SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 11 | November 2023 - Peer Reviewed Journal

# ADVANTAGES OF INTRAMEDILLARY OSTEOSYNTHESIS IN LONG TUBULAR BONE FRACTURES

**Makhmudov Boburbek Erkinovich**
*Assistant, Department of Traumatology and Orthopedics, Fergana Institute of Public Health Medicine Uzbekistan*

**ABSTRACT**
*Intramedullary osteosynthesis is used to treat complex fractures of tubular bones. This is a type of surgical intervention, which involves the introduction of a metal rod into the bone marrow. The operation is quite difficult to perform, but the effectiveness of its use is much higher than the application of plaster dressings or the use of other methods of treatment. Osteosynthesis is prescribed in specific cases, and not for any type of fractures, so it is important to know when intervention is appropriate.*
**KEY WORDS:** *osteosynthesis, long tubular, bone fractures, operation, diagnosis and treatment, surgical intervention.*

Osteosynthesis is the reposition of fragments of damaged bone by surgical method. The operation is performed using nails, plates, rods, special external fixation devices. The choice of technique depends on the type, localization and features of the fracture. All of them are aimed at one goal — to match the fragments in such a way as to ensure their rapid fusion and restoration of impaired functions. The concept of "intramedullary" implies the introduction into the bone marrow, to align the axis of the bone.

Intramedullary osteosynthesis technique is used in such conditions:
- Transverse and oblique closed fracture of the femur, tibia or humerus;
- Improper fusion after applying a plaster cast;
- The development of a "false joint";
- The danger of developing an open fracture from a closed one;
- Damage by splinters of muscle bones, large blood vessels and nerves;
- Pseudoarthrosis.

The first thing to distinguish is the open and closed types of intramedullary osteosynthesis. The first is an intervention on the operating table, when a wide incision is made, a hematoma is removed and the normal position of the debris is restored. The closed method is more complex, but minimizes the possibility of complications. In this case, a dissection of no more than 3 cm and the use of a special orthopedic device is performed.

Intraosseous osteosynthesis is prohibited in the following cases:
- Extensive open fracture;
- The presence of bacterial agents in the area of damage;
- Hemodynamic instability;
- Osteomyelitis;
- Sepsis;
- Chronic venous insufficiency;
- Blood pathologies;
- Arthrosis of stage 3-4.

You can consider how a closed operation is performed using the example of osteosynthesis of the femur. The course of intervention includes the following steps:

In most cases, the intervention is performed under epidural anesthesia.
Perform an X-ray of the hip, necessarily including two compositions. This is necessary to monitor the performance of intramedullary osteosynthesis and the dynamics of further recovery. Epidural anesthesia is used more often, as it has fewer negative reactions. If there are contraindications — general anesthesia.

SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 11 | November 2023 - Peer Reviewed Journal

The patient is placed on the healthy side and the limb is bent at an angle of 100 degrees.

A 2-3 cm skin incision is made over the spit and the subcutaneous fat and muscles are pushed apart in a blunt way so as to get to the bone.

An awl is inserted 1 cm from the top of the large spit and, scrolling, injected into the bone marrow.

The awl is removed by inserting a conductor in parallel, the diameter of which is individually determined for each patient. The bone marrow canal is drilled through it to insert the rod.

The rods are fixed with nails.
A metal plate is used to reposition and fix external fragments.

The blocked area is subject to the following X-ray to determine the localization of elements and determine the quality of the introduction of metal structures.

Osteosynthesis of the tibia, humerus or femur is dangerous for the development of fat embolism. These are massive areas of the musculoskeletal system, rich in fatty matter. When tissue structures are damaged, parts of the yellow bone marrow can come off and migrate to other organs with the blood flow, and close the lumen of the main vessels. More often they are transported to the lungs with the development of acute respiratory failure. It is more dangerous to damage the arteries of the brain with the occurrence of a stroke.

If the rules of asepsis, antiseptics and low resistance of the patient's body to infectious agents are violated, an inflammatory reaction is possible in the area of intramedullary osteosynthesis. This is fraught with prolonged purulent processes, necrosis in the area of the postoperative scar. Further, chronic osteomyelitis develops with gradual damage to the bone structure, muscles, and the bone marrow canal. Less often there is a breakdown of metal structures with incorrect selection of their sizes.

After intramedullary osteosynthesis, the patient should stay in the hospital for 10-14 days to monitor, prevent negative reactions and infection.

Recovery should begin the very next day after the intervention. It is very important that the patient himself is interested in getting out of bed early, walking on crutches or using other devices. This contributes to the early inclusion of muscles in work, the prevention of bedsores, stagnant processes. The movements should be healthy, smooth and gradual.

Full restoration of functioning occurs in 3-6 months. with the use of all necessary methods of treatment.

Cparn,eHne fracture can be achieved with conservative treatment. However, even minimal angular and rotational displacements lead to significant impairment of limb function. The results of treatment of 100 patients with fractures of both forearm bones were analyzed. Of these, about half (group 1) received conservative treatment, and in the 2nd - surgical treatment was used. In group 1, unsatisfactory treatment results were obtained in 71% of cases (non-fusion, limitation of the amplitude of movements) [8]. In view of this, with diaphyseal fractures in adults, if there are indications, surgeons prefer surgical treatment.

During our research, 71 patients with fractures of the forearm bones were treated, who underwent 107 operations of intramedullary osteosynthesis of the forearm bones, 56 of them — ulnar and 51 — radial. Osteosynthesis of both bones was performed in 34 patients (table).

The age of the patients ranged from 21 to 77 years, the average age was 46 years. There were 39 women (54.93%), 32 men (45.07%). Osteosynthesis with blocking (BIOS) was performed in 82 cases, without blocking — in 25. In 51 cases, intraoperative reposition was performed in a closed way and in 56 — in an open way. Implants of the company "S1t", "Osteosynthesis" were used. The terms of surgical intervention ranged from 5 days to 6 months after the injury.

The pinning process began with a closed reposition of fragments. The physiological curvature of the bones was restored by modeling the rods from radiographs of a healthy forearm. In 11 cases of fractures of the ulna, straight unmodified rods inserted through the lateralized entry point from the side of the ulnar process were used for osteosynthesis, in 45 the rods were modeled using radiographs of a healthy forearm. In all patients, the angle of curvature of the ulna was measured using radiographs of a healthy forearm, it ranged from 6 to 13. Bone curvature was more pronounced in people with hypersthenic body type. The more physically developed the patient was, the greater the angle of curvature of the radius and ulna. The displacements were eliminated under the control of an

SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 11 | November 2023 - Peer Reviewed Journal

electron-optical converter by traction and control of fragments using bone forceps applied percutaneously to both fragments in the immediate vicinity of the fracture site within 2-4 cm. If a 3-5-fold attempt at a closed reposition was unsuccessful, they switched to an open reposition through small accesses 3-5 cm long. Primary open reposition was also used for stale fractures (2-3 weeks) and the absence of an end stop in the fracture zone.

Upon admission, a closed reposition of fragments and plaster immobilization were performed. A history of bone osteosynthesis of the radius and ulna was performed 8 months ago in one of the hospitals. In the postoperative period, there was a violation of the supination of the forearm. On the 8th day after admission, the bone clamps were removed, the bone marrow channels of the radial and ulnar bones were drilled and their blocking osteosynthesis was performed. Rehabilitation has begun in the immediate postoperative period. The patient noted an increase in the volume of supination movements, pronation was fully restored within 10 days after surgery.

## RESULTS AND DISCUSSION

There were no complications in the postoperative period. Delayed treatment results (for more than 3 months) were observed in 63 (88.73%) patients. Consolidation of fractures was found in all observations. Restoration of limb function without any significant movement restrictions was obtained in all patients with blocking osteosynthesis, with the exception of 1 case of severe forearm injury as a result of a dog bite, and 10 patients started working immediately after discharge from the hospital. Of the 25 patients who underwent intramedullary osteosynthesis without blocking, 8 had movement restriction due to the development of moderate rotational contractures. The reason for this was the "telescoping" of the fragments of the radius on the rod with its shortening. In the absence of an end stop with oblique and comminuted fractures, a telescopic effect is observed with the displacement of fragments along the length, leading to shortening. In 7 observations, when using straight rods on the ulna, when the fracture was localized in the curvature zone, a wedge-shaped defect was formed on the medial side, which led to delayed consolidation. The fracture line was traced in the period from 6 to 14 months. In these patients, a moderate restriction of pronation was also noted, on the basis of which it can be concluded that not only the bending of the radius is important in ensuring rotational movements of the forearm, but also the bending of the ulna. The straightening of the elbow curvature with a straight rod in these patients led to its elongation and, in cases of isolated fractures, to a violation of the ratio in the distal radioulnar joint when comparing radiographs of the damaged and healthy forearm. In the future, these patients had a moderate restriction of the elbow deviation of the hand when compared with the healthy side. With fractures of both bones, with the "elongation" of the ulna, diastasis occurred between the fragments of the radius.

There are two ways to solve this problem:

1st — the implementation of compression between fragments after blocking one of the ends of the rod;
2nd — the formation of the bending of the rod during osteosynthesis of the ulna.

When forming preferences for a particular type of osteosynthesis, we analyzed the advantages and disadvantages of the main types of osteosynthesis of fractures of the forearm bones: bone, transosseous and intramedullary.

When considering bone osteosynthesis, the following advantages were revealed: anatomical reposition under visual control, stable fixation, allowing early functional treatment. The negative aspects of the method: traumatism, resulting in a violation of the blood supply of fragments, the complexity of the technology, a high risk of non-fusion, refractures, infectious complications. So, according to the data, the risk of refractures after removal of plates reaches 20%.

The appearance of a periosteal callus is a sign of bone viability. It is also correct that in all cases the early periosteal corn is a fixation, i.e. it enhances the stability of fixation.

Evaluating transosseous osteosynthesis, it should be noted that the method is low-traumatic and practically does not disrupt the blood supply of fragments. It makes it possible to control fragments in the postoperative period, however, early development of rotational movements is practically impossible due to the "fixation" of muscles to the skeleton, as a result of which contractures are formed. The method requires regular dressings and constant medical supervision. The entire period of fixation in the device is dangerous due to the occurrence of infectious complications of soft tissues in the spokes. The above certainly reduces the quality of life. We prefer to use this method as a temporary one for severe open fractures for the period of healing of soft tissues.

Blocking intramedullary osteosynthesis (BIOS) has the following properties:

1) minimally invasive, preservation of periosteal blood supply;
2) accurate restoration of the physiological curvature of bones;
3) stable fixation;
4) No need for external immobilization;
5) the possibility of early rehabilitation;

SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 11 | November 2023 - Peer Reviewed Journal

6) good quality of life of the patient;
7) no refractures after removal;
8) minimal risk of structural failure;
9) the possibility of segment reconstruction in complicated fractures.

The disadvantages of the method are: the need to use X-ray television systems during surgery, the difficulties of closed reposition, the risk of damage to tendons.

Comparing the stability of fixation of BIOS and bone osteosynthesis, it should be noted that the load distribution during BIOS occurs along the length of the rod, which minimizes the risk of destruction of the mechanical structure.

In case of bone osteosynthesis, the load is concentrated not along the segment axis on the part of the plate between the screws adjacent to the fracture zone, which increases the risk of fracture of the structure. Cortical osteosynthesis disrupts the biology of fusion due to the rigidity of fixation, which excludes dynamic compression due to muscle traction, unlike BIOS.

During the surgical treatment of patients with the BIOS method, we also faced difficulties of a very different nature. The BIOS of the forearm bones consists of many nuances, each of which is important. We came to the conclusion that it is necessary to develop technical means and a clear algorithm for the technology of performing BIOS of these localizations, taking into account all possible features.

## CONCLUSION

1. The BIOS of the forearm bones has a number of advantages in comparison with the bone and transosseous methods. It allows you to restore the anatomy and biomechanics of the forearm, shorten the period of disability, restore the function of the limb in the near future.
2. If it is impossible to compare fragments in a closed way, it is advisable to switch to an open reposition. Open reposition should be performed for fractures more than 2-3 weeks old, as well as for oblique and comminuted fractures.
3. The criterion for restoring the anatomy of the ulna in its isolated fractures, as well as in fractures of both bones, is the restoration of the physiological bending of both the radius and the ulna. This ensures adequate reposition of the radius, preservation of rotational movements, restoration of relationships in radioulnar joints.
4. It is necessary to develop technical means and a clear algorithm for the technology of performing BIOS of the forearm bones, taking into account all possible features of anatomy.

Treatment of diaphyseal fractures of the forearm bones is one of the problematic sections of traumatology and orthopedics due to the subtle biomechanical interaction of the radius and ulna bones and the extremely important functional purpose of the segment. Forearm fractures are characterized by a significant number of complications, primarily non-contractures and contractures. The exact restoration of the anatomy and biomechanics of the forearm is paramount, since failure to comply with this requirement leads to a violation of supination -pronation, restriction of the function of the hand, non-fusion. Violation of the relationship in the brachial, brachial, proximal and distal radioulnar and wrist joints is an unfavorable prognostic sign of the restoration of the function of the upper limb. Fractures of the forearm bones with inadequate treatment can lead to significant impairment of limb function. Unlike other diaphyseal fractures of long tubular bones, fractures of the radius and ulna, in addition to restoring the length and axis, require pedantic elimination of rotational deformation, without which full-fledged pronation and supination movements are impossible.

The features of consolidation place high demands on the exact reposition and preservation of blood supply. Muscles (pronators and supinators) are the cause of displacements, especially rotational ones. In fractures of the radius in the proximal third, the thrust of the biceps and the supinator provides supination of the proximal fragment, and the pronator teres and pronator quadratus attached distally cause pronation of the distal fragment and angular displacement. With fractures of the ulna diaphysis in the upper third, the proximal fragment shifts towards the radius. The muscle mass in the upper third of the forearm often leads attempts at closed reposition to failure. Fractures of the radius diaphysis in the distal third tend to shift at an angle open to the outside (i.e., the ends of the fragments shift to the ulna) due to traction of the m. pronator quadratus and the long muscles of the forearm. In addition to the noted features of the anatomy and biomechanics of the forearm bones, it is necessary to note the important role of the interosseous membrane, as well as the physiological bends of the radius and ulna bones that determine the rotation of the forearm.

The treatment of such severe injuries is a serious problem: even with an ideal reposition of both fractures, non-fusion of the femoral neck or avascular necrosis of the head account for 10 and 30%, respectively. A hip fracture in such cases should have priority in treatment before a diaphyseal fracture. The current level of development of intramedullary osteosynthesis allows simultaneous osteosynthesis of both fractures with one implant (PFN, long gamma nail), however, this is a technically complex intervention and requires significant surgical experience in the application of intramedullary osteosynthesis. Intramedullary osteosynthesis in open fractures Open fractures are usually accompanied by significant damage to the soft tissues around the bone and a decrease in its periosteal circulation. On the lower leg, where the thickness of the soft tissues above the bone is small, such injuries are most frequent (about 15% of all tibial fractures). Intramedullary osteosynthesis allows the final stabilization of the fracture without additional damage to soft tissues. Due to the danger of violations of intramedullary blood flow in open fractures, the use of bone marrow channel drilling leads to an increase in the number of purulent-necrotic complications, and therefore is not recommended. Currently, in the treatment of open fractures of the I-II degree, the use of intramedullary osteosynthesis without drilling is considered an almost established method of treatment. There are more and more reports of the successful use of intramedullary stabilization and with grade III injuries, however, such injuries require a comprehensive approach to treatment using complex plastic interventions, therefore, external fixation remains the method of choice for severe open fractures.

For a relatively short period of time, intramedullary osteosynthesis has become one of the main methods of treatment for fractures of long tubular bones. Modern trends in the development of implants and surgical intervention techniques allow the method to be used not only for simple fractures of the middle of the diaphysis, but also for severe multi-fragmented, segmental and some intra-articular injuries.

## REFERENCES

1. *Wenda, K., Ritter, G., Degreif, J. Zur Genese pulmonaler Komplikationen nach Marknagel-osteosynthesen // Unfallchirurg (1988). – Band 91. – S. 432 – 435*
2. *Pape, H.C., Regel, G., Dwenger, A et al. Influences of different methods of intramedullary femoral nailing on lung function in patients with multiple trauma // J Trauma (1993). – Vol. 35. – P. 709 – 716.*
3. *Schemitsch, E.H., Kowalski, M.J., Swiontkowski, M.F. Cortical bone blood flow in reamed and unreamed locked intramedullary nailing: a fractured tibia model in sheep // J Orthop. Trauma (1994). – Vol. 8. – P.373 – 382.*
4. *Melcher, G.A., Metzdorf, A., Schlegel, U. Influence of reaming versus nonreaming in intramedullary nailing on local infection rate: experimental investigation in rabbits // J Trauma (1995). – Vol. 39 – P. 1123 – 1128*
5. *Canale S. T., Beaty J. H. Campbell's operative orthopaedics. 11th ed. St. Louis: Mosby, 2008. P. 4892.*
6. *Cornell C. N., Lane J. M. Newest factors in fractures healing // Clin. Orthop. 1992. Vol. 277. P. 297-311.*
7. *Knight R. A., Purvis G. D. Fractures of both bones of the forearm in adults // J. Bone Joint Surg. 1949. Vol. 31A. P. 755.*
8. *Helber M. U., Ulrich C. External fixation in forearm shaft fractures // Injury. 2000. Vol. 31, Suppl. 1. P. 45-47.*
9. *Hertel R., Pisan M., Lambert S., Ballmer F. T. Plate osteosynthesis of diaphyseal fractures of the radius and ulna // Injury. 1996. Vol. 27. P. 545-548.*