

Intramedullary Osteosynthesis of Clavicle Fractures

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Clavicle fractures account for 3% of closed fractures of the tubular bones and are typical for persons of young working age. Fractures of the middle third account for 75%, lateral 20%, and medial 5% of all clavicle fractures. Most often, the treatment of these injuries requires open reduction and internal fixation with internal fixation, or much less often an external fixation device is used [1-3].

Intramedullary fixation of clavicle fractures has not found proper application due to the S-shape form of the medullary canal and the migration of the intramedullary implant. Axial and rotational instability of the "bone-implant" system is also considered to be a traditional disadvantage of intramedullary osteosynthesis. The use of a cancellous screw for clavicle fractures in most cases eliminates these shortcomings.

The aim is to present a method of intramedullary fixation of clavicle fractures with a cancellous screw.

Operation technique

After the standard processing of the surgical field in the projection of the clavicle fracture, a longitudinal skin incision up to 6 cm long was performed. Fragments of the fracture were isolated using the generally accepted method. Further, depending on the preoperative planning and intraoperative data, the fracture was fixed using one of the following methods.

Method 1 (introduction of the screw through the peripheral fragment)

The medullary canal of the central fragment of the clavicle was sequentially processed with drills with a diameter of 4 to 6 mm so that its diameter was 0.5-1 mm less than the diameter of the

cancellous screw. The medullary canal of the peripheral fragment was prepared with drills so that its diameter was equal to the diameter of the screw, and a hole was drilled through the posterior cortical plate in the region of the acromial third of the clavicle. Next, the medullary canal of the central fragment was processed with a tap (Figure 1A-D). Through the medullary canal of the peripheral fragment, a conductor 4 mm in diameter was inserted above which, along the posterior surface of the shoulder girdle, a skin incision was made up to 1.5 cm. Then, the fracture was repositioned, and the screw was rotated further into the central fragment until interfragmentary compression occurred and the fracture was optimally stabilized.

Figure 1: Stages of surgical intervention. Preparation of the bone marrow canal: A - The central fragment with a drill; B - Central fragment with a tap; C - Peripheral fragment with a drill; D - Peripheral fragment with a tap.

Method 2 (Introduction of the screw through the central fragment)

A distinctive feature of this method is the introduction of a cancellous screw from the side of the sternal end of the clavicle (from the inside to the outside), through a hole in the anterior cortical plate.

In all cases, the cancellous screw was inserted in such a way that its threaded part was completed in one of the fragments behind the fracture line. If there was a comminuted fracture, then the free fragment was placed in its place and further screw insertion was carried out by fixing the fragment in the place, which was then covered by the periosteum or fixed with 1-2 cerclage sutures made of absorbable suture material. The tissues were sutured in layers. The upper limb was immobilized with a bandage or placed on a wedge-shaped pillow until the pain syndrome was relieved. The duration of the surgical intervention was 35 ± 10 min.

Rehabilitation

Immobilization of the upper limb, isometric contractions of the muscles of the shoulder and forearm were performed immediately after the operation (the first 3-4 days). Local hypothermia and magnetotherapy were used.

From the 5th day, isotonic active exercises for the shoulder joint were carried out, aimed at increasing the range of motion in it, a dosed load on the muscles of the shoulder girdle, electrical muscle stimulation.

On the 10th day, the patient performed active movements of the upper limb in a gentle mode, active exercises with a dosed load on the muscles, and passive exercises for the shoulder joint with a methodologist. Most patients did not require immobilization.

From the 14th day, isokinetic and functional exercises were carried out for the shoulder joint and upper limb, a gradual increase in physical activity. The sutures of the postoperative wound were removed.

The cancellous screw was removed 2-2.5 months after surgery as follows: the location of the cancellous screw head under the skin was determined by palpation. A skin incision was made up to 1.5 cm above the palpable head of the implant. The screw was unscrewed with a screwdriver. Patients did not need immobilization of the upper limb and in most cases continued their labor activity.

Clinical Case

A 27-year-old patient (No. 2584/456) was injured as a result of a fall on the left shoulder joint. He went to the trauma center on July 27, 2021, where a closed fracture of the left clavicle in the middle third with fragment displacement was diagnosed. Open reduction and intramedullary osteosynthesis with a cancellous screw were performed urgently. The postoperative period proceeded smoothly. The fixator was removed two months after the operation. An excellent result was obtained (Figure 2 A, B).



Figure 2: 27-year-old patient (No. 2584/456). A - Photo of radiographs of the left clavicle at the stages of treatment. B - Functional result 12 months after the injury.

Conclusions

- The use of a cancellous screw for primary intramedullary fixation of clavicle fractures meets the requirements of stable-functional osteosynthesis and has a positive effect on the rehabilitation of the patient, who is able to perform light physical labor 2-3 weeks after the operation.
- The use of this technique does not require complex instruments and special training of the surgeon, which allows us to recommend it in clinical practice.

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