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# THE CHOICE OF THE METHOD OF OSTEOSYNTHESIS OF EXTRA-ARTICULAR FRACTURES OF THE LOWER LEG BONES.

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**Resume:**The research is based on retrospective analysis of reasons for the choice of the type of osteosynthesis in 67 patients with extra-articular fractures of the tibia. Surgical treatment was carried out with using external transosseous osteosynthesis, external fixation and intramedullary locking nailing. The factors that determined the preferential use of one of these variants of osteosynthesis depending on type of fracture, its localization, the presence of polytrauma and a number of other features of the clinical situation, were revealed. The data can be used to develop a differentiated approach to the selection of treatment of fractures of this localization.

**Keywords:** bones of tibia, extraarticular fractures, osteosynthesis, treatment.

## Introduction

The high frequency of diaphyseal fractures of the lower leg bones, reaching 17% of all fractures of the musculoskeletal system [1], requires the use of effective treatment methods that ensure the maximum possible restoration of the function of the damaged limb. Currently, according to publications, various variants of internal and external transosseous osteosynthesis (CHKO) are used for extra-articular fractures of the lower leg bones [1, 2, 4]. At the same time, certain contradictions remain regarding the criteria for choosing the type of osteosynthesis. In particular, it is believed that the benefits of CHKO are most fully manifested in the treatment of open fractures, polytrauma, a combination of fractures with soft tissue injuries. However, there are also reports of the successful use of CHKO precisely for "simple" fractures of the shin bones, and among the advantages that determined the choice, minimal traumatism, the possibility of early function and load are noted [5].

MATERIALS AND METHODS

The data of the case histories of 67 patients with fractures of the shin bones treated in the period 2015-2020 in the department of emergency traumatology of the Andijan branch of the RNCEMP were analyzed. Among the victims, there were 41 men (69.3%), 26 women (30.7%). Age distribution: from 20 to 30 years — 5 people (5.9%), from 31 to 40 years —

28 people (47.5%), from 41 to 60 years — 20 people (39.6%), over 60 years — 4 people (7.0%). Among the variants of osteosynthesis used, the following were distinguished: external transosseous osteosynthesis (used in 34 patients (66.7%), intramedullary blocked osteosynthesis (BIOS) - 18 patients (17.6%), extramedullary osteosynthesis - 16 patients (15.7%).

In each of the groups of patients, according to the applied osteosynthesis variant, the following were studied: the nature of the fracture (open, closed), the mechanism of injury (direct, indirect), the type of fracture in accordance with the classification of AO, localization of the tibial fracture (proximal metaphysis, diaphysis, distal metaphysis), the presence of other injuries (polytrauma). The reliability of the differences was determined using generally accepted methods of variation statistics (the differences were considered reliable at $p < 0.05$).

## THE RESULTS AND THEIR DISCUSSION

A comparative analysis of the selected groups of patients according to the above indicators revealed a number of differences that, in our opinion, are essential for understanding the reasons for choosing one or another variant of osteosynthesis, taking into account the specific conditions of the clinical situation. Table 1 shows a number of indicators that to a certain extent characterize the severity of the damage received.

When analyzing the data in Table 1, attention is drawn to the significant excess of the percentage of victims with polytrauma and with a direct mechanism of injury in the group of patients treated by the CHKO method, compared with the group of internal osteosynthesis. A similar ratio is observed when comparing the BCO with each of the individual types of internal osteosynthesis. The choice of PCO in polytrauma can be explained by its minimal invasiveness in comparison with other options, which allowed performing PCO even in a serious condition of the victims (including two-stage, in the form of a stabilization scheme in an emergency, followed by bringing the device to the full scheme). As for the mechanism of injury, it can be assumed here that the choice of CHKO was due to the presence of mechanical trauma and the rapid development of trophic disorders on the part of soft tissues (infected abrasions, epidermal blisters, etc.), which made it unsafe to carry out open surgical access. Out-of-focus fixation with the connection elements of the apparatus with the bone through intact soft tissues became preferable.

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Table 1.

Distribution of patients according to the nature, mechanism and type of injury.

| Number of patients | The nature of the fracture | | Mechanism of injury | | Type of injury | |
|---|---|---|---|---|---|---|
| | open | close | straight | indirect | isolated | polytrauma |
| 30 | 2 | 28 | 12 | 18 | 27 | 3 |
| 9 | - | 9 | 2 | 7 | 7 | 2 |
| 7 | 1 | 6 | 2 | 5 | 7 | - |
| 21 | 3 | 18 | 6 | 15 | 19 | 2 |
| 67 | 6 | 61 | 23 | 44 | 60 | 7 |

The percentage of victims with open fractures is also higher in the CHTKA group, which was expected and generally corresponds to the views existing in Russian traumatology on the choice of treatment for open fractures.

Quite characteristic moments were also revealed in the use of osteosynthesis options for various types of fractures according to the AO classification (Table 2).

Table 2.

Distribution of patients by type of operation performed.

| Type of operation | Fracture type according to AO classification | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 |
| transosseous | 12 (17,9%) | 6 (8,9%) | 4 (5,8%) | 1 (1,4%) | 2 (2,9%) | 3 (4,4%) | 2 (2,9%) | 2 (2,9%) | 1 (1,4%) |
| intramedullary | 2 (2,9%) | 3 (4,4%) | 1 (1,4%) | 1 (1,4%) | 1 (1,4%) | - | - | - | - |
| extramedullary | 2 (2,9%) | 4 (5,8%) | 2 (2,9%) | 1 (1,4%) | 1 (1,4%) | 1 (1,4%) | - | 1 (1,4%) | - |
| Internal osteosynthesis | 3 (4,4%) | 7 (10,4%) | 3 (4,4%) | 1 (1,4%) | 1 (1,4%) | - | - | - | - |
| Total | 19 (28,3%) | 20 (29,8%) | 10 (14,9%) | 4 (5,8%) | 5 (7,4%) | 4 (5,8%) | 2 (2,9%) | 3 (4,4%) | 1 (1,4%) |

Table data. 2 quite clearly define the tendency to use mainly CHKO for more severe types of fractures. Thus, in the treatment of 6 fractures of type C, CHKO was used in 5 cases (7.4%). If in the CHKO group fractures of type C accounted for 11.6% of observations, fractures of type B — 8.7%, and type A — 32.6%, then intramedullary blocked

osteosynthesis was used mainly for fractures of type A (8.7%). Bone osteosynthesis was also used mainly for fractures of type A (11.6%), and for fractures of type B and C, as a rule, it was used with a small length of one of the fragments (in the upper or lower third of the lower leg).

Certain trends were also revealed in relation to the choice of the type of osteosynthesis with different localization of the fracture throughout the tibia. So, in the studied period, all 12 observations of the use of BIOS relate to fractures of the tibia in the middle third. Of the 12 cases of bone osteosynthesis in 4 cases (5.8%), it was used for fractures of the proximal or distal metadiaphyseal divisions.

The commonly used standard interlocked intramedullary osteosynthesis is most adapted to fractures close to transverse. The presence of a short fragment (especially distal) somewhat complicates the selection of the size of the structure. This contributed to the fact that in case of fractures in the metaphysical region of the variants of internal osteosynthesis, preference was given to modern bone fixators.

The choice of TCO in severe classification types of fractures was determined both by the fact that these fractures were more often caused by high-energy trauma and were accompanied by injuries and trophic disorders of soft tissues, and by the fact that the stability of the connection of the apparatus with the bone was primarily due to the strength of the connection of the apparatus with the bone of standard metaphysical "bases", which does not depend much on the type of fracture and its localization throughout the diaphysis. The latter factor also determined the possibility of a more uniform distribution of the use of CHKO at different levels of extra-articular fractures of the tibia.

Table 3.

Distribution of patients depending on the timing of the operation.

| Type of osteosynthesis | 1st day | 2-7 days | 8-14 days | Over 14 days |
|---|---|---|---|---|
| transosseous | 23 (34,3%) | 6 (8,9%) | 2 (2,9%) | 1(1,4%) |
| intramedullary | 7 (10,4%) | 9 (13,4%) | 1 (1,4%) | - |
| extramedullary | 4 (5,8%) | 5 (7,4%) | - | 1 (1,4%) |
| Interior | 3 (4,4%) | 2 (2,9%) | - | 3 (4,4%) |
| Total | 37 (55,2%) | 22 (32,8%) | 3 (4,4%) | 5 (7,4%) |

In emergency cases, percutaneous osteosynthesis was used more often during the first day of injury - (47.7%) of patients. This was due to minimal trauma, which did not require the preparation of the victim for osteosynthesis, even in conditions of polytrauma. In contrast, when performing internal osteosynthesis, the requirements for the patient's condition and his preparation for intervention are usually higher, and the submersible structure itself requires precise size selection even at the stage of preoperative preparation. As a result, most of the interventions for internal osteosynthesis (Table. 3) were performed starting from 2 days after the injury in a planned manner. Thus, in the presence of indications for osteosynthesis in an emergency, the most frequent operation was precisely CHKO.

Conclusions

1. The tendency to the predominant use of CHKO is noted in case of urgent intervention, with open fractures and polytrauma. This method in the studied group of victims was the main one for type B and C fractures according to the AO classification (93.8% of type C fractures and 79.2% of type B fractures were operated by the CHKO method).

2. Blocking intramedullary osteosynthesis was used in closed fractures of the middle third of the tibia, mainly in isolated trauma (83.3% of cases), most often in type A fractures (88.8%).

3. The extramedullary method of osteosynthesis was used in isolated (closed fractures), mainly (56.2%) with damage to metaphysical divisions, in 93.7% of cases — with fractures of type A and B according to the AO classification.

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