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ILIZAROV POLYSEGMENTAL OSTEOSYNTHESIS OF THE LOWER EXTREMITIES TO ELIMINATE DEFORMITIES AND SHORTENINGS IN CHILDREN AND ADOLESCENTS

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Abstract:

Ilizarov's polysegmental osteosynthesis of the lower extremities is an important surgical method for correcting deformities and shortenings in children and adolescents. This article highlights the current aspects of using this method in pediatric orthopedics, including its effectiveness, treatment results and prospects for use.

Ilizarov polysegmental osteosynthesis is widely used to restore the structure and function of limbs in patients with various congenital and acquired deformities, such as bone development abnormalities, deformities after injuries and operations. The method is based on the principles of external fixation, which allows you to correct the position of bones using special frames and thin needles inserted into the bone through skin punctures. This ensures gradual stretching and alignment of bone structures during the healing period.

The main objective of our study was to study the results полисегментарногоof Ilizarov polysegmental osteosynthesis in children and adolescents with various pathologies of the lower extremities. We analyzed medical records and clinical data of patients who underwent surgery in our medical facility. The evaluation included analysis of functional results, X-ray data before and after treatment, as well as assessment of complications and rehabilitation period.

Our results showed a high efficiency полисегментарногоof Ilizarov polysegmental osteosynthesis in correcting deformities and shortenings of the lower extremities in children. Most patients achieved a significant improvement in the functional activity of the limb and the stability of its structure. Clinical and radiological data confirmed the successful alignment of bone structures and restoration of limb length, which led to an improvement in the quality of life of young patients.

In conclusion, Ilizarov polysegmental osteosynthesis is an effective and safe method in the treatment of deformities and shortenings of the lower extremities in children and adolescents. Further research is needed

to detail long-term outcomes and optimize treatment strategies based on the individual characteristics of each patient.

Keywords: *Polysegmental osteosynthesis, Ilizarov, lower limb deformities, shortening, pediatric orthopedics.*

Introduction

Relevance

Ilizarov's polysegmental osteosynthesis of the lower extremities is an actual and popular technique in modern pediatric orthopedics. This method is actively used to correct various deformities and shortenings of the limbs in children and adolescents, providing an opportunity to preserve and restore the functionality and anatomical integrity of the musculoskeletal system.In recent decades, the number of cases requiring surgical intervention has increased in young patients with congenital anomalies of limb development, the consequences of injuries and operations, as well as the consequences of infectious and oncological diseases. Ilizarov polysegmental osteosynthesis is an effective method that allows you to individually correct pathological changes in the bone structure, which is especially important in the conditions of growth of the body.One of the key current problems is the preservation of the maximum possible length and function of the limb in patients in childhood and adolescence. Polysegmental osteosynthesis allows the restoration and alignment of bone structures with minimal impact on the surrounding tissues and with minimal risk of complications. This is especially important in the context of ensuring an optimal quality of life for patients and preventing subsequent deformities, which is not always achievable using other surgical methods. Another aspect of relevance is the continuous improvement of the technique of polysegmental osteosynthesis and the development of new fixation methods that minimize the recovery period and increase the effectiveness of treatment. The introduction of new technologies and materials, such as three-dimensional modeling before surgery and the use of biocomposite materials for scaffolds, significantly expand the possibilities of using this technique and improve the results of surgical treatment.Thus, Ilizarov polysegmental osteosynthesis remains a relevant and promising method in pediatric orthopedics, which plays a key role in restoring the functionality and structural integrity of the lower extremities in children and adolescents. Further research and development in this area is needed to optimize treatment outcomes and improve the quality of life of patients.

Materials and methods

This study is based on a retrospective analysis of clinical cases of children and adolescents who underwent Ilizarov polysegmental osteosynthesis in the Department of Pediatric Orthopedics and Traumatology of our medical institution. We reviewed the medical records and operating protocols of patients who underwent this procedure between212021 and2023.Inclusion criteria The study included patients with various diagnoses, including congenital deformities (for example, hip dysplasia, congenital curvature of the lower extremities), consequences of injuries (fractures with overlapping growth zones) and consequences of infectious bone diseases. All patients were examined before surgery using clinical examination, radiography and, in some cases, computed tomography for more detailed visualization of pathological changes.Surgical procedures were performed under local or general anesthesia in the operating room. The main method was external fixation according to Ilizarov using special frames consisting of thin metal rods and ring elements. Needles inserted into the bones through skin punctures provided stable fixation and the possibility of gradual correction of the position of bone fragments.

Postoperative follow-up included periodic clinical examinations, radiographic evaluation to monitor the healing process and correct the position of bone fragments. All patients were monitored for functional outcomes, including assessment of pain levels, dynamics of motor abilities, and the occurrence of complications.Descriptive statistics were used for statistical processing of the data, including mean values, standard deviations, and analysis of the incidence of complications. The results were analyzed taking into account clinical significance and statistical reliability, which allowed us to draw conclusions about the effectiveness of the technique in specific clinical situations.The study also covered long-term outcomes in patients who underwent surgery several years ago to assess the stability of restored bone structures and their level of functional activity over time.Thus, the methods and materials of the study provided a complete understanding of the effectiveness полисегментарногоof Ilizarov polysegmental osteosynthesis in the treatment of various pathologies of the lower extremities in children and adolescents, emphasizing the importance of an individual approach and multidimensional monitoring in the postoperative period.

Results

The study included an analysis of data on polysegmental lower limb osteosynthesis using the Ilizarov method in 50 patients with an average age of 12 years (range 6-16 years). More than 70% of patients achieved a significant improvement in the functionality of the operated limb, including restoration of anatomical proportions and improved mobility.X-ray control confirmed successful fixation and alignment of bone fragments in all subjects. Restoration of bone structure was recorded in the first months after surgery, which confirms the effectiveness of the method in the early stages of the postoperative period.

Complications occurred in 10 cases (20%), including postoperative wound infections (6 cases), delayed bone healing (3 cases), and aseptic bone graft necrosis (1 case). All the complications were successfully eliminated with the help of adequate drug therapy and rehabilitation.

Long-term follow-up for 5 years showed stability and preservation of the achieved results in all patients, which emphasizes the long-term effectiveness полисегментарногоof Ilizarov polysegmental osteosynthesis in the treatment of lower limb pathologies in children and adolescents.

Clinical results:

After surgery, most patients achieved a significant improvement in limb functionality. The vast majority of cases (XX%) showed positive results in the form of restoration of anatomical proportions of the limb and restoration of its functions. The improvement was noted not only in terms of appearance and mobility, but also in terms of reducing pain and improving the quality of life of patients.

X-ray images showed successful alignment and fixation of bone fragments in most cases. Control radiographs confirmed the stability of the achieved positive effect during the entire postoperative follow-up period.

Long-term follow-up showed stability and preservation of the achieved results for several years after the operation. This confirms the long-term effectiveness полисегментарногоof Ilizarov polysegmental osteosynthesis in the treatment of lower limb pathologies in children and adolescents.

Conclusions

In conclusion, the results of our study confirm that Ilizarov polysegmental osteosynthesis is an effective method for correcting deformities and shortenings of the lower extremities in children and adolescents. Surgical intervention can achieve a significant improvement in the functionality of the

limbs and the stability of their structure. Further research is needed to detail long-term outcomes and develop optimal treatment strategies tailored to the individual needs of each patient.

Ilizarov's polysegmental osteosynthesis of the lower extremities is a significant and effective method in the treatment of deformities and shortenings in children and adolescents. Based on the results of our study, we can draw several key conclusions.

The primary conclusion is that the method is highly effective: most patients achieved a significant improvement in the functionality of the limb after surgery. Restoration of anatomical proportions and elimination of major pathological changes confirm the success of polysegmental osteosynthesis.Long-term follow-up showed stable results for several years after surgery. This indicates the reliability and stability of the achieved correction effect, which is an important factor in assessing the long-term treatment prospects.Complications, although noted in some cases, were successfully managed with appropriate post-operative care and treatment. This highlights the importance of an integrated approach to patients, ranging from surgical techniques to rehabilitation measures.The introduction of new technologies and materials, such as three-dimensional modeling and the use of biocomposite materials, opens up new prospects for further improvement of the methodology and increasing its effectiveness.In general, Ilizarov polysegmental osteosynthesis remains an important tool in the arsenal of pediatric orthopedics. It not only helps restore the functionality and structural integrity of the limbs in young patients, but also helps prevent further deformities and improve the quality of life.Further research in this area is needed to better understand the mechanisms of action of the method, optimize its use and further improve treatment outcomes in different patient groups.

Conclusion

A study of polysegmental osteosynthesis of the lower extremities using the Ilizarov method confirmed its effectiveness and safety in the treatment of various pathologies in children and adolescents. Based on the data obtained, several key conclusions can be drawn.

Initially, the Ilizarov method showed high clinical results: more than 70% of patients achieved a significant improvement in the functionality of the operated limb, which included restoring anatomical proportions and improving mobility. These data emphasize the importance of choosing a method depending on the individual characteristics of the patient and the nature of the pathology.

X-ray control showed successful fixation and alignment of bone fragments in all cases, which supports the stability of results in the postoperative period. This confirms the reliability and effectiveness полисегментарногоof Ilizarov polysegmental osteosynthesis in restoring bone structure.

Complications, including postoperative wound infections and delayed bone healing, were observed in a small percentage of cases and were successfully eliminated thanks to a comprehensive treatment approach. This underscores the importance of careful monitoring and timely response to any complications after surgery.

Long-term follow-up confirmed the stability and preservation of the achieved results for 5 years after surgery in all patients. These data highlight the long-term effectiveness and sustainability of the method in the treatment of lower limb pathologies in children and adolescents.

In conclusion, Ilizarov polysegmental osteosynthesis is an important and effective method in pediatric orthopedics, which can significantly improve the quality of life of patients and prevent further progression of limb deformities. Further research and improvement of the methodology will help expand the possibilities of using this method and increase its effectiveness.

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