

# MINIMALLY INVASIVE TECHNIQUES FOR THE TREATMENT OF CLOSED INTERCONDYLAR EMINENCE FRACTURE: CLINICAL OBSERVATION

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This article presents a clinical case of the surgical treatment of a fracture in the intercondylar eminences of the knee joint in a 7-year-old child. Closed fractures of the intercondylar exaltation are mainly a characteristic of childhood. This type of damage occurs by dysfunction of the knee resulting from instability. Because the fracture of the intercondylar eminences of the knee joint in children is similar to the damage of the anterior cruciate ligament in adults, the current course of knee surgery is a minimally invasive technique. These include fixation of the intercondylar exaltation using video stroboscopy as well as the assistance of various implants (e.g., screw, wire, and Dacron). In the children's Department of Traumatology and Orthopedics of the Federal Center of Traumatology, Orthopedics and Endoprosthesis Replacement in Barnaul, various surgeries are performed, including arthroscopy of the right knee joint, intercondylar exaltation reposition, and fixation of the intercondylar exaltation latch Lupine (De PuyMitek).

**Keywords:** knee fracture, surgical treatment, children.

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## Introduction

Closed fractures of the tibial spine are the most prevalent fractures in childhood [1]. The incidence of this type of injury is 0.5% among all types of skeletal injuries and 5% of knee joint injuries in children [2]. This type of injury is accompanied with knee dysfunction because of instability, as tibial spine fractures in children are similar to damage of the anterior cruciate ligament in adults. In the case of late or inadequate treatment, contractures, deformation, and severe degenerative and dystrophic changes in the child's middle years of age may develop. There are anecdotal publications addressing treatment approaches and assessment of long-term results for this type of injury. Non-surgical methods are used for the treatment of fractures with acceptable degrees of fragment displacement (type 1) [3].

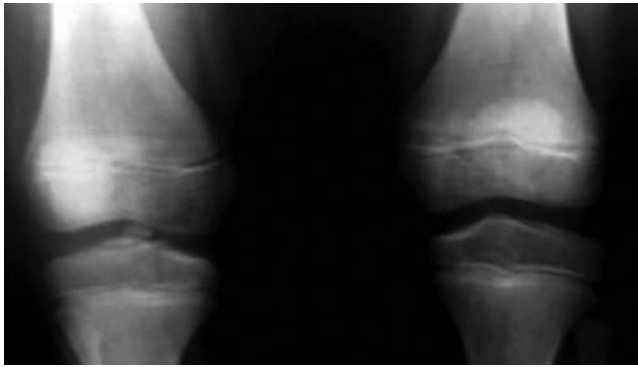
Advocates of non-surgical approaches believe that there are more indications in younger patients for this approach [4]. Types 2 and 3 tibial spine injuries require surgical intervention [3]. There are so-called open methods (for example, the fixation of the tibial spine with a bulb-tipped pin and the technique of U-shaped suturing according to Lee), which have the following negative aspects: the lack of sufficient compression with fixation of a fragment,

prolonged presence of a foreign body in the joint cavity, and extensive arthrotomy, which may contribute to the formation of early degenerative and dystrophic changes in articular structures [2]. Minimally invasive surgery is the current trend for knee surgery [5]. These include fixation of the tibial spine with various implants (anchors, minifixators) during arthroscopic intervention [6].

## Clinical observation

In May 2013, a 7-year-old male patient diagnosed with "chronic closed tibial spine fracture of the right knee joint with fragment displacement, type 2" was admitted to the Department of Pediatric Traumatology and Orthopedics, Federal center of traumatology, orthopedics and endoprosthetics, Barnaul.

According to his medical history, the child was injured after falling from a 5-m high house roof in October 2012. He was admitted to the Department of Pediatric Traumatology, Barnaul, with the following diagnoses: multiple traumas, closed fracture of the medial epicondyle of the right humerus with displacement of fragments, closed displaced fracture of the right olecranon, injury and hemarthrosis of



**Fig. 1.** Radiograph of the knee joints of the patient before surgery. Fracture of right tibial spine, type 2, can be seen

the right knee joint, and injury and subcutaneous hematoma of the right iliac region.

During hospitalization, open reposition and osteosynthesis of the olecranon with screw-awl was performed. X-ray examination of the injured knee joint was not performed, but physical therapy (magnetic therapy) was conducted. Subsequently, the patient complained of episodes of pain, instability, and blockades of the knee.

Clinical examination revealed the following symptoms and signs: swelling of the knee joint (because of a moderate synovitis), decreased range of motion (ROM), and positive anterior drawer sign. X-ray examination was performed, and an intercondylar eminence fracture with displacement of fragments, type 2, was diagnosed (Fig. 1).

In May 2013, arthroscopy of the right knee joint with tibial spine reposition and fixation of the tibial spine with fixator Lupine (DePuy Mitek, USA) was performed. There were no postoperative complications, and fixation of the right knee joint with a removable joint-immobilizer was performed. The child received appropriate post-operative medications and physical therapy. On postoperative day 8, he was discharged in satisfactory condition.

After 4 weeks, the child was re-examined at an outpatient follow-up visit. There were no complaints, edema of the right knee joint, or signs of synovitis. Control X-ray examination (Fig. 2) was performed, and the consolidation of bone fragments in the area of fracture was satisfactory. Gradually increasing weight on the right lower extremity with a removable joint-immobilizer was permitted.

Clinical examination of the patient was performed once per 3 months with the last examination in September 2015 (Fig. 3); there



**Fig. 2.** Right knee-joint radiograph of our patient 4 weeks after arthroscopic fixation of the tibial spine

were no complaints, the knee joint was active in the full range of motion, and there were no signs of instability. The child successfully returned to normal activity.

## Conclusion

This clinical observation suggests that the presence of complex and rare intra-articular injuries of the knee joint in children lead to joint dysfunction. These types of knee injuries require detailed examination of the knee joint to avoid undiagnosed injuries that can lead to disability. Use of high-tech, minimally invasive techniques for the treatment of chronic injuries of the knee joint shows a satisfactory and consistent result with joint function recovery, which corresponds to modern views on knee surgery.



**Fig. 3.** Right knee-joint radiograph of the patient 2 years after arthroscopic fixation of the tibial spine

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## МАЛОИНВАЗИВНЫЕ ТЕХНОЛОГИИ В ЛЕЧЕНИИ ЗАКРЫТОГО ПЕРЕЛОМА МЕЖМЫШЕЧКОВОГО ВОЗВЫШЕНИЯ КОЛЕННОГО СУСТАВА. КЛИНИЧЕСКИЙ СЛУЧАЙ

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В статье представлен клинический случай хирургического лечения перелома межмышечкового возвышения коленного сустава у ребенка 7 лет. Закрытые переломы межмышечкового возвышения в основном характерны для детского возраста. При возникновении данного вида повреждения возникает дисфункция коленного сустава из-за нарушения стабильности, так как перелом межмышечкового возвышения коленного сустава у детей является аналогией повреждения передней крестообразной связки у взрослых. Современным направлением хирургии коленного сустава являются малоинвазивные методики. К ним относится фиксация межмышечкового возвышения с использованием видеоартроскопической ассистенции различными имплантатами (винтом, проволокой, лавсаном). В детском травматолого-ортопедическом отделении Федерального центра травматологии, ортопедии и эндопротезирования города Барнаула выполнена операция — артроскопия правого коленного сустава, репозиция межмышечкового возвышения, фиксация межмышечкового возвышения фиксатором Lupine (DePuyMitek).

**Ключевые слова:** перелом коленного сустава, хирургическое лечение, дети.

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