

## CASE REPORT

# Unilateral genu recurvatum: a case report

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## Summary

**Introduction:** Genu recurvatum is characterized by knee hyperextension, gait instability, and pain. It is rarely encountered in routine orthopedic practice, and evidence regarding optimal treatment strategies remains limited. In this case, the absence of trauma, associated varus malalignment, and the unilateral presentation further increased the complexity, with progressive worsening observed over a three-year follow-up period. This report presents a rare case of unilateral genu recurvatum of unknown etiology, treated with corrective proximal tibial osteotomy and posterior tibial slope adjustment, along with postoperative outcomes and a brief review of the literature.

**Case Presentation:** A 32-year-old male patient presented with unilateral genu recurvatum and an intact posterior cruciate ligament (PCL), confirmed by MRI and arthroscopy. Preoperative planning was based on MSCT analysis. An open-wedge proximal tibial corrective osteotomy with plate fixation was performed. Under C-arm-guided fluoroscopy, the planned correction and posterior tibial slope were achieved. The posterior tibial tilt increased from 94° to 101°, improving knee stability and correcting the deformity.

**Conclusion:** Corrective proximal tibial osteotomy with posterior slope adjustment represents an effective treatment option for unilateral genu recurvatum of unknown etiology. This technique provides reliable mechanical axis correction, joint stabilization, and favorable clinical outcomes with relatively rapid postoperative recovery.

**Keywords:** knee recurvatum, corrective osteotomy, posterior tibial slope

## INTRODUCTION

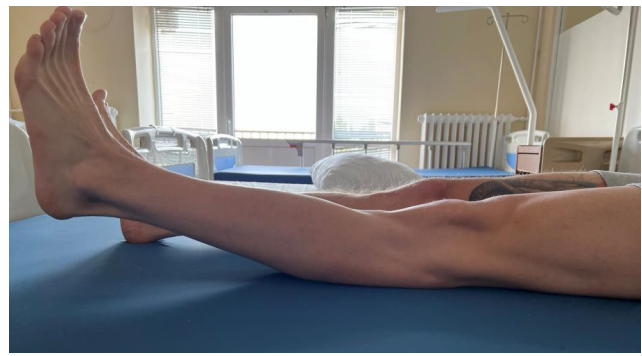
Symptomatic genu recurvatum is defined as pathological hyperextension of the knee joint greater than  $5^\circ$  (1), which occurs when the mechanical tibial axis diverges anteriorly from the femoral mechanical axis in the sagittal plane. The most common symptoms associated with this condition include pain, instability, weakness, leg length discrepancy, and reduced range of motion (2,3). Genu recurvatum may be congenital (primary) (4) or acquired (secondary) following trauma (5), cerebrovascular accidents, poliomyelitis (6), growth arrest of the physeal plate (7, 8), Osgood-Schlatter disease (8, 9), or prolonged cast immobilization (9, 10). Dejour et al. (11) classified genu recurvatum into three types: pure osseous deformity, most often resulting from damage to the growth zone of the tibial tubercle; chronic hyperextension caused by soft-tissue stretching; and a combined form involving both osseous and soft-tissue damage. In addition, the etiology may be idiopathic. Because of the diverse pathological and pathophysiological mechanisms underlying genu recurvatum, treatment strategies are also varied. Treatments include proximal tibial osteotomy (PTO) to correct bone alignment, surgery to tighten posterior ligaments, and nonoperative methods such as muscle strengthening, orthotics, or gait correction (11).

For this study, we performed a literature review using PubMed and selected a systematic review addressing therapeutic options for symptomatic genu recurvatum (12). The review identified six studies (a total of 80 patients) that met the inclusion criteria, which focused on differences between preoperative and postoperative posterior tibial tilt, range of motion, and postoperative outcome scores, including the scoring system described by Lecuire et al. (13). The most frequently reported causes of symptomatic genu recurvatum were prolonged immobilization, epiphyseal growth arrest associated with fracture, idiopathic epiphyseal growth arrest, soft tissue laxity, and idiopathic bone deformity. Five of the six studies described operative treatment, most commonly anterior opening-wedge PTO for deformity correction (2,3,4,14,15).

This study presents a case of symptomatic unilateral genu recurvatum. It illustrates surgical management with an anterior opening-wedge proximal tibial osteotomy, highlighting restoration of posterior tibial slope and functional recovery.

## CASE REPORT

A 32-year-old male patient complained of instability and pain during high-intensity activities, with symptoms progressively worsening over the past three years, without known trauma. Clinical examination revealed independent ambulation with a limp on the left side, full range



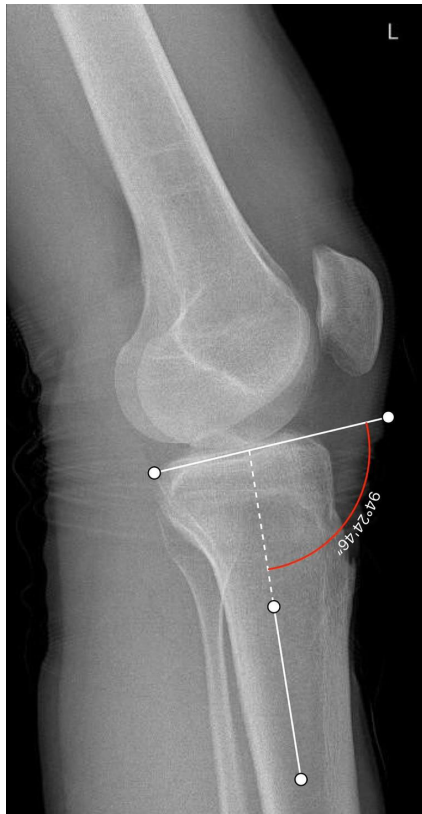
**Figure 1.** Preoperative image of the patient's left knee in full extension, demonstrating  $15^\circ$  recurvatum deformity (supine position)

of motion, ligamentous stability, and hyperextension of  $+15^\circ$  during gait (Figures 1 and 2). The skin was intact, without pathological changes, and the distal neurovascular status was normal. Radiographic evaluation demonstrated a posterior tibial slope of  $-4.24^\circ$  (Figure 3). The diagnosis was made according to ICD code: M218 – Deformationes extremitatum acquisitae aliae, specificatae genu recurvatum sinistri.



**Figure 2.** Preoperative images of the patient's left knee in full extension, demonstrating  $15^\circ$  recurvatum deformity (standing position)

The treatment plan included arthroscopy, corrective osteotomy of the proximal tibia, and fixation with a Tomofix plate (Synthes®). Under regional spinal anesthesia and analgo-sedation, after proper positioning and preparation of the operative field, the left knee joint was approached through standard arthroscopic portals. A longitudinal incision was made on the anterior aspect of



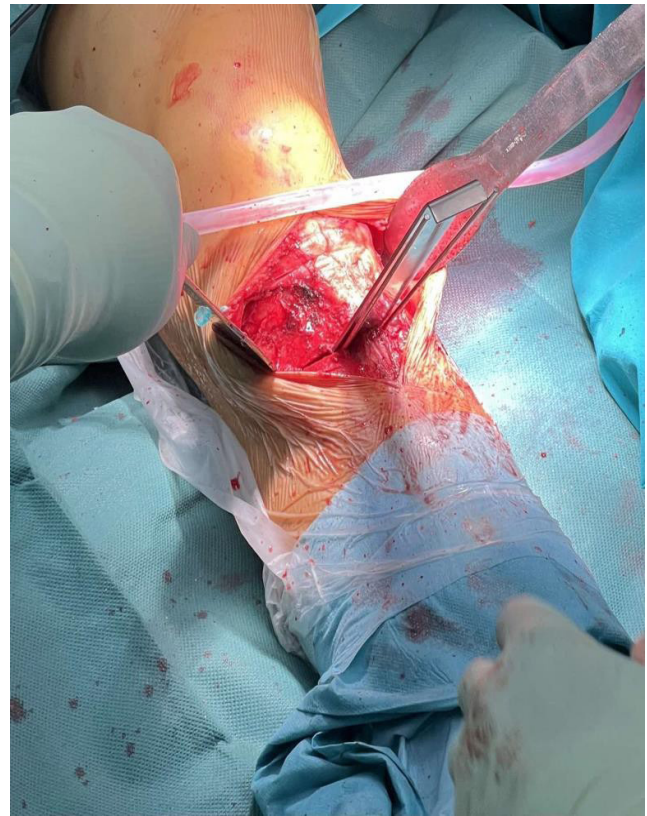
**Figure 3.** Lateral radiograph of the left knee demonstrating posterior tibial slope (PTS) measuring 94.24°.

the proximal tibia. After dissection of the skin and subcutaneous tissues, the bone was exposed. Two K-wires were placed 5 mm below the tibial tuberosity, angled upward and posteriorly to guide the planned osteotomy. Using the pins as a guide, an osteotomy of the proximal tibia was performed (**Figure 4**). The preplanned wedge was opened using osteotomes, and the gap was filled with an allograft from the bone bank. A Tomofix plate with supporting screws was then placed anteromedially (**Figure 5**). Intraoperative X-ray confirmed proper alignment and correction. The wound was cleaned and closed in layers. After adequate analgesia and pain reduction, range-of-motion exercises were initiated in the hospital. The patient was mobilized with assistive devices, without weight-bearing on the operated leg, for six weeks.

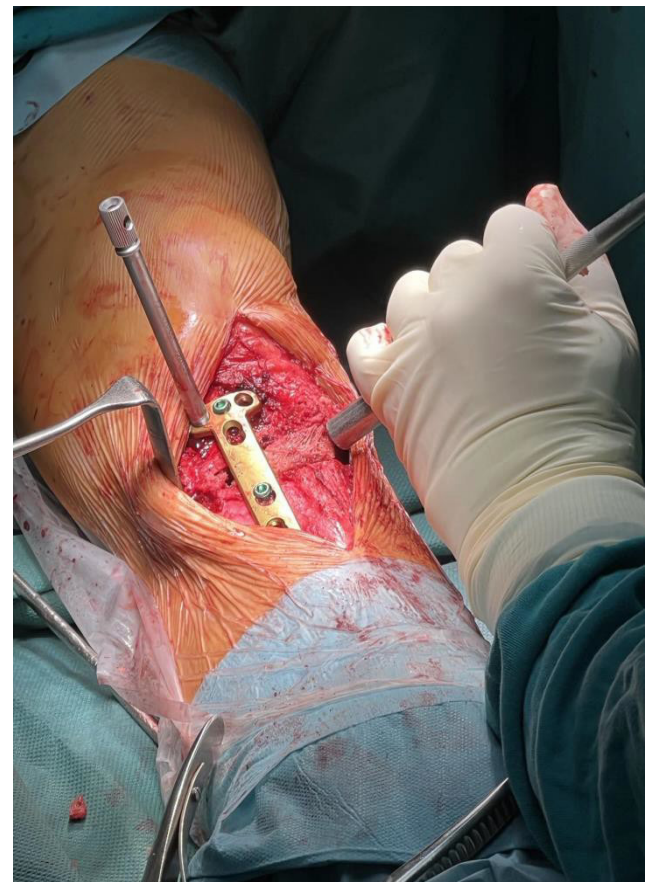
Bone union was achieved after three months. At the 4.5-month follow-up, the patient walked independently without complaints. The range of motion was normal, and radiographic evaluation confirmed restoration of the posterior tibial slope to approximately +10°, eliminating hyperextension and improving knee stability (**Figures 6 and 7**). Functional recovery was complete, with no residual pain or limitations in daily activities.

## DISCUSSION

Unilateral genu recurvatum is uncommon and often associated with significant functional impairment. Surgical correction is indicated when symptoms persist despite



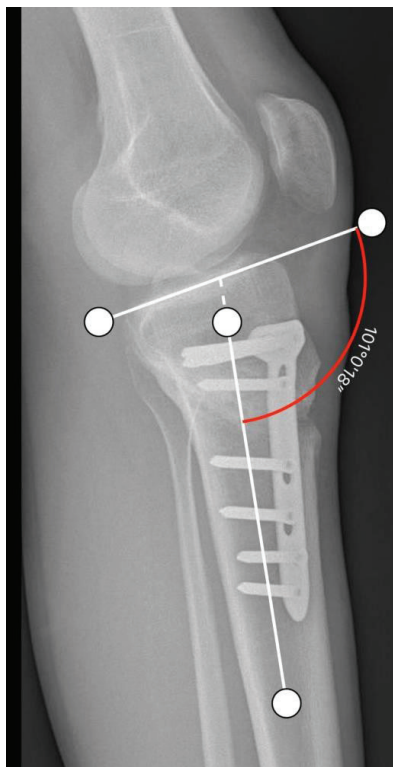
**Figure 4.** Intraoperative placement of two K-wires positioned 5 mm distal to the tibial tuberosity, marking the osteotomy site on the tibia.



**Figure 5.** Intraoperative fixation with the TomoFix® plate (Synthes®) and filling of the osteotomy gap using bone allograft from the bone bank.



**Figure 6.** Postoperative images showing the corrected alignment and position of the left knee (frontal and lateral position)



**Figure 7.** Postoperative X-ray demonstrating an increased posterior tibial slope of 101°.

conservative treatment (11,12). Our case confirms that anterior opening-wedge PTO effectively restores anatomical alignment and resolves symptoms. Literature reports success rates exceeding 80%, although no standardized technique exists, and the choice of procedure should be individualized (14-18). Correction of the posterior tibial slope is a key objective, as its anterior displacement represents the primary biomechanical factor contributing to recurvatum (17).

## CONCLUSION

Corrective proximal tibial osteotomy is a reliable method for treating symptomatic genu recurvatum, particularly in cases with significant anterior tibial slope displacement (16, 17). Restoration of anatomical alignment leads to excellent functional outcomes and symptom resolution.

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**Ethical approval:** The publication of this case report was reviewed and approved by the Ethics Committee of the Institute of Orthopedics “Banjica”, Belgrade, approval number 8/87/25 (date July 18, 2025).

**Informed consent:** Written informed consent has been obtained from the patient to publish this paper, including all accompanying medical information and images.

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## UNILATERALNI REKURVATUM KOLENA: PRIKAZ SLUČAJA

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### Sažetak

**Uvod:** Genu recurvatum predstavlja deformitet kolena karakterisan hiperekstenzijom, nestabilnošću pri hodu i bolom. U rutinskoj ortopedskoj praksi se retko sreće, a podaci o optimalnim terapijskim strategijama su ograničeni. U prikazanom slučaju odsustvo traumatskog uzroka, pridružena varus malalignacija i jednostrana prezentacija dodatno su povećali kompleksnost deformiteta, uz progresivno pogoršanje tokom trogodišnjeg perioda praćenja. Cilj ovog rada je prikaz retkog slučaja jednostranog genu recurvatuma nepoznate etiologije lečenog korektivnom osteotomijom proksimalne tibije uz korekciju posteriornog tibijalnog nagiba, kao i prikaz postoperativnih rezultata uz kratak pregled literature.

**Prikaz slučaja:** Prikazan je slučaj 32-godišnjeg pacijenta sa jednostranim genu recurvatum deformitetom i očuvanim zadnjim ukrštenim ligamentom (PCL), što je

potvrđeno magnetnom rezonancom i artroskopijom. Preoperativno planiranje zasnovano je na MSCT analizi. Izvedena je otvorena klinasta korektivna osteotomija proksimalne tibije uz fiksaciju pločom. Pod kontrolom C-arm fluoroskopije postignuta je planirana korekcija i željeni posteriorni tibijalni nagib. Posteriorni tibijalni nagib povećan je sa 94° na 101°, čime je postignuta stabilizacija kolena i korekcija deformiteta.

**Zaključak:** Korektivna osteotomija proksimalne tibije uz korekciju posteriornog nagiba predstavlja efikasnu terapijsku opciju u lečenju jednostranog genu recurvatuma nepoznate etiologije. Ova tehnika omogućava pouzdanu korekciju mehaničke osovine, stabilizaciju zgloba i povoljne kliničke rezultate uz relativno brz postoperativni oporavak.

**Ključne reči:** genu recurvatum, korektivna osteotomija, posteriorni tibijalni nagib

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