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Realignment osteotomies in the treatment of chronic instabilities of the knee associated with malalignment (case report)

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ABSTRACT

INTRODUCTION: Chronic knee instabilities associated with malalignment are complex and unusual disorders with various treatment modalities.
PRESENTATION OF CASE: We describe two cases of chronic instability of the knee with malalignment. Furthermore, we describe realignment osteotomies as the treatment of chronic instabilities for these cases.
DISCUSSION: In the literature review, there are few cases of chronic instabilities treated by realignment osteotomy. Only soft tissue procedures are not enough to treat the chronic instability of the knee with limb malalignment.
CONCLUSION: Deformity analysis with good preoperative planning and then realignment of the lower extremity, lead to better results and will preserve the joint from instability.

1. Introduction

Chronic ligamentous instabilities on both medial and lateral sides with malalignment of the knee are challenging because of the different treatment modalities. Limb alignment plays a crucial role in the reconstruction procedure. Only soft tissue interventions may not be enough for the permanent stability if there is an accompanying bone and joint malalignment.[1,2] In these situations soft tissue reconstruction alone will lead to recurrent laxity and early failure over the time.[1,3] In course of the time, untreated malalignment may worsen the instability and lead to the development of arthritis.[4,5] Although the use of osteotomies for arthritis and deformities are commonly performed, outcome of the osteotomies for instability are rarely reported.[6–10]

The purpose of this study is to report two complicated chronic cases with instability and malalignment of the knee and to discuss the role of osteotomy for these cases in the light of literature.

The patients gave informed consent prior to being included in the study.

2. Case (1) presentation

An 18-year-old man was admitted to our outpatient service for painful limping and left knee instability. He experienced an open reduction and internal fixation, for medial tibia plateau fracture six months ago. Lachman, anterior drawer, posterior drawer, external rotational recurvatum and Dial tests were positive. Active left ankle dorsiflexion and active left hallux dorsiflexion were absent and there was hyposensitivity on the foot around the peroneal region. In the X-ray examination, nonunion was diagnosed on the medial plateau. He was operated for screw removal. After the operation MR scanning was performed. Anterior cruciate ligament, posterior cruciate ligament and posterolateral corner lesions were detected. He also had peroneal contusion in an EMG study. In the second operation, peroneal nerve release and Veltri–Warren procedure were performed.[10] Anatomic reconstruction was made by dividing two pieces of bone–tendon–bone autograft, which was used for each fibular and tibial part with suture anchors fixation. Having low energy trauma on the 18th day of the surgery, he came to our emergency service with pain on the medial side of the left knee and inability to walk well. Swelling was observed. Radiographs showed a failure of the implants at the medial side of the knee (Fig. 1). Mechanical axis deviation and malalignment analysis of the lower limb were investigated on the orthoroentgenogram for the preoperative planning.[11] Stress radiographs show lateral joint space widening. Proximal tibia vara was detected after the deformity planning. Instable medial plateau fragment was fixed with cannulated screws and high tibial osteotomy was performed using an Ilizarov type circular external fixation in which knee joint was included in order to correct the malalignment of lower limb (Fig. 2a). External fixator was removed after the fourth month of surgery (Fig. 2b). Recovery of peroneal nerve was observed in the nerve conduction study. Range of motion of the knee joint was 0–110° without pain and there were no ligamentous laxity in the last follow-up. Gait pattern was normal.

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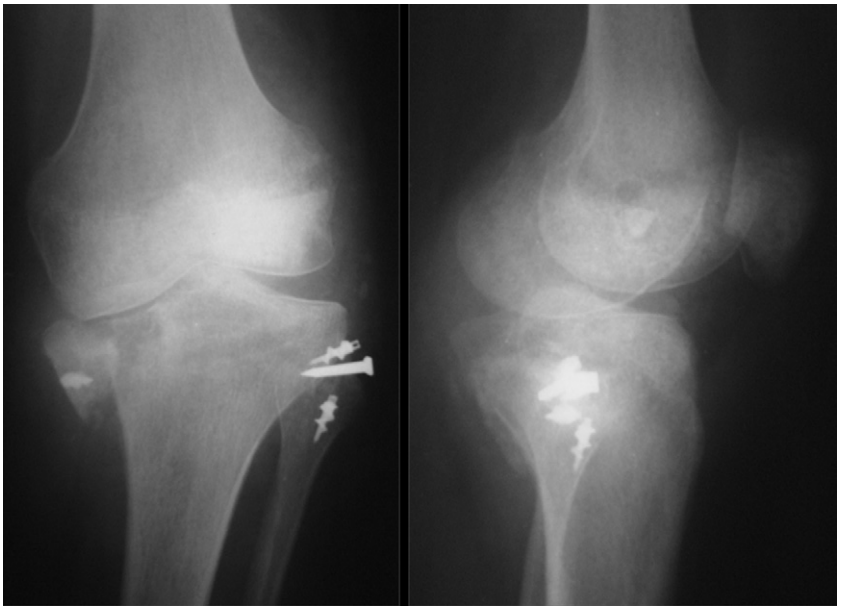

Fig. 1. Radiographs showing the failure of the reconstruction following trauma.

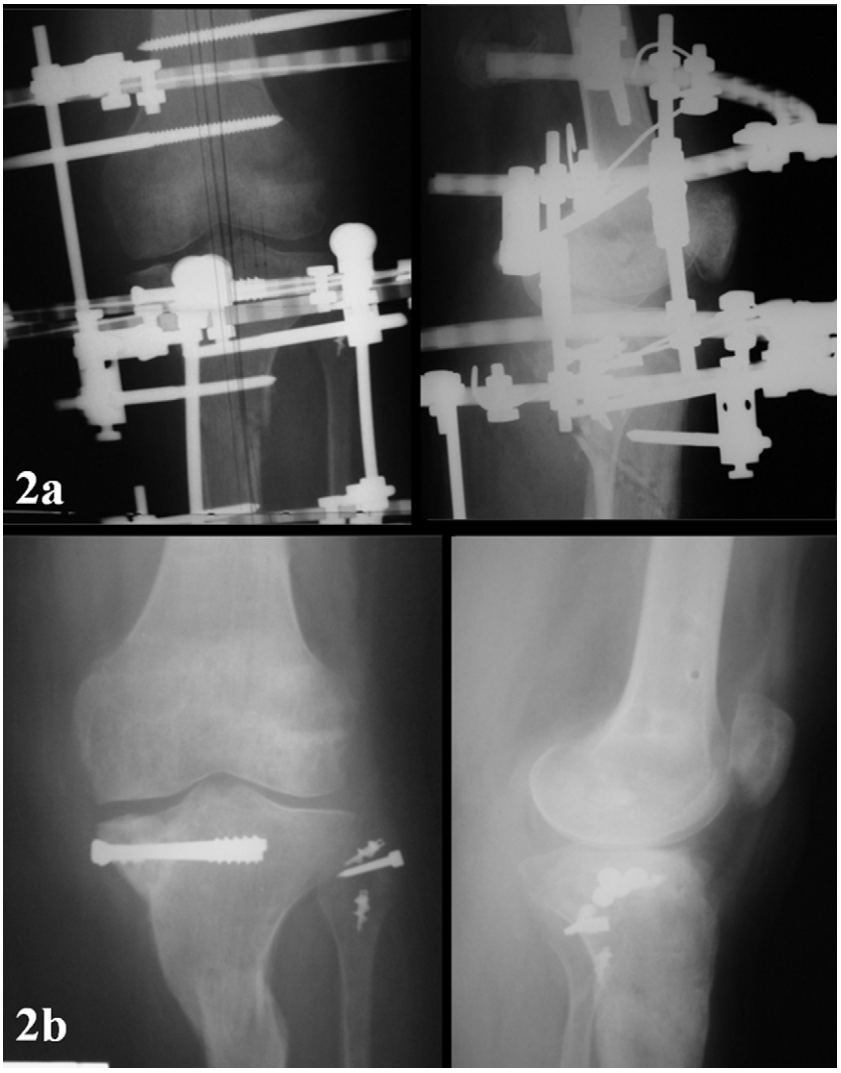

Fig. 2. (a) Deformity correction with high tibial osteotomy and application of the circular external fixation. (b) Radiographic control in 4th month follow-up after removal of external fixator.

Fig. 3. Preoperative clinical and radiographic views.

Fig. 4. Postoperative clinical and radiographic views after realignment procedures.

3. Case (2) presentation

A 43-year-old woman attended with a swollen and painful knee with varus deformity. She presented five years of history of increasing difficulty with her walking and restricting daily activities. She felt off balance due to instability and she had complained of inability to squat. Nerve conduction study was normal. Physical examination of the left knee demonstrated instability with positive Lachman, Dial and varus stress tests, varus deformity, 10° flexion contracture of the knee and 3 cm limb length discrepancy were detected. Radiographs revealed mechanical axe deviation to medial side with both distal femur and proximal tibia deformity (Fig. 3). Restoring the malalignment we performed fixator assisted nailing to femur and high tibial osteotomy with correcting the deformity by Ilizarov type external fixator (Fig. 4). After removing external fixator on the sixth month follow-up, the knee was stable and pain free. Range of motion of the joint was 0–100° and there was no instability in the last follow-up. Gait was normal.

4. Discussion

Acute and chronic posterolateral knee instability are usually accompanying with cruciate ligaments rupture. Surgical treatments for acute injuries mostly include ligament reconstructions. Reconstructions for acute injury have better results than chronic instabilities.[10] Soft tissue reconstruction alone, without correction of the malalignment, is unsatisfactory especially in chronic instabilities.[9,12]

The successful results after high tibial osteotomy (HTO) for medial compartment osteoarthritis and varus knee have been reported in the literature.[13] There are few studies about HTO treatment in the knee instability and they have underlined satisfactory results.[7–9,12]

In recent years, osteotomies and deformity corrections for chronic knee instability have gained interest due to the restoration of the biomechanics and the stability of the joint.[12] If malalignment is suspected, long-cassette hip to ankle weight bearing orthoroentgenograms should be taken in order to make a deformity analysis and plan for a possible osteotomy. Ligament and soft tissue repair or reconstruction without deformity correction may fail because of chronic repetitive stretching. Varus deformity increases tensile forces on the reconstructed ligaments and may lead to incompetence.[10,14] In case of chronic posterolateral rotary instability in the varus knee, the osteotomy is generally the first stage of a two stage procedure with ligament reconstruction.[5] A valgus proximal tibial osteotomy must be performed before or simultaneously with the reconstruction to correct the alignment and for the protection of the repair.[12] Several options have been described for HTO, whether alone or simultaneously with other procedures (anterior cruciate ligament reconstruction, meniscal transplant, cartilage resurfacing).[15,16] Little evidence exists about the efficacy of HTO alone or in combination with other procedures because of the lack of randomised controlled studies.[15] However, it is commonly believed that alignment correction is essential in achieving durable results.

Various surgical techniques were presented for posterolateral instability with varus knee. Posterolateral corner, anterior and posterior cruciate ligaments soft tissue repair or reconstruction treatments are especially selected for acute or after the realignment procedure for second stage surgery. Patellar, hamstring, quadriceps, Achilles or allograft tendons may be used for these soft tissue reconstructions.

In patient with chronic posterolateral instability with varus deformity, realignment osteotomies should be performed. HTO is an effective surgical procedure.[12] It may be performed by using

external or internal fixation systems. The goal of the osteotomy is to correct the coronal and sagittal plane deformity. If the varus is originating from the distal femur, femoral osteotomy should be performed as the realignment procedure.[1] Knee realignment osteotomy and distraction osteogenesis can be used for achieving the stability by tightening knee collateral ligament laxity.[6]

Our cases were both complicated and have a chronic instability problem. In our first case, at his initial surgical treatment option, we experienced failure due to perform only soft tissue reconstruction. After the deformity analysis, malalignment was determined around the knee joint. Realignment osteotomies were performed according to preoperative planning for both of them. Results were satisfactory; there was no knee instability left after these procedures.

5. Conclusion

Limb alignment is a knotty and key component of the knee joint stability. Soft tissue reconstruction alone, in the case of a chronic instability with malalignment, will over time fail due to varus shearing forces on the joint. Analysis of the deformity with good preoperative planning and then realignment of the lower extremity, lead to better results and will preserve the joint from recurrent laxity for second stage soft tissue reconstructions.

Conflict of interest statement

None.

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Author contributions

All authors contributed equally to this work.

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