Brachial Artery Injuries: A Seven-year Experience with a Prospective Database

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Abstract
Introduction: A Trauma Vascular Registry was established in 1998. The aim of the study was to review brachial artery injuries.

Methods and Materials: Review of the prospective registry & case-notes of all identified Brachial Artery Injury. Data was captured on a proforma.

Results: 177 brachial artery injuries were identified, 154 (87%) were male, 130 were due to stab wounds (73.4%) while gunshot or other sharp trauma accounted for 27 injuries (16.1%). 17 blunt injuries and 3 other injuries were noted. The mid-brachial artery was injured most frequently (113; 68.3%). Angiograms were only performed in five patients and diagnosis was by clinical examination in the remaining patients. 22% of patients had a concomitant nerve injury, while 9 had humerus fractures. Repair was by vein graft in 92 patients (52%), while a primary repair was performed in 80 (45.2%). Specialist Registrars performed 142 repairs (80.3%). Sixteen patients (9%) required forearm fasciotomy, with four cases of limb loss. Three of the cases of limb loss presented over 6 hours post-injury.

Discussion and Conclusions: Brachial artery injuries are the commonest vascular injuries to the limbs, with a good prognosis, provided early repair is undertaken. Arteriography is usually unnecessary and limb loss is low, provided appropriate decompression of a compartment syndrome is performed, however in this group the limb loss rate is 25% compared to the overall of 2%. The repair of a brachial artery is a good training procedure for surgical trainees, associated with a low morbidity.

Key Words
Brachial · Injury · Vascular · Outcome · Training

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Introduction
The brachial artery originates from the continuation of the axillary artery at the infero-lateral border of the teres major muscle, proceeding infero-laterally, from medial to anterior in the arm, toward the cubital fossa, where it divides into the radial and ulnar arteries opposite the radial neck, medial to the biceps tendon. It courses fairly superficially and is palpable for its entire length. Collateralisation occurs in the shoulder area and around the elbow. [1] See figure 1.

Most likely due to this superficial location, brachial artery injuries are reported to be the most common vascular injury in the upper limb [2–9] and there exist numerous reports that delayed or technically inadequate repair may lead to muscle ischaemia or loss of the limb [2, 5, 8, 10].

The Tygerberg Hospital in Cape Town, South Africa, serves a large population of low socio-economic standing, with a high incidence of interpersonal violence and motor vehicular trauma. The Trauma Service treats around 20000 trauma patients per year, of whom around 100 per year will have a significant vascular injury. Since August of 1998 the service has maintained a prospective database of all vascular injuries for all

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patients over the age of 13 years treated in the hospital. Pediatric aged patients (less than 13 years) are treated by the Pediatric Surgeons.

The aim of the study was to review the database and attempt to identify factors that impact on the outcome and management of these common injuries.

Methods and Materials
The prospective Trauma Vascular Registry of the Tygerberg Trauma Service was reviewed for the period from August 1998 till August 2005. All index cases where an injury to the Brachial Artery was identified were reviewed in depth to determine the patient demographics, mechanism of injury, injury severity score, pre-operative work-up, surgical management, injury type and associated injuries, complications (specifically the presence of compartment syndrome and limb-loss) and the final outcome of the patient.

Ethics committee waiver: No institutional ethics committee approval was required since the identities of the patients under review are not publicly accessible and the study constitutes a case audit with no new intervention performed.

Results
At the time of the review 659 records were identified in the Trauma Vascular Registry. Of these 177 records revealed an injury to the brachial artery (26.7%).

Demographics
The male: female ratio was almost 9:1, with 154 males (87%) in the cohort. The spectrum of injury mechanism included 160 (90.4%) penetrating and only 17 blunt injuries.

Mechanism of Injury
The penetrating injury group included 130 stab wounds (73.4%), 23 gunshot wounds (13.9%), 4 cases with penetration by other sharp objects, 2 dog-bites and one shotgun blast. Blunt injury was related to a motor accident in 9 cases (53% of all blunt injuries), elbow dislocation in 6 cases and one case each of an industrial injury and a blunt assault.

The injury was located in the middle third of the artery in the majority of the cases (113/63.8%), followed by the distal third in 47 cases (26.5%) and a proximal third injury was only identified in 17 cases (9.6%). The left side was more often injured that the right side in an almost 60:40 ratio.

Pre-operative Work-up
Pre-operative assessment was based only on clinical findings in all but 5 cases who underwent angiography, all of whom were delayed presentation or initially operated elsewhere. The rest of the patients were explored on the presence of clinical “hard signs” [11] of a vascular injury, with the radial pulse absent in 96 (54.2%) or weak in 73 (41.2%) of cases. The injury severity scores (ISS) ranged between 4 and 18 and the mean was a score of 7.

Surgical Findings and Management
At surgery the vessel was explored with the arm in abduction and external rotation via a standard incision over the vessel. The injuries identified included: partial laceration in 93 (56.4%), transection 52 (29.3%), a pseudoaneurysm in 15 cases (8.5%) and a traumatic arterio-venous fistula was identified in three cases. Nine patients (5%) were found to have a thrombosed artery, of which five were due to an intimal flap injury. Additional venous injuries were found in 16 patients.