

Advantages of Treating Lower Limb Axis Deformities in Children Using the Temporary Growth Plate Blocking Method

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Abstract: The aim of this scientific study is to compare the results of examined patients with axial deformities of the lower limbs, particularly varus and valgus deformities, who underwent surgical treatment using the method of hemiepiphysiodesis (36 patients). The hemiepiphysiodesis technique we recommend, with mandatory consideration of the anatomy of the distal femur, is the method of choice for orthopedic surgeons. We observed these patients from the time of surgery to long-term outcomes in order to improve the results of surgical treatment.

Keywords: Lower limb deformities, leg bones, hemiepiphysiodesis, anatomy of the distal femur, children, valgus deformity, varus deformity.

Introduction: Objective: To improve treatment outcomes in children with lower limb axis deformities by using a minimally invasive temporary growth plate blocking method.

Materials and Methods

The study included 36 pediatric patients aged 9 to 13 years who had various types of lower limb axis deformities. They were treated between 2018 and 2025 in the Department of Traumatology and Orthopedics of the former Tashkent Pediatric Medical Institute (TashPMI). Of the 36 patients treated and observed in the clinic, 24 (66.6%) were boys, and 12 (33.4%) were girls.

Results

Depending on the patients' age, different treatment approaches were selected. In older children, the timely use of a minimally invasive method — namely, hemiepiphysiodesis — showed significant improvement in treatment outcomes. The results obtained from our clinical observations support this conclusion. All 36 patients in our study were treated

using various techniques of temporary growth plate blocking, i.e., hemiepiphysiodesis. Comparing the results, we found that this method provided better outcomes than other treatment options for limb axis deformities. When performed in accordance with the requirements of temporary hemiepiphysiodesis — taking into account the anatomical structure of the femur — postoperative pain, discomfort, and complications were minimal or absent.

In recent years, the proportion of orthopedic diseases in children has been relatively higher compared to other congenital conditions. Among orthopedic disorders, congenital and acquired deformities of the lower limb axis occupy a leading position. These deformities, in turn, cause various physical and psychological inconveniences throughout the life of the affected child and their family.

One of the most pressing and relevant issues currently attracting the attention of researchers and practicing orthopedic surgeons is lower limb axis deformities in children [1]. Therefore, researchers emphasize the importance of effective treatment approaches for

patients with such deformities and recommend the implementation of child-preserving therapeutic methods in clinical practice whenever possible [6].

A great deal of time and effort is being devoted worldwide to preventing and managing the early and late complications that arise as a result of lower limb axis deformities. These deformities often cause significant psychological and physical distress to both the affected child and their family [5]. According to the literature, among the causes leading to lower limb axis deformities, rickets ranks first. Post-rickets complications often result in valgus and varus deformities of the legs. Among these, valgus deformities occur more frequently than varus ones and are generally considered less responsive to conservative treatment. Despite the application of various conservative methods in treating lower limb axis deformities—particularly valgus deformities—recurrence and progression of the deformity during the growth period are often observed. In patients older than five years, the effectiveness of conservative treatment is found to be minimal or entirely absent [4]. Taking this into account, orthopedic surgeons are actively seeking surgical solutions to this problem. In recent years, research has shown that numerous surgical methods have been developed to correct lower limb axis deformities, and the majority of these involve performing various types of osteotomies on the affected bones [3].

According to the literature, the method of guided bone growth has been widely used in the treatment of

various skeletal deformities, yielding highly favorable results. This method has several advantages: it is minimally invasive, and despite being a surgical procedure, it does not require prolonged postoperative immobilization or the use of external corrective devices [1,7].

Taking all of the above into account, we set the following objective: To determine the indications for the correction of lower limb axis deformities in children based on their age and orthopedic clinical findings, and to improve treatment outcomes by applying the minimally invasive temporary growth plate blocking method.

Materials and methods

The study included 36 pediatric patients aged 3 to 14 years with various types of lower limb axis deformities. All patients were treated between 2018 and 2025 in the Department of Traumatology and Orthopedics of the Tashkent Pediatric Medical Institute (TashPMI). They were placed under our supervision, treated surgically using the proposed methods, and their outcomes were analyzed. Among the patients, 24 (66.6%) were boys and 12 (33.4%) were girls. The predominance of boys was attributed to the fact that valgus deformities often interfere with active lifestyles and, from a cosmetic standpoint, are more noticeable and opposite to the normal anatomical appearance in males. In our sample, 32 patients (88.9%) presented with valgus deformities of the lower limb axis, while 4 patients (11.1%) had varus deformities.

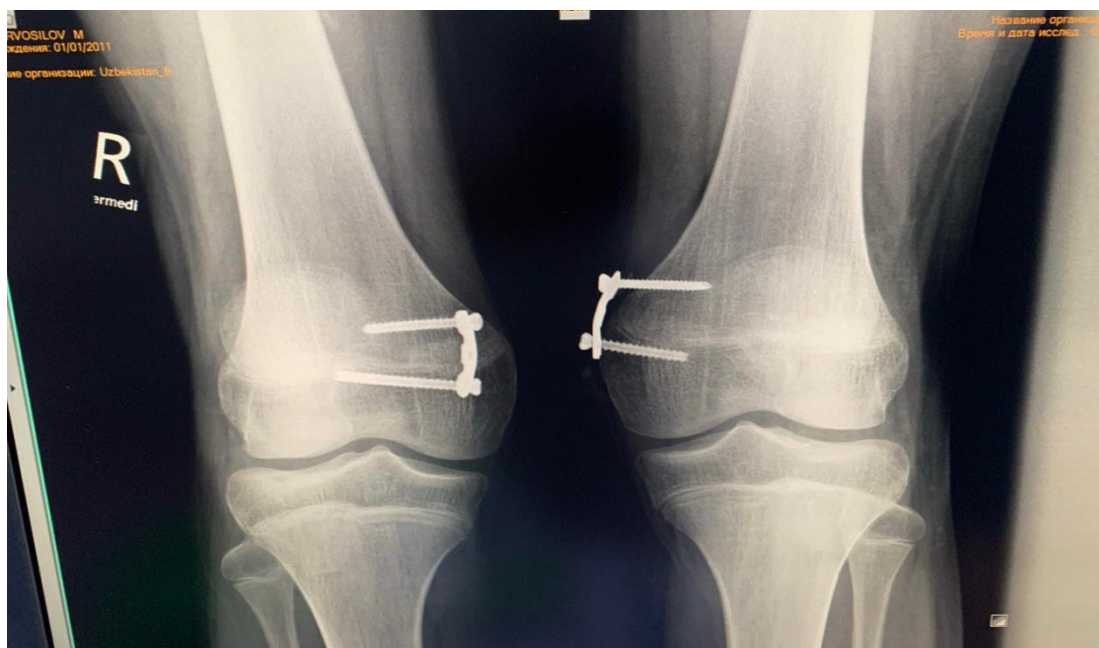
Distribution of patients according to age and gender. Table:

Gender Type of Deformity	Boys	Girls
Valgus deformity	21	11
Varus deformity	3	1

All of the patients mentioned above had previously undergone several courses of conservative treatment, which were either ineffective or resulted in recurrence of the deformity. As the children grew older, many of them began to experience discomfort during physical activity and psychological distress due to the cosmetic appearance of their legs compared to their peers at school. These factors ultimately led to their consent for surgical intervention. Among the patients treated in our department, 32 (88.9%) children with valgus

deformities of the lower limb axis underwent temporary hemiepiphysiodesis by placing plates on the distal medial surface of the femur, carefully considering its anatomical structure. The remaining 4 (11.1%) children with varus deformities were treated using the same temporary hemiepiphysiodesis technique, but with plates placed on the proximal lateral surface of the tibia. For the procedure, patients were required to be over 9 years of age, and the degree of deformity had to be at least 20 degrees.

Figure 1. Example of a patient who underwent surgical treatment at the TashPMI clinic



The hemiepiphyseodesis procedure was primarily performed using a special “figure-eight” 8-shaped plate (Figure 1). After regaining consciousness from general anesthesia on the same day, the operated patients reported minimal postoperative pain, unlike with other surgical techniques such as polyperforative osteotomy. Most of them were able to stand and walk carefully within hours after surgery. The absence of immobilization devices significantly reduced discomfort for the children. Starting from the day after surgery, patients underwent gradual rehabilitative exercises in addition to standard postoperative care. The duration of plate retention depended on the child’s age and the degree of deformity. In our observations, the shortest period was 10 months, and the longest was up to 30 months.

Results

The analysis of patients treated at the Department of Traumatology and Orthopedics of TashPMI using the hemiepiphyseodesis method for lower limb axis deformities showed that this surgical approach is minimally invasive and effective for both varus and valgus deformities. Within 1–2 days post-surgery, patients were able to walk independently, with short-term, low-intensity pain. By day 3–5, full range of motion in the knee joint was typically restored, and patients resumed independent walking progressively. No cases of complications commonly seen after cast immobilization - such as muscle hypotrophy, discomfort, or joint contractures - were observed.

Our clinical observations also revealed that only one patient (2.8%) experienced incomplete correction. This was due to non-compliance with orthopedic recommendations and late presentation (at age 13,

though with larger anthropometric parameters), which resulted in premature closure of the growth plate before full correction could be achieved. To date, none of the patients in our follow-up have shown any of the plate fractures frequently reported in other studies.

Conclusion

In the treatment of lower limb axis deformities, the shortest duration required for correction using the hemiepiphyseodesis method was 10 months. On average, achieving a complete result required 1–2 years, with the first signs of correction observed at around 6 months postoperatively. One of the main advantages of this approach is that patients do not experience significant physical limitations and can continue their normal school activities, which makes this method highly convenient and socially favorable. The temporary hemiepiphyseodesis technique demonstrates high clinical effectiveness, characterized by minimal postoperative complications compared to other surgical interventions.

Thus, despite the existence of numerous treatment techniques, temporary growth plate blocking (guided growth) - when performed with careful consideration of the anatomical features of the growth zones - can be regarded as a modern, effective, and physiologically appropriate surgical method for correcting deformities of the lower limb axis in growing children.

In contrast, for children under 9 years of age with early-detected deformities, conservative management remains a reasonable and sufficient approach.

However, in school-aged children, the application of temporary hemiepiphyseodesis represents the method of choice, providing optimal results with minimal invasiveness and low complication rates.

References

1. Kenis V.M., Morenko A.V., Korshunov A.V., et al. Numerical modeling of stresses in the construct for temporary hemiepiphysiodesis in patients with systemic skeletal dysplasias. *Vestnik Travmatologii i Ortopedii im. N.N. Priorova*. 2018; No.1.
2. Kadirov I.M., Ganiev A.K., Sadikov S.A. Experience in treating axial deformities of the lower extremities in children using a minimally invasive method. *Internauka Journal*. Moscow. No.22(56), Part 1, June 2018.
3. Ganiev A.K., Gulyamov S.S., Usmonov A.A. Correction of valgus deformities of the lower limbs by the epiphysiodesis method. *Proceedings of the Scientific-Practical Conference of Traumatologists and Orthopedists of Uzbekistan, "Current Issues in Traumatology and Orthopedics"*, Jizzakh, June 8, 2019.
4. Gerges M., Messner J., Lim B., Chhina H., Cooper A. Efficacy and safety of "Sleeper Plate" in temporary hemiepiphysiodesis and the observation of tethering. *J Pediatr Orthop*. 2022; 42(7): e762–e766. doi:10.1097/BPO.0000000000002184.
5. Torrez T.W., Amick M., Njoku N., Zhang E., Stephens S.E., Makarewich C.A. Removal of the metaphyseal screw from tension band constructs after hemiepiphysiodesis: High rates of physeal tethering and subsequent implant removal. *J Pediatr Orthop*. 2025; 45(2): 100–106. doi:10.1097/BPO.0000000000002843.
6. Coppa V, Marinelli M, Procaccini R, Falcioni D, Farinelli L, Gigante A. Coronal plane deformity around the knee in the skeletally immature population: A review of principles of evaluation and treatment. *World J Orthop*. 2022 May 18;13(5):427-443. doi: 10.5312/wjo.v13.i5.427. eCollection 2022 May 18. PMID: 35633744
7. Retzky J, Pascual-Leone N, Cirrincione P, Nichols E, Blanco J, Widmann R, Dodwell E. The Perils of Sleeper Plates in Multiple Hereditary Exostosis: Tibial Deformity Overcorrection Due to Tether at Empty Metaphyseal Hole.. *J Pediatr Orthop*. 2023 Sep 1;43(8):471-474. doi: 10.1097/BPO.0000000000002458. Epub 2023 Jul 18. PMID: 37469302.