

SHOTGUN INJURY AS A CAUSE OF FLOATING ELBOW: A CASE REPORT

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Floating elbow represents an injury that is a combination of ipsilateral humeral shaft and forearm fractures. Shotgun injury of the elbow is a very severe and complex type of injury, often with complications such as infection, nerve palsy, and range of motion limitation.

We present a case report of a 46-year-old man with a gunshot wound to the right elbow. He sustained an injury of the distal humerus and proximal ulna which resulted in a floating elbow injury. As the initial clinical exam indicated normal neurovascular status, after adequate preoperative preparation, primary surgical treatment of the wound was performed under general endotracheal anesthesia as well as stabilisation of the right elbow with the Mitković external fixator with two pins placed in the humeral shaft and two pins placed in ulna shaft. Two weeks later we performed internal fixation of the mentioned injury.

Surgical treatment of such severe gunshot wounds requires primary treatment with an external fixator with subsequent conversion to internal fixation when the local status of the wound is normal.

Floating elbow injuries should be brought into the correct anatomical reposition as soon as possible with internal fixation because it allows us to have good function of the elbow with the best possible range of motion.

Acta Medica Medianae 2024;63(2):81-86.

Key words: *floating elbow, shotgun injury, external fixation, nerve palsy, range of motion*

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Introduction

Non-fatal firearm injuries are often combined with orthopaedic complications like fracture, compartment syndrome, infection, nerve palsies, soft-tissue damage and lead toxicity given the extent of musculoskeletal involvement (1).

The floating elbow is defined as a simultaneous ipsilateral fracture of the humerus and forearm. It is an uncommon injury occurring both in children and in adults (2, 3). There are two major categories of floating joint injuries that have been described in the literature: type 1—skeletal disruption above and below an articulation without direct injury to the intermediate joint and type 2—

combined skeletal and direct articular injury. Also, there is a type 3 lesion which includes associated neurovascular damage of overlying soft tissue elements, with or without simultaneous articular involvement as described below (4).

We present a case of floating elbow resulting from a shotgun shooting, its severity, primary care as well as definitive treatment and follow-up of a patient one year after injury.

Case Presentation

A 46-year-old man was admitted to the emergency room due to a shotgun injury to the right elbow. The patient was in a state of traumatic shock, frightened and in severe pain. The orthopedic surgeon was called for a consultation immediately upon admission to the emergency room.

Initial clinical examination showed bleeding from the lateral side of the right elbow, swelling, bruising, inability of motion as well as pathological mobility along with severe pain. After primary lavage, several smaller wounds were observed which indicated shotgun injury. The neurovascular status of the injured extremity was initially normal.

The wound was bandaged, the extremity immobilized, the patient stabilized and referred for

radiographic examination. The radiographs taken at the initial examination showed a supracondylar fracture of the humerus and a fracture of the proximal third of the ulna (Figure 1).

After primary care in the emergency room and diagnostic procedures, patient was admitted to the Clinic for Orthopedic Surgery and Traumatology. Upon the admission, fluid resuscitation, intravenous analgesics and antibiotics were administrated and the patient was prepared for surgery.

After adequate preoperative preparation, the patient was operated on under general endotracheal anesthesia. The wound was thoroughly washed with hydrogen peroxide, saline solution and povidone-iodine solution. The wound was debrided, the swab was taken and the accessible shotgun pellets were removed from it. Then the right elbow was stabilized with the Mitković external fixator with two pins placed in the humeral shaft and two pins placed in the ulna shaft (Figures 2 and 3).

The early postoperative course went normal, the patient was transferred to the intensive care unit where he received antibiotics for a full 72 h (Ceftriaxone 2 g/24 h, Amikacin 1 g/24 h), fluids,

analgesics and anticoagulants with daily wound dressing. Afterwards, he was transferred to the Traumatology Department where he was hospitalized for another four days for further care and then discharged home in good general condition with a plan for definitive osteosynthesis in two weeks.

After two weeks patient was readmitted to the Traumatology Department for definitive osteosynthesis of fractures. As the wounds from the shotgun were healing and complete preparation was done, another surgery was performed. Open reduction and fixation of the distal humerus was performed with free screws due to the good position of fracture fragments and the sparing of soft tissue after the initial injury. Osteosynthesis and open reduction of ulna were performed with reconstructive plate due to large comminution of fracture fragments (Figure 4). After a few more days at the Traumatology Department, the patient was discharged home with a sterile swab, good operative wound status and a satisfying range of motion and with a plaster cast.



Figure 1. Open elbow dislocation and X-ray of the elbow on admission to the clinic



Figure 2. Condition after washing the wounds and external fixation of the elbow



Figure 3. X-ray of the elbow after external fixation



Figure 4. X-ray of the elbow after internal fixation

At the first check-up after 10 days, the plaster cast and sutures were removed, and local status was neat, but the patient complained about weakness in moving the thumb as well as a slight loss of sensation on the dorsum of the hand, which indicated nervus radialis paresis. We started early elbow activation and multivitamin therapy along with analgesics and anticoagulants. Another check-up after two weeks showed slightly better results.

Follow-up visits were scheduled at 2, 6 and

12 months postoperatively and annually thereafter. Two months after surgery, patient was referred to physical therapy. Six month follow-up showed that a slight loss of sensibility on dorsum of the hand was persistent and range of motion was satisfying, so the patient was referred on to another cycle of physical therapy. At 12-month follow-up, the patient was completely recovered with no radial paresis, a full range of motions and neat local status (Figure 5).



Figure 5. Functional outcome 12 months after surgery

Discussion

Floating elbow is a very uncommon injury. Poor functional outcome is very frequent and associated with high morbidity irrespective of the interventions offered (2).

Complications which can occur after floating elbow injury, e.g., infection, myositis ossificans, non-union, and malunion of the humerus or forearm bones, vascular or nerve injury, can lead to poor functional results (3).

We report a case of a 46-year-old man with a gunshot wound to the right elbow. The neurovascular status of the injured extremity was initially normal. After adequate wound irrigation elbow was stabilised with the Mitković external fixator.

Fractures in the upper extremity after a gunshot are mostly treated either conservatively using plaster or splint, or surgically with open reduction and internal fixation (ORIF) using screws and plates, intramedullary nails (IMN) or external fixators. Wounds can be surgically treated and debrided and the bullet may or may not be removed (5).

We assessed that there was a very high risk of infection, so we decided on primary external skeletal fixation and delayed definitive care.

With the Mitković external fixator, it is possible to fix all fractures of the upper extremity, even very complex injuries such as floating elbow. The Mitković external fixator type is excellent in treating fractures caused by firearm injuries because it is easy and quick to apply, provides good stability and enables wound care because of its unilateral type (6).

Most gunshot fractures of the extremities are treated surgically and these patients are always treated with intravenous antibiotics prophylactically (1).

We opted for a combination of two antibiotics (Ceftriaxone 2 g/24 h, Amikacin 1 g/24 h)

There are no prospective, randomized controlled trials investigating two cohorts of patients where one group receives antibiotics and one group does not as seen with the low-velocity gunshot studies. Such a study would really help determine whether antibiotics should be administered prophylactically to all patients presenting with a high-velocity GSW (gunshot wounds) fracture to the extremity. Despite the literature suggesting the use of antibiotics, in light

of an absence of high-quality studies, there are no definitive recommendations on antibiotic use (7).

Considering the good healing of the soft tissues, after two weeks the patient underwent another operation for definitive stabilization of the fracture. Open reduction of the humerus fracture and stabilization with free screws was performed, as well as osteosynthesis of the ulna with a plate and screws. In the available literature, fixation with locking plates for stable fixation is mainly shown.

This procedure made the fracture heal, although it was quite an unstable reconstruction (8), but with minimal compromise of soft tissues and minimal risk of infection.

Ten days after the operation, palsy of the radial nerve was observed during a regular check-up.

Reported rates of nerve injury after upper extremity GSWs are highly variable. Traumatic injury to surrounding nerves resulting in clinical palsy after a GSW to the upper extremity can be secondary to direct trauma from the bullet, or indirect trauma such as thermal damage, laceration secondary to fracture fragment displacement, or compression secondary to swelling or subacute scar formation among many other variables (9).

After early physical therapy and vitamin supplementation, there is an improvement in the clinical response.

A common complication after a floating elbow injury is a poor functional outcome (2, 3).

Although the amount of residual gunshot bullet material near the fracture site is more predictive of fracture union rate than comminution (10), delayed healing or non-union did not occur in our case.

The case we present shows an excellent functional outcome 12 months after injury. Good soft tissue healing, fracture healing in good position and almost full range of motion.

Conclusion

Surgical treatment of these severe injuries requires primary treatment with external skeletal fixation with later conversion to internal fixation when there are no local signs of infection. Internal fixation of such an injury requires the best possible repositioning and stable fixation to avoid frequent complications.

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„PLUTAJUĆI LAKAT“ NASTAO KAO POSLEDICA RANJAVANJA SAČMOM IZ LOVAČKE PUŠKE: PRIKAZ SLUČAJA

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„Plutajući lakat“ je povreda koja predstavlja kombinaciju ipsilateralnog preloma nadlaktatne kosti i kosti podlaktice. Povreda lakta izazvana hicem iz lovačke puške teška je i složena vrsta povrede, često praćena komplikacijama poput infekcije, paralize nerava i ograničenja obima pokreta.

Predstavljamo slučaj četrdesetšestogodišnjeg muškarca sa prostrelnom ranom desnog lakta. Zadobio je povrede distalnog humerusa i proksimalne ulne, što je rezultiralo povredom „plutajućeg lakta“. Budući da je na inicijalnom kliničkom pregledu neurovaskularni status bio normalan, nakon adekvatne preoperativne pripreme urađene su primarna hirurška obrada rane u opštoj endotrahealnoj anesteziji i stabilizacija lakta spoljašnjim fiksatorom po Mitkoviću, sa dva klina u telo humerusa i dva klina u telo ulne. Dve nedelje kasnije urađena je unutrašnja fiksacija navedene povrede.

Hirurško lečenje ovakvih teških prostrelnih povreda zahteva primarni tretman spoljašnjim fiksatorom, sa prevođenjem u unutrašnju fiksaciju onda kada lokalni status rane bude uredan.

Povrede „plutajućeg lakta“ treba što pre dovesti u ispravnu anatomsku repoziciju unutrašnjom fiksacijom, s obzirom na to da ona omogućava dobru funkciju lakta sa što većim obimom pokreta.

Acta Medica Medianae 2024; 63(2): 81-86.

Ključne reči: *plutajući lakat, povreda lovačkom puškom, spoljašnja fiksacija, paraliza nerava, obim pokreta*

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