoured over surgical intervention in the non-acute setting(1,2), with benefits including reduced operating time, reduced blood loss and morbidity(3). Open surgical repair of the injuries described above would have required wide exposure and extensive tissue dissection, carrying the risk of further distorting surface pathogens and damaging surrounding structures to achieve proximal and distal control of the target vessels(4,5). The swift achievement of haemostasis in trauma is a key predictor for successful outcomes(6). Percutaneous repair of thoracic and aortic aneurysms have been demonstrated to be faster than their open equivalents(7,8) and the time benefits of endovascular procedures in the trauma setting are intuitive. While we argue a primary interventional procedure is usually faster than open, recently concerns have been raised regarding the time between arrival and needle to skin versus scalpel to skin(9) and negative outcomes have been described as a result of the delay(10). This can be countered by having an Interventional Vascular Radiologist as part of the unstable trauma team, being the primary reporter of the unstable trauma CT whilst the angiography suite is being readied in preparation.

Conclusion

We present a small case series demonstrating successful utilisation of endovascular techniques in the management of penetrating traumatic injuries in the acute setting. Further work is required before it can be considered the primary therapy but it should be considered in each case. The inclusion of interventional radiologists who may both report and intervene at patient presentation is representative of the new standard of care we propose for unstable patients with penetrating trauma.

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