Journal of Health Physiotherapy and Orthopaedics

Case report

Rehabilitation of Post-Operative Tibial Pseudoarthrosis in a Toddler

Ansil Ali K*

Master of Physiotherapy (neuro). Under MGR university, Tamilnadu, India.

Corresponding author: Ansil Ali K ✉ ansil.alik@gmail.com, **Orcid Id**: https://orcid.org/ 0009-0001-4227-4240

Received - 12-12-2024**, Revised** - 15-12-2024, **Accepted** - 20-12-2024 **(DD-MM-YYYY)**

Refer this article

Ansil Ali K, Rehabilitation of Post-Operative Tibial Pseudoarthrosis in a Toddler. Journal of health physiotherapy and orthopedics, November-December 2024, V 1 - I 1, Pages - 0018 – 0021. Doi: https://doi.org/10.55522/jhpo.V1I1.0007.

ABSTRACT

Pseudoarthrosis of the tibia is an uncommon condition in infants, but when it does develop, it causes a deformity in the tibia of the affected leg, causing it to bend backward. Our patient, who came to the physiotherapy department for post-operative treatment of the Ilizarov external fixator used to rectify this deformity, had a similar experience. When the patient first arrived at the department, her ankle ranges were nearly non-existent, and her hip and knee ranges had been reduced, as had her strength in the affected limb. Her physiotherapy routine was precisely constructed with her age and preferred activities in mind, allowing us to easily reach our target objective through play therapy. After a month of providing her this regimen to follow at home, we noticed considerable gains in her strength and joint ranges, leading us to believe that physiotherapy is beneficial in this unusual disease.

Keywords: Pseudoarthrosis tibia, Physiotherapy, Ilizarov's fixation, Case report, etc.

INTRODUCTION

Congenital pseudarthrosis of the tibia (CPT) is a rare disorder that can manifest in a variety of forms, ranging from simple tibial angulation anterolaterally to complete non-union with significant bone deformities. The association between type 1 neurofibromatosis and CPT is well acknowledged, although the particular cause is unknown. The fibrous soft tissue and abnormal periosteum found in pseudarthrosis are clearly essential in the pathogenesis, most likely due to reduced osteogenic capacities and decreased local vascularization. (Pannier, 2011.) Its management is difficult and takes several years.

The focus of decision-making should be on long-term function. The utilization of bone rod constructions, morphogenic proteins, and directed development in deformity treatment has resulted in the most significant advances in care in recent years. One of the primary benefits of an external fixation approach, initially published by Ilizarov in 1971, is that it can cure pseudoarthrotic lesions and all of their potential repercussions, such as leg length disparity, refracture, and ankle valgus, all at once. Ilizarov's treatment has the advantage of allowing for a multitargeted approach; external fixation can be used for distraction, compression, or bone transfer at different tibial levels [1].

The technique's potential downsides include the treatment's complexity and time, as well as the risk of infection. It has also been demonstrated that hyperemic stimulation of distraction osteogenesis can result in femoral enlargement. (Eisenberg, Vuillermin, 2019) 50% of patients who were treated with Ilizarov's method had positive outcomes. (Javaid et al., 2020). To avoid joint contractures and subluxations, which occur when muscles are irritated by pins or cables impaling them, rigorous physiotherapy is essential. The importance of physiotherapy in the successful implementation of Ilizarov's procedure is obvious because stretching and preserving range of motion are critical to preventing contractures, dislocations, and subluxation,

while functional loading and ambulation are required for bone ossification. (Green, 1990)

Patient Information

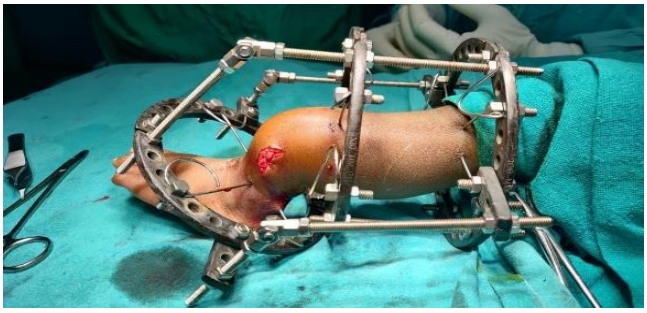
A 2-year-old girl and her parents reported to the orthopedic department with a bent leg (figure 1); her complaints were very clear, namely trouble walking, which interfered with her everyday playing activities. X-ray (figure 2) and other tests revealed a congenital pseudoarthrosis of the left tibia. She was her parents' first child, and no one in her family or relatives had any pertinent medical issues. She was shortly operated on to repair the deformity using a wedge osteotomy and an external Ilizarov's fixation. After a few days, the patient was referred to the physical therapy department for further treatment [2].

Figure 1: The day when patient presented to the orthopedic department

Figure 2: X-ray of the left tibia anteriorly (L) and laterally (R) showing pseudoarthrosis with signs of sclerosis

When she went to the physiotherapy department, she was thoroughly examined in supine position; she was conscious, oriented, and cooperative; she was thin in build; her vitals were normal; and she met all of the developmental milestones except that she couldn't walk or do activities that required weight-bearing on both limbs. There was a limited deformity, i.e., her left tibia was bent backward in the distal half, with an Ilizarov's fixation over it; there was no major muscle atrophy, discolouration, edema, swelling, or temperature rise in and around that location; and an open incision was seen (figure 3).

Figure 3: Left lower limb with external fixation



During movement examination, A definite muscle spasm was palpable in the left leg muscle enclosing the tibia, whereas the right lower limb joints and end feelings were normal. On the left side, ankle motions were nearly gone, as was left knee range of motion (ROM); approximate ranges of the left lower limb are shown in table 1.

Table 1: Range of motion of left lower limb joints

Joint	**Movement**	**ROM of left lower limb**	
		Active	Passive
Ankle	Plantarflexion	0°	5°
	Dorsiflexion	0°	0°
	Inversion	0°	0°
	Eversion	0°	0°
Knee	Flexion	90°	90°
	Extension	0°	0°
Hip	Flexion	90°	90°
	Extension	10°	15°
	Internal rotation	10°	15°
	External rotation	15°	20°
	Abduction	30°	40°
	Adduction	10°	15°

On the left side, the knee and hip felt firm, while the ankle joint felt rigid and bony. Manual muscle testing grading on the right was marginally lower, whereas the left side was significantly lower (see table 2).

Table 2: Manual muscle test grading

Joint	**Muscles**	**Grading**	
		Left	**Right**
Ankle	Plantarflexors	2	3
	Dorsiflexors	1	3
	Inverters	1	3
	Everters	1	3
Knee	Flexors	3	3
	Extensors	3	3
Hip	Flexors	3	3
	Extensors	3	3
	Internal rotators	3	3
	External rotators	3	3
	Abductors	3	3
	Adductors	3	3

There was a noticeable limb length difference of 8 cm from the right lower limb. The girth of the thigh was equal on both sides, but the leg girth was different due to muscular thickening at a spot caused by the deformity and

potential wasting of the muscles of the lower left leg [4].

Therapeutic interventions

Her routine was designed with her age in mind. The treatment goals were developed following a thorough discussion with her parents, who were advised on the approaches, duration, and what to expect from the physiotherapy treatment, as well as how to perform the home exercise program. Table 3 lists her goals and the interventions necessary to achieve them. The duration of the interventions' dosage has not been stated due to the unknown time period required to restore the limb to normal. As a result, the regimen is intended to be followed until the end of orthopedic treatment, with progressions as determined by the physiotherapist.

The frequency of each intervention will be 5 times per day, taking into account the energy expenditure that a child has at this age. As the regimen progresses, the frequency of these procedures will gradually increase [5].

Table 3: Physiotherapy intervention

Goals	Physiotherapy intervention	Rationale
Pain reduction	Ice massage	Ice reduces the pain by numbing the area i.e., action through pain gait mechanism.
To reduce or prevent limb edema	Elevation and toe movements	Gravity will assist to drain edema in elevation and toe movement will facilitate with the same, since, the range of the ankle joint is negligible.
To prevent or relieve muscles and fascia tightness	Myofascial release	This will loosen up the muscles and fascia and prevent them from going into tightness.
Providing patient proprioceptive sensations	Making the patient stand on a walking frame	While doing this activity she will automatically gain proprioception through the non-affected extremity and through the affected extremity when it starts touching the ground.
Gaining or maintaining normal range of motion of the adjacent joints i.e., hip, knee and possibly ankle	Kicking ball while standing on the walking frame in every direction	Since the patient is a child, she would not understand the commands of the therapist hence the hip and knee ranges can be actively maintained as well as improved with play therapy
	Hydrotherapy	When the child will be immersed in the pool she will move her limbs by herself to enjoy the water and we will gain the range of every joint effortlessly.
Maintaining the strength of the muscles of adjacent joints	Make to child to squeeze a sponge ball below the buttocks, thighs and Ilizarov's	To further increase the strength of the limb, isometrics have been added in this way.

Follow-up and outcome of interventions

The patient will be summoned for a monthly follow-up to monitor the progression of her regimen. The range of mobility of the knee, ankle, and foot, as well as manual muscle testing of the primary muscles around the joint, were employed to assess outcomes within one month. Both outcome measures improved significantly since the first day of evaluation (tables 1 and 2). The total improvement in the ranges was substantially of 5°, and manual muscle testing was grade 3+ for the muscles that were graded 3 on day 1 (Table 2), while the muscles with grade 1 and 2 remained constant [6].

DISCUSSION

The external fixator-stabilized limb of an Ilizarov frame must be used physiologically during the duration of its use. Weight bearing for lower extremity activities, as well as functional upper limb use, are necessary for proper growth and ossification. Myofascial tissues resist elongation during any Ilizarov's surgery involving bone segment movement, such as lengthening, deformity treatment, or bone transport, resulting in either progressive deformity at the corticotomy site or joint contractures that can proceed to subluxations and dislocations. As a result, throughout a patient's fixation, intensive physiotherapy, dynamic and static splinting, and appropriate sleep postures must be used. (Green, 1990). A study found that early range of motion exercises and weight bearing should be prioritized because immobility did not appear to be useful. (Iliopoulos and Galanis, 2020). The use of hydrotherapy in Ilizarov's fixator was also surveyed in a 1999 study (Barker et al., 1999), which inspired us to train this youngster in water for her ranges and strength. Overall, most physiotherapy approaches are basic, such as icing and myofascial release, but others have been modified to meet her age, such as kicking a ball through the affected limb while bearing weight on the non-affected on a standing frame, squeezing a sponge ball below various areas of the lower limb, such as below the thigh or leg for isometric strengthening, and hydrotherapy to improve ranges and strength, among other things.

CONCLUSION

Physiotherapy therapies are critical in the rehabilitation of a child with tibial pseudoarthrosis using and removing an Ilizarov's fixator. The improvement in the

outcome measures indicates that the patient's joint ranges and strength have improved since the day of evaluation, which will help her achieve her developmental milestone of standing, walking, and running independently.

ACKNOWLEDGEMENT

We thank our college for this opportunity to publish this unique case and the patient to provide consent for the same.

Authors' contribution

DJ suggested the idea of the case-report, TML formulated the manuscript, DJ and PP finalized the manuscript for publication process.

Funding

This study has not received any external funding.

Conflict of interest

The authors declare that there is no conflict of interests.

REFERENCES

1. Barker K, Burns M, Littler S, 1999. Physiotherapy for Patients with an Ilizarov External Fixator: A Survey of current practice. Physiotherapy. 85, Pages 426–432. Doi: https://doi.org/10.1016/S0031-9406 (05)65501-0.
2. Eisenberg KA, Vuillermin CB, 2019. Management of Congenital Pseudoarthrosis of the Tibia and Fibula. Curr Rev Musculoskelet Med. 12, Pages 356–368. https://doi.org/10.1007/s12178-019-09566-2.
3. Green SA, 1990. Physiotherapy during Ilizarov fixation. Techniques in Orthopaedics. 5, Pages 61–65.
4. Iliopoulos E, Galanis N, 2020. Physiotherapy after tibial plateau fracture fixation: A systematic review of the literature. SAGE Open Medicine. 8, Doi: https://doi.org/10.1177/2050312120965316.
5. Javaid M Z, Khan J, Javaid MM, et al, 2020. Outcome of Congenital Pseudoarthrosis Tibia Treated with Illizarov Fixator in Children. International Journal of Orthopaedics. Pages 1289–1292. Doi: https://doi.org/10.17554/ijo.v7i3.2792.
6. Pannier S, 2011. Congenital pseudarthrosis of the tibia. Orthopaedics & Traumatology: Surgery & Research. 97, Pages 750–761. Doi: https://doi.org/10.1016/j.otsr.2011.09.001.