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## CAUSES OF TIBIAL FRACTURE CONSOLIDATION DISORDERS IN EXTRAFOCAL COMPRESSION-DISTRACTION OSTEOSYNTHESIS AND WAYS TO PREVENT THEM

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### ABSTRACT

*This article presents the results of treatment of 540 patients with tibia fractures using Ilizarov compression-distraction osteosynthesis. The patients were divided into two groups. The first group included 486 patients who underwent one-stage manual repositioning of fractures and fixation with the Ilizarov apparatus of 4 rings. The fragments remaining after displacement were gradually repositioned in the apparatus. 80% of the fractures healed in time, and 20% of the patients had poor consolidation, no fracture heal and false joints. The second group consisted of*

54 patients. They underwent complete repositioning of the fragments under EOP control and were fixed in an Ilizarov apparatus of 4 rings. In the second group of patients, special attention was paid to complete fracture repositioning and rigid fixation in the apparatus. All patients in the second group had fracture healing in time, except for one patient who had concomitant diseases such as third-degree obesity and diabetes mellitus. Positive results were obtained in patients in the second group, where complete repositioning and rigid fixation of the fracture fragments were performed immediately before fracture heal.

**KEYWORDS:** *Tibia Fracture, Compression-Distraction Osteosynthesis, Poor Consolidation, Non-Unionised False Joint.*

## INTRODUCTION

Currently, the most popular compression-distraction apparatus is the G.A. Ilizarov apparatus, which provides stable fixation of fractures and gradual dosed repositioning without exposing the fracture zone. A significant number of scientific publications and clinical practice testify to the wide possibilities of transosseous compression-distraction osteosynthesis by the apparatus. At the same time, the widespread use of this method of osteosynthesis has revealed a number of complications (from 7 to 56.4%) in the form of suppuration of the pins, poor consolidation of the fracture site, non-union of the fracture and even false joints. The process of bone repair depends on a number of general and local factors. In the vast majority of patients, fracture heal ability mainly depends on local factors. Some authors attribute these complications to physician error, others to poor tactics and management, and still others to the poor quality of devices produced by the medical industry. The results of long-term application of the percutaneous extrafocal compression-distraction osteosynthesis for fractures of the tibia bones in the trauma department of the Republican Specialized Scientific and Practical Medical Centre of Traumatology and Orthopaedics show the presence of patients with impaired consolidation of fractures of the tibia bones.

**Objective of the study.** To investigate the causes of impaired consolidation of tibial fractures when using the Ilizarov transverse compression-distraction osteosynthesis apparatus.

## Materials and methods of research

A comparative study of the results of 540 patients with diaphyseal fractures of the tibia bones treated with the Ilizarov apparatus was carried out. The patients were divided into 2 groups. The first group consisted of 486 patients treated in 2016-2018. Of these, 286 (59%) were male and 200 (41%) were female. Among these patients, 152 (31%) were under 25 years of age, 213 (43%) were under 40 years of age and 121 (25%) were over 40 years of age. 330 (68%) had closed fractures and 156 (32%) had open fractures. Dislocation of bone fragments was observed in 480 (98%) victims. In 95 (20%) patients there were various comorbidities. Fresh fractures were observed in 380 patients and non-fresh fractures in 106 patients. In the first days of admission after anaesthesia, manual repositioning of the fractures was performed and the fractures were fixed in an Ilizarov apparatus consisting of 4 rings. The remaining displaced fragments, if any, were eliminated gradually in the apparatus. The average time of fixation with the apparatus was 3.5 months. The second group consisted of 54 patients with various diaphyseal

fractures of the tibia bones treated between 2019-2020. The age of the patients ranged from 20 to 52 years. There were 39 (72%) males and 15 (28%) females. Open fractures were in 21 (39%) patients and closed fractures in 33 (61%). Displaced bone fragments were observed in 49 (90.7%). 46 (84.7%) patients had fresh fractures and 8 (15.3%) had non-fresh fractures. 14 (25.9%) patients had various comorbidities. The care of this group of patients was based on the shortcomings of the first group of patients. In fractures without a bone defect, the main cause of non-union is poor bone separation and inadequate and too short-term immobilisation. In this group of patients, special attention was paid to ensuring sufficient fracture separation under EOP control and rigid fixation. To this end, the two rings of the apparatus closer to the fracture line were fixed with three spokes across the central and peripheral fractures.

### Results of the study

The results of treatment of the first group of patients, 79 (16%) patients had delayed fracture healing (treatment period more than 5 months), and 18 (4%) had unhealed fractures and false joints. These complications were mainly observed in patients who did not achieve complete fracture juxtaposition, fracture immobility, errors in appliance technique (application of appliance rings at different distances from the fracture line), and patients who had concomitant diseases (anemia, diabetes mellitus). In addition, the vast majority of these patients had high-energy injuries with significant damage to soft tissue and paraosseous structures. In addition to the above, non-standard Ilizarov apparatuses were used in 18 patients. Soft tissue inflammation around the spokes of the apparatus should also be mentioned among the complications of hardware treatment. Among our patients, they were observed in 25 (5%). These complications occurred mainly in those patients where the apparatus spokes were insufficiently stretched and the care of the apparatus was impaired. Treatment results of the second group of patients. The average time of fixation was 2.5 months. Two patients had inflammation around the pins, which was eliminated by conservative treatment and did not affect the results of fracture treatment. One patient, who suffered from stage III obesity and diabetes mellitus, showed poor consolidation of the fracture. His fracture healed within 9 months. Immediate and long-term results were good in all patients in this group.

### CONCLUSIONS

Thus, the comparative analysis showed that meeting the basic requirements for hardware treatment, i.e. a one-stage complete repositioning of the fracture and its rigid fixation until fusion, makes the method effective, as evidenced by the positive treatment results we obtained in patients of the second group.

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