MICRO LABS LIMITED

ORTHO NEWSCAST

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Dear Doctor,

Greetings from Micro Labs. We are happy to bring you "**Ortho Newscast**" which contains latest and interesting news in the field of Orthopaedics.

This issue contains

- **Assessment of the structural relationship between tibia and fibula alignment: A comparative radiological investigation**
- **Clinical efficacy of arthroscopic partial meniscectomy with suture repair for discoid lateral meniscus in patients under 40 years of age**
- **Efficacy of vibration therapy on pain and function in individuals with chronic low back pain**
- **Salter-Harris Type I Growth Plate Injury in a Patient Undergoing Limb-Lengthening Surgery- An uncommon case report**

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Assessment of the structural relationship between tibia and fibula alignment: A comparative radiological investigation

INTRODUCTION

Ensuring the correct coronal alignment of the limb holds significant importance, as misalignment is not only associated with abnormal biomechanical stress on the knee's articular cartilage, contributing to degeneration and osteoarthritis, but it is also associated with reduced long-term component durability following total knee arthroplasty (TKA).[1] Up to 20% of patients who have undergone total knee arthroplasty (TKA) express dissatisfaction with the outcomes. The primary factors contributing to this dissatisfaction may include unequal flexion or extension gaps, soft tissue imbalances, and issues with patellar tracking. These issues are more common in patients with a mismatch between femoral and tibial coronal alignment in the knee joint or those with an extreme varus or valgus alignment.[2] Standard radiographic methods are used to assess the alignment of the lower limb. However, a precise evaluation of the mechanical and anatomical axes of the lower limb requires knowledge of the positions of both the ankle and hip.[3] The existing literature does not provide a consensus on the correlation between the coronal fibular axis and the tibial mechanical axis. So, this study investigated the anatomical relationship between the alignment of the tibia and fibula.

KNEE OSTEOARTHRITIS

For patients with or without knee osteoarthritis, the proximal fibular anatomic axis serves as a trustworthy landmark for the tibial mechanical axis in the coronal plane.

METHODS

This prospective study included 324 patients with knee osteoarthritis who underwent a total of 336 total knee arthroplasties (TKAs). The study divided them into two groups: the experimental group (Group A) comprised 100 knees in 100 patients, while the reference group (Group B) included 100 volunteers. The inclusion criteria for Group A involved the presence of recurrent knee joint pain over the past month, X-ray evidence of knee joint space narrowing, subchondral bone sclerosis, cystic changes, and osteophyte formation, morning stiffness lasting less than 30 minutes, and audible bone crepitus during activity. Group B inclusion criteria were age over 70 years, no history of knee pain, absence of lower extremity deformity, and no radiographic osteoarthritis (KL0/I) according to the Kellgren-Lawrence classification. Data on age, sex,

weight, height, and body mass index (BMI) were collected from all participants. Limb alignment was assessed using full-length standing hip-to-ankle radiographs. The coronal proximal fibular anatomic axis-to-tibia mechanical axis angle (PFTA) was used to represent the anatomical relationship between the tibia and fibula alignment. A negative PFTA value indicated fibula varus relative to the tibia mechanical axis, while a positive value indicated fibula valgus. Pearson's correlation analysis was performed to investigate the relationship between PFTA and other variables, including BMI, hip-knee-ankle (HKA) angle, and tibia length.

RESULTS

The reliability of radiographic measurements was consistently excellent, with intraclass correlation coefficients (ICC) ranging from 0.91 to 0.97. Patients with knee osteoarthritis in this study tended to be relatively young and exhibited varus deformity. In Group A, the mean PFTA was -0.9° ± 0.9° of varus, ranging from -2.6° to 1.0°, while in Group B, it was -1.0° ± 0.8° of varus, ranging from -2.3° to 1.0°. There was no statistically significant difference between the two groups. Figure 1 depicts the neutral distribution of PFTA. Notably, the majority of patients in both Group A (88%) and Group B (90%) had a fibular varus in relation to the tibia's mechanical axis, and no significant variation in the distribution of PFTA was observed between the two groups. When considering the mean PFTA value as baseline data, the percentages of subjects with PFTA deviations within 0.5° (ranging from -0.4° to -1.4°), 1° (ranging from 0.1° to -1.9°), and 1.5° (ranging from 0.6° to -2.4°) in Group A were 51%, 84%, and 94%, respectively. In contrast, in Group B, the percentages of subjects with PFTA deviations within 0.5° (ranging from -0.5° to -1.5°), 1° (ranging from 0° to -2.0°), and 1.5° (ranging from 0.5° to -2.5°) were 53%, 87%, and 96%, respectively. Importantly, there were no significant differences in the distribution of deviation between the two groups, with p-values of 0.78, 0.56, and 0.52, respectively. Additionally, Pearson correlation analysis revealed that none of the patient-specific factors were correlated with PFTA.

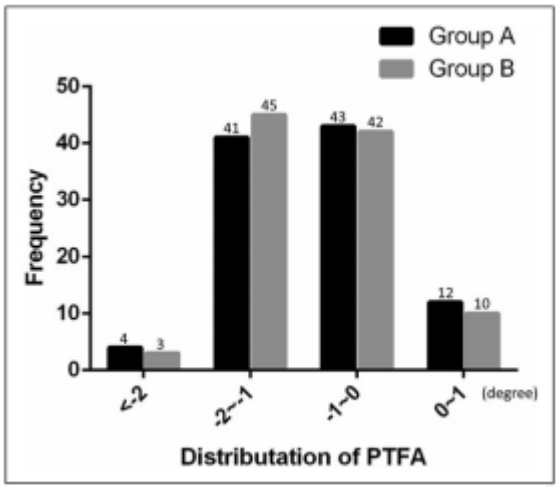

Figure 1. Neutral distribution of PFTA

DISCUSSION

In this study, it was demonstrated that the proximal fibular anatomical axis serves as a dependable marker for assessing the tibial mechanical axis in the coronal plane, regardless of whether patients have knee osteoarthritis or not.[1] Xie K et al. demonstrated that the fibular shaft axis and the medial cortex of the proximal fibular shaft can be trusted as consistent indicators of the tibial mechanical axis in patients with knee osteoarthritis. However, the dependability of

the lateral cortex of the proximal fibular shaft is less reliable, particularly in patients with a BMI less than 25.3 kg/m^2.[4]

CONCLUSION

The proximal fibular anatomical axis serves as a dependable reference point for the tibial mechanical axis in the coronal plane, regardless of whether patients have knee osteoarthritis or not. The author also introduced a straightforward supplementary technique for evaluating coronal tibial mechanical alignment, which doesn't demand extra time or surgical equipment, and can be applied during anteroposterior knee radiography or intraoperative fluoroscopy.

REFERENCE

1) Tang S, Pan X, Xu R, Shi X. Proximal fibular axis is a reliable landmark for tibial coronal alignment in patients with or without knee osteoarthritis: A radiological comparative study. J Orthop Surg (Hong Kong). 2023 Sep- Dec;31(3):10225536231207564.
2) Lin YH, Chang FS, Chen KH, Huang KC, Su KC. Mismatch between femur and tibia coronal alignment in the knee joint: classification of five lower limb types according to femoral and tibial mechanical alignment. BMC Musculoskelet Disord. 2018 Nov 24;19(1):411.
3) Marques Luís N, Varatojo R. Radiological assessment of lower limb alignment. EFORT Open Rev. 2021 Jun 28;6(6):487-494.
4) Xie K, Han X, Jiang X, Wang L, Ai S, Yu Z, Hao Y, Wu H, Qu X, Yan M. The fibular shaft axis and medial cortex of the proximal fibula are reliable landmarks for the mechanical axis of the tibia in patients with knee osteoarthritis. Knee. 2019 Dec;26(6):1386-1394.

Clinical efficacy of arthroscopic partial meniscectomy with suture repair for discoid lateral meniscus in patients under 40 years of age

INTRODUCTION

Arthroscopic partial meniscectomy with meniscal repair effectively resulted in satisfactory clinical outcomes for lateral discoid meniscal tears in patients under 40 years of age.

Discoid meniscus is a congenital variation of the knee joint, characterized by structural deformities that may result in meniscal instability. Discoid lateral meniscus (DLM) is a more common occurrence, with an incidence rate ranging from 0.4% to 17%, while discoid medial meniscus is rarely found, with an incidence of 0.06% to 0.3%. The unique morphology and structure of DLM make it susceptible to tears, often leading to symptoms like pain, snapping, or limited knee extension, primarily due to peripheral detachment.[1] Treatments for a torn discoid meniscus encompass total meniscectomy, partial meniscectomy, and partial meniscectomy combined with repair, with a focus on preserving the functional aspects of the remaining discoid meniscus.[2] Hence, a combination of partial meniscectomy and repair was undertaken to maximize the preservation of the meniscus.

METHODS

Ten patients who underwent partial meniscectomy with meniscal repair for lateral discoid meniscal tears were included in the study. The group consisted of an equal number of male and female patients, with an average age of 22 years, ranging from 14 to 40 years at the time of surgery. The period between symptom onset and the surgical procedure averaged 2.6 months, ranging from 1 to 9 months. The mean duration of follow-up was 11.2 months, with a range of 5 to 13 months. During the surgical procedure, the Watanabe classification was employed to categorize the discoid meniscus. An inside-out meniscal repair technique was utilized, using non-absorbable materials. In two cases, meniscal stimulation, such as a fibrin clot, was employed. Clinical assessments were conducted both before and after surgery, utilizing the Lysholm and Subjective International Knee Documentation Committee (IKDC) 2000 scores. Radiological assessments were carried out approximately 9.5 months' post-surgery using magnetic resonance imaging (MRI). Statistical analysis was performed using R2.8.1, and for the comparative analysis, the Mann-Whitney U test and Welch t-test were applied.

RESULTS

According to the Watanabe classification, seven patients had complete discoid meniscus, while three had incomplete discoid meniscus. Among these cases, four exhibited longitudinal tears, four had horizontal/complex tears, and two had radial/horizontal tears. Before the surgery, the patients had an average Lysholm score of 43, with a range of 14 to 66. Following the procedure, their mean postoperative score at the last follow-up was 87.2, ranging from 94 to 100. Additionally, the preoperative IKDC score averaged 21.8, ranging from 8 to 35.6, and the mean postoperative score at the last follow-up was 87.7, with a range of 79.3 to 93.1. Magnetic resonance imaging (MRI) showed signs of partial healing, indicating improved signal intensity in the meniscus for six patients, while four patients still exhibited residual meniscal damage approximately 9.5 months after the surgery, with a range of 5 to 12 months. Three patients exhibited meniscal extrusion and wear in the coronal plane images (Figure 1).

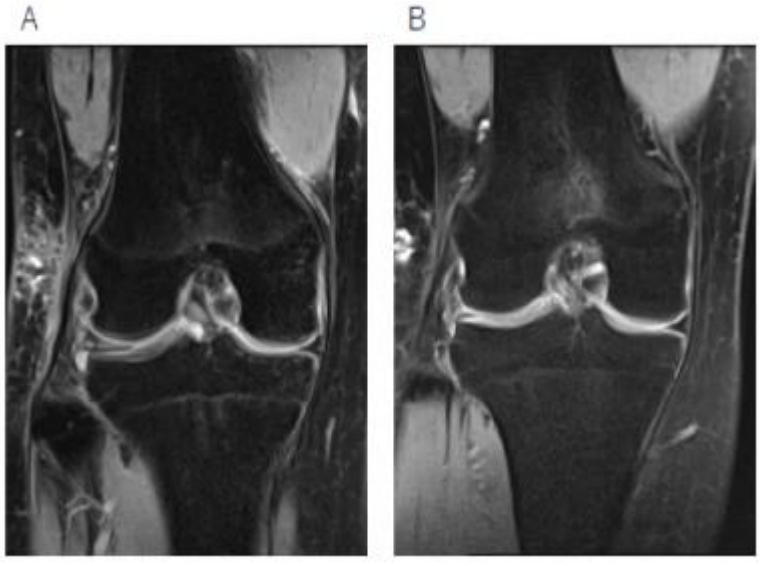

Figure 1. MRI showing a repaired lateral meniscus with a horizontal rupture in the anterior segment, a degenerative rupture in the middle portion, and a longitudinal rupture in the posterior segment. Echo picture with T2-weight gradient.

(A) a month following surgery.

(B) a year following surgery.

DISCUSSION

In this study, the combination of arthroscopic partial meniscectomy and meniscal repair effectively produced favorable clinical outcomes for lateral discoid meniscal tears. Nonetheless, it's noteworthy that in one patient, the repaired meniscus showed signs of wear and tear one year after the surgical procedure.[1] The studies revealed that complex meniscal tears exhibited significantly improved postoperative scores with repair as the treatment, while the results indicated that longitudinal meniscal tears showed better short-term postoperative scores when treated with meniscectomy.[3]

CONCLUSION

In patients under 40 years of age, arthroscopic partial meniscectomy with meniscal repair effectively resulted in satisfactory clinical outcomes for lateral discoid meniscal tears. It's worth noting that, in one patient, the reshaped meniscus through repair exhibited signs of wear and tear one year after the surgery. While the precise causes remain unclear, it's possible that histological characteristics of the discoid meniscus played a role in this observation.

REFERENCE

1) Kim JH, Ahn JH, Kim JH, Wang JH. Discoid lateral meniscus: importance, diagnosis, and treatment. J Exp Orthop. 2020 Oct 12;7(1):81.
2) Mine T, Nakano H, Shinohara M, Kuriyama R, Tominaga Y, Ihara K, Yonehara T. Arthroscopic Partial Meniscectomy with Suture Repair for Discoid Lateral Meniscus in Patients under 40 Years of Age. The Open Orthopaedics Journal. 2023 Oct 13;17(1): e187432502309060
3) Gan JZ, Lie DT, Lee WQ. Clinical outcomes of meniscus repair and partial meniscectomy: Does tear configuration matter? Journal of Orthopaedic Surgery. 2020 Jan 8;28(1):2309499019887653.

Efficacy of vibration therapy on pain and function in individuals with chronic low back pain

INTRODUCTION

Patients with CLBP can benefit from vibration therapy by having better lumbar function and less pain.

Low back pain (LBP), sometimes referred to as lower back pain or lumbar pain, originates from the area below the ribcage, encompassing the lumbosacral and sacroiliac regions, and may or may not radiate into the lower extremities. When the pain persists for over three months, it is classified as chronic low back pain (CLBP). Common treatments like oral medications and suspension training offer limited effectiveness for CLBP, which is a prevalent condition with a multifaceted origin and development.[1] Whole body vibration (WBV) is gaining popularity as a treatment approach to alleviate pain, boost muscle activity, and enhance health-related quality of life. Vibration triggers the activation of primary muscle spindles, stimulating alpha motoneurons, and ultimately engaging the extrafusal muscle fibers. This process elicits a stretch-reflex response in trunk muscles, leading to the activation and strengthening of muscles

in individuals dealing with chronic low back pain.[2] The purpose of this systematic review was to assess the impact of vibration therapy on pain and function in CLBP patients.

METHODS

In this systematic review and meta-analysis, a total of 860 subjects were included (VT group: 432, control group: 428). The study encompassed patients with chronic low back pain (CLBP), regardless of race, nationality, or the duration of the condition, defined as pain originating from the lower ribcage, affecting the lumbosacral and sacroiliac regions, and lasting over 3 months. The VT group received either vibration therapy alone or in combination with additional treatments such as medication and exercise therapy, while the control group received interventions other than vibration therapy. The outcome measures included pain intensity indicators (visual analog scale (VAS) and numeric rating scales (NRS)) and functional indicators (Oswestry disability index (ODI) and Roland–Morris disability questionnaire (RMDQ)). To assess the certainty of evidence for each outcome indicator, the GRADE framework was employed. The meta-analysis was conducted using RevMan 5.3 software.

RESULTS

In the experimental group, participants received either vibration therapy alone or in combination with other treatments, while the control group underwent interventions excluding vibration therapy. The duration of these interventions ranged from 2 to 24 weeks. The assessment of included outcome indicators was based on GRADE, which indicated a low level of certainty for the pain intensity index, ODI score, and RMDQ score. The meta-analysis revealed that, with the exception of Rittweger's study, the VT group demonstrated significantly lower pain index scores compared to the control group [SMD=-0.71, 95% CI (-1.02, -0.39), I^2=76%]. ODI scores were also significantly lower in the VT group compared to the control group [MD=-4.24, 95% CI (-8.10, -0.38), I^2=88%]. Furthermore, RMDQ scores in the VT group were significantly lower than in the control group [MD=-2.21, 95% CI (-3.41, -1.01), I^2=0%]. Regarding pain intensity, the whole-body vibration group exhibited significantly lower scores compared to the control group [SMD=-0.49, 95% CI (-0.79, -0.19), I^2=58%, P=0.001], with a noteworthy difference. Considerable heterogeneity was observed among the findings in the local vibration group (I^2=76%). Meta-analysis demonstrated a statistically significant reduction in the pain intensity index in the local vibration group compared to the control group [SMD=-1.07, 95% CI (-1.60, -0.53), I^2=76%]. For ODI scores, the whole-body vibration group had significantly lower scores than the control group [MD=-3.30, 95% CI (-5.76, -0.83), I^2=36%, P=0.009], with a statistically significant difference. However, in the local vibration group, substantial heterogeneity was present (I^2=97%), and the meta-analysis indicated no statistically significant difference in ODI scores between the local vibration group and the control group [MD=-5.78, 95% CI (-16.23, 4.66), I^2=97%, P=0.28]. This suggests that local vibration therapy may not significantly enhance lumbar function in patients with CLBP (Figure 1).

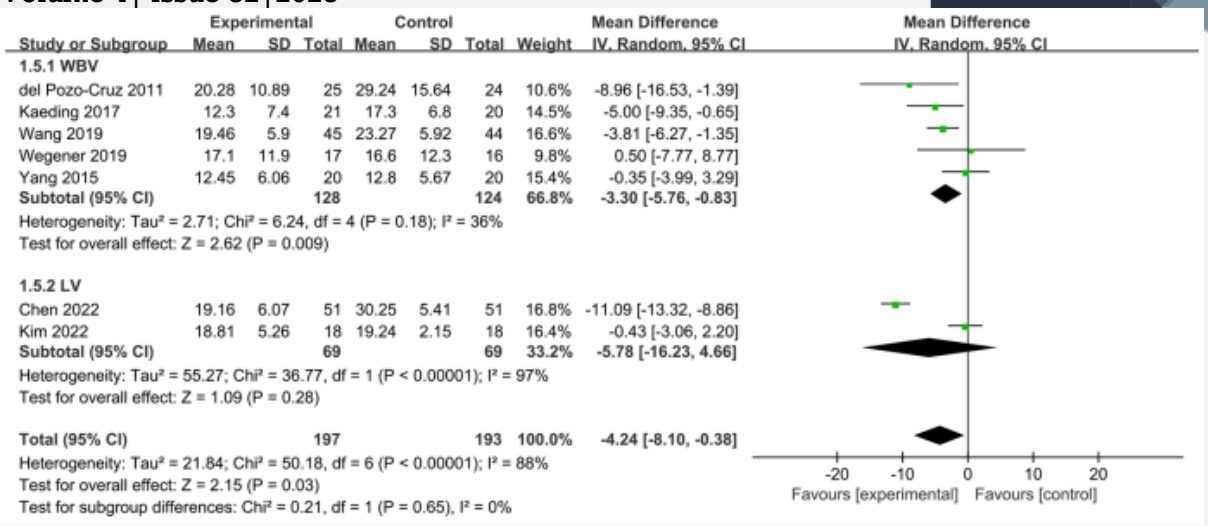

Figure 1. ODI score subgroup analysis

DISCUSSION

The present study demonstrated that vibration therapy has the potential to relieve pain and enhance functionality in individuals with chronic low back pain (CLBP). Dong Y et.al., revealed that incorporating whole body vibration into exercise routines can enhance the activation of lumbar-abdominal muscles in individuals with chronic low back pain (CLBP).[3] Germann D et al. illustrated that local vibration, including the utilization of automated mechanical devices, can offer therapeutic benefits in the management of chronic low back pain (CLBP).[4]

CONCLUSION

The current evidence indicates that vibration therapy has the potential to relieve pain and enhance function in individuals with CLBP. Nevertheless, it's crucial to approach the findings of this study with caution due to the low certainty of evidence and the uncertain clinical significance of the results. Additional randomized controlled trials (RCTs) in the future are required to provide a more definitive assessment.

REFERENCE

1) Li Q, Liu P, Wang Z, Li X. Vibration therapy to improve pain and function in patients with chronic low back pain: a systematic review and meta-analysis. J Orthop Surg Res. 2023 Sep 26;18(1):727.
2) Wang W, Wang S, Lin W, Li X, Andersen LL, Wang Y. Efficacy of whole body vibration therapy on pain and functional ability in people with non-specific low back pain: a systematic review. BMC Complement Med Ther. 2020 May 27;20(1):158.
3) Dong Y, Wang H, Zhu Y, Chen B, Zheng Y, Liu X, Qiao J, Wang X. Effects of whole body vibration exercise on lumbar-abdominal muscles activation for patients with chronic low back pain. BMC Sports Sci Med Rehabil. 2020 Dec 10;12(1):78.
4) Germann D, El Bouse A, Shnier J, Abdelkader N, Kazemi M. Effects of local vibration therapy on various performance parameters: a narrative literature review. J Can Chiropr Assoc. 2018 Dec;62(3):170-181.

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Salter-Harris Type I Growth Plate Injury in a Patient Undergoing Limb-Lengthening Surgery- An uncommon case report

INTRODUCTION

SH type I growth plate injuries are typically stable and respond well to conservative treatment, resulting in positive clinical outcomes.

The growth plate located at the distal femur was renowned for its rapid growth rate among all growth plates in humans. It contributes significantly to both overall body growth (up to 40%) and femur growth (up to 70%). In the pediatric population, fractures of the distal femur growth plate are relatively uncommon, accounting for only 7% of physeal fractures in the lower limb. Among these, Salter-Harris (S-H) Type II fractures are the most common and tend to occur more frequently in older children. S-H Type I fractures at the distal femur are the least likely to cause growth disturbances, while S-H Type IV fractures are associated with the highest incidence of growth complications.[1] Salter-Harris Type I (SH-I) fractures are relatively uncommon, particularly when they occur in the distal femur. In most instances, these fractures are linked to traumatic incidents, making their diagnosis a complex task due to the often minimal radiographic evidence. Furthermore, there is a scarcity of documented cases regarding SH-I fractures resulting from limb-lengthening procedures.[2] A Case was presented in which a boy with proximal femur focal deficiency, undergoing a limb lengthening procedure, experienced a Type I Salter-Harris (SH-I) fracture in the distal femur.

CASE PRESENTATION

A 13-year-old boy presented with a noticeable painless limb that had been progressing over two years. He had normal physical and motor development and an uneventful perinatal history. He attended a regular school and participated in sports. During the examination, he exhibited an unaided gait with a shortened limb, showing a 5 cm reduction in the length of his right lower limb. A long leg X-ray disclosed a shortened right femur and the absence of the right fibula head. The diagnosis was right proximal femur focal deficiency, and he underwent a limb-lengthening procedure using a hybrid

Figure 1. The right knee radiographs. (A)anteroposterior (AP) and (B)lateral radiographs show a type I Salter-Harris fracture over the distal femur

limb reconstruction system (LRS). A cross-knee ring external fixator was custom-built and linked to the LRS to avoid knee subluxation during the lengthening process. During the surgery, extensive precautions were taken to prevent any direct harm to the growth plate. The operation proceeded without complications, and the lengthening phase began one week after the initial procedure. This lengthening phase spanned 50 days, with a daily rate of 1 mm of lengthening. The consolidation phase lasted approximately three months after completing the lengthening. Furthermore, the osteotomy site was positioned 10 cm proximal to the distal femoral growth plate, resulting in a total femoral bone lengthening of 5 cm. Following the conclusion of the lengthening phase, the cross-knee ring external fixator was removed from the LRS. Subsequently, the patient began experiencing pain in the right knee, which worsened with passive movement. The patient did not report any recent falls or trauma prior to the onset of knee pain. A physical examination of the knee showed slight swelling and tenderness over the medial condyle of the femur. A knee X-ray indicated a 2 mm medial separation of the distal femoral growth plate, with no extension of the fracture into the metaphysis or epiphysis (Figure 1). On the lateral X-ray, no anterior or posterior displacement was observed across the physis. The diagnosis was a Type I Salter-Harris fracture of the distal femur, and conservative treatment was initiated. This included six weeks of immobilization, followed by gentle knee range of motion exercises. After six months, the patient had fully regained knee range of motion and was able to walk with assistance. A follow-up X-ray indicated progressive callus formation around the growth plate, with no additional fracture displacement.

DISCUSSION

Injuries to the growth plate in the distal femur often carry the risk of significant complications, particularly concerning growth disturbances. In this present study, the author observed a growth plate injury in a patient undergoing a limb-lengthening procedure.[2] The distal femoral growth plate plays a crucial role in longitudinal femoral growth, and fractures in this area can lead to growth arrest in as many as 50% of cases.[3] Bellamy et al. concluded that the extent of fracture displacement and the number of years left until reaching skeletal maturity were found to be connected to a heightened risk of needing corrective surgery to address growth disturbances.[4]

CONCLUSION

SH type I growth plate injuries during limb-lengthening procedures are rare but require caution to prevent harm to the growth plate and surrounding soft tissues. After frame removal, any risk of growth plate injury must be carefully assessed to avoid severe consequences. Thorough clinical evaluations and regular radiographs are essential for conservative treatment to maintain proper alignment and prevent limb length discrepancies. Prolonged follow-up is critical to detect potential growth issues. It’s worth noting that SH type I growth plate injuries are typically stable and respond well to conservative treatment, resulting in positive clinical outcomes.

REFERENCE

1) Alhammoud A, Younis MH, Ahmed AF, Ibrahim T. Surgical versus nonsurgical treatment of distal femur physeal fractures: a systematic review and meta-analysis. Journal of Musculoskeletal Surgery and Research. 2019 Apr 1;3:179.
2) Esmat SM, Sulong AF, Awang MS, Oon ZS, Mohd Yusof N. A Rare Case of Salter-Harris Type I Growth Plate Injury in a Patient Undergoing Limb-Lengthening Procedure. Cureus. 2023 Aug 14;15(8):e43448.
3) Duffy S, Gelfer Y, Trompeter A, Clarke A, Monsell F. The clinical features, management options and complications of paediatric femoral fractures. Eur J Orthop Surg Traumatol. 2021 Jul;31(5):883-892.
4) Bellamy JT, Ward LA, Fletcher ND. Evaluation of pediatric distal femoral physeal fractures and the factors impacting poor outcome requiring further corrective surgery. J Pediatr Orthop B. 2021 Jan;30(1):6-12.