

Tab. 3A. Distribution of the patients according to the local presentation of the affected limb for all 104 patients studied

Presenting manifestations		No.	%
Absent pulse		92	88.5
Ischemia		90	86.5
Hemorrhage		90	86.5
Venous injuries		45	43.3
Bone fractures	Humerus	37	35.6
	Radius or ulna	11	10.6
Peripheral nerve injuries		33	31.7
Pseudoaneurysm		21	20.2
Hematoma		14	13.5
Tendinous injuries		12	11.5
Pulse insufficiency		12	11.5
Compartment syndrome		4	3.8

Tab. 3B. Distribution of the patients (N = 104) according to the associated systemic injuries other than the affected limb

Associated injury	No.	%
Chest injury	17	16.3
Abdominal injury	4	3.8
Head injury	4	3.8

(86.7%), half of the patients belonged to the 31–40 years age group, 83.7% of the patients were military, and in 57% of the patients, the injury was on the left side. Penetrating injury was the mechanism causing 92.3% of BA injuries, while blunt trauma was the cause in the remaining 7.7% (Tab. 1). Bullet injury was the most common form of penetrating trauma (76 out of 96). Other forms of penetrating trauma in a descending order of incidence were single large shells in 14 patients and multiple missiles in 6 patients.

The mean admission period was 13 days (range, 4–30 days). Prolonged hospitalization was needed for those who were subjected to fasciotomy owing to a musculoskeletal injury, nerve injury, venous repair, or compartment syndrome. Follow-up was typically required for neurologic or orthopedic examination.

Different surgical interventional approaches were reported in the present study (Tab. 2). The outcome was successful in almost all cases of vascular interventions and subsequent encouraged salvage rate of affected limbs (the amputation rate was 5.8%). A total of 81.7% of the patients were treated with end-to-end anastomosis. Moreover, ligation of veins was done in 22 cases of venous injuries and simple venorrhaphy was performed in 23 cases. In 14.4% fasciotomy was required and in 11.5% muscle repair was mandatory. Twelve patients

had either muscular or tendinous injuries that were repaired intraoperatively by orthopedic surgeons.

Autologous, reverse, interposition graft of saphenous veins for 10 cases of BA injuries, and in 6 cases, the preferred surgical option was amputation of the affected limb at different levels. Nine cases of BA injuries had severely damaged brachial arteries were compulsory ligated. Three cases of BA injuries developed early postoperative re-thrombosis, for which arterial reperfusion was achieved by embolectomy. No case of BA in this study required any prosthetic graft, stenting, or carpal-tunnel release.

Among the 6 patients who required amputation, three cases required an above-elbow amputation, two of them an amputation performed at the wrist level, and one at the level of the phalanges.

In this retrospective study, associated presenting manifestations were found in most (87%) of the cases (Tab. 3A and 3B). Thirty-three of 104 patients had peripheral nerve injury: 17 had mixed nerve injuries to both ulnar and median nerves, 6 had median nerve injuries only, and 10 had ulnar nerve injuries only. Twelve of the thirty-three associated nerve injuries were repaired intraoperatively by neurosurgical specialists, followed by postoperative evaluation for any neural deficit. Afterwards, some of the patients showed functional debility throughout the follow-up period.

In the current study, some patients presented with multiple injuries at the time of presentation, with 43.3% of the patients having a combined arterial and venous injury (of either the cephalic or basilic veins). Twenty-one of these patients had pseudoaneurysm of BA, but presented late (2–4 weeks) after upper limb injury. They were managed with saphenous vein graft interposition (Figures 2a and 2b) and/or primary repair. Furthermore, 35.5% had a fractured humerus and 11 patients had injuries to the bones of the forearm. Most frequently, fractures occurred among patients with bullet injuries (20 patients); a fracture was also found in 4 patients with multiple missile injuries (6 patients). All fractures were managed with external fixation (Figures 1a and 1b) and 31.7% had nerve injuries.

Discussion

In the current study, males represented the bulk of cases (90 cases; 86.7%). For comparison, similar results were obtained by another study in Iran. This male preponderance results from the fact that men are much more energetic and exposed to violent activities (6).

Those in the 31–40 years age group were affected most commonly, representing 50.1%. This is in agreement with a Turkish study (7). By contrast, Bitsch M. et al found that the 20–30 years age group was the most common age group (60% of those affected) (8). This might be related to the sample distribution as most of the patients were military.

Left-side injury was the commonest and represented 57% of all cases. This result agrees with the study by Ekim et al who found that the left hand is more commonly affected and accounts for 67.3% of all injuries (9).

Associated nerve injuries were common in these cases (31.8), a finding which was also identified by other studies (10). Anatomically, the BA is bounded by three vital nerves: the radial, ulnar, and median nerves, and their courses extend along the humerus. These nerves are also often injured in cases of BA injuries with resultant neural deficits.

In the current study, some postoperative complications were reported in 12 patients, including wound infection (3 patients), neurological deficit (3 patients), ischemic changes caused by thrombosis (2 patients), or venous