

Treatment of Genu Valgum in Children By Means of Temporary Hemiepiphyodesis using Tension Band Plates

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Abstract

Introduction: Idiopathic genu Valgum is a frequently diagnosed growth disorder in adolescence. When the of conservative therapy fails, leg straightening by means of hemiepiphyodesis is used we aimed to analyse the result.

Methods: Between July 2017and July 2019, 12 recon - Plates were implanted near the knee in children sufferingfrom genu Valgum to modulate growth.

Results: The median follow-up period was about 30 months The median age at implantation was 11.5. Of the 12patients, 5 were girls. The recon-Plates remained in place for a median period of 12 months. Irrespective of the location of hemiepiphyodesis, the intermalleolar distance was corrected to a median of 1.1 cm while the anatomical femorotibial angle was corrected by on average 9°. Mechanical lateral distal femoral angle changed an average 8 +/- 1.5 degrees. Medial proximal tibial angle changed an average 5 +/- 1 degree

Conclusion: Temporary hemiepiphyodesis using recon-Plates is an easy and effective procedure used to treat genu valgum.it affects by modulating growth. Slight overcorrection is desirable due to the rebound phenomenon, especially in young patients with high growth potential

Keywords: Hemiepiphyodesis, tension band plate, eight plate, recon-plate, Genu valgum, Growth modulation

Introduction

genu valgum is a frequently diagnosed growth disorder in adolescence; also called as knock –knee it consists of medial angulation of knee and outward deviation of the longitudinal axis of both tibia and the femur⁽¹⁾ . Pathologic genu valgum refers to the pathologic condition of persistent or worsening genu valgum in a patient older than 7 years of age. This needs to be differentiated from physiologic valgus, which is normal during early childhood growth and generally resolves by age 7^(3,4,5,6,7)

While valgus deformity can arise from the distal femur or the proximal tibia, it is most often primarily from the femur and is associated with external rotation of the distal end and Varus deformity of the tibia⁽¹⁾.

In advanced cases, the distal end of the femur and tibia are rotated externally by the pull of the biceps femoris and the tensor fascia femoris, and the distal shaft of the tibia develops a compensatory internal rotation⁽¹⁾.

Besides deformity, knee pain is the most common patient complaint. When the conservative therapy fails, leg straightening by means of hemiepiphysiodesis is used we aimed to analyse the result.

Methodology

Between July 2017 and July 2019, 12 tension band Plates were implanted near the knee in children suffering from genu Valgum to modulate growth

An AP standing long-length film (bilateral hips to ankles) was taken when clinical examination was consistent with pathologic genu Valgum. It allowed for assessment of the mechanical axis and joint deviation.

Tibiofemoral angle (angle formed between longitudinal axes of the tibial and femoral shafts) >15 degree after 7 years of age Or intermalleolar distance > 8 cm was taken as genu Valgum. We determined whether the deformity originated from the femur or tibia.

The mL DFA (mechanical lateral distal femoral angle) is the lateral angle between lines from the center of the femoral head to the center of the tibia spines versus a line along the distal femoral condyles.

The MPTA (medial proximal tibial angle) is the medial angle between lines from the center of the tibia spines to the center of the ankle mortise versus a line along the tibial plateau. Both angles are considered normal at 87° , and are definitively abnormal if they fall outside of the normative ranges of 85 to 90 degrees⁽⁸⁾.

Hemiepiphysiodesis is used in skeletally immature children in girls best done between the ages of 8-11 years and in boys between 8-13 years⁽¹⁾. Fixation can be placed on the distal femur, proximal tibia, or both depending on the location of deformity and expected growth time remaining.

Close follow-up every 3-4 months after hemiepiphysiodesis fixation placement was done to monitor for abnormal angular or rotational correction as well as overcorrection. Fixation removal within 24 months is sometimes recommended to prevent permanent physal growth arrest slight overcorrection before removal of fixation was done in children who begin hemiepiphysiodesis treatment before the age of 10 due to the risk of rebound medial overgrowth and loss of correction.

Surgical steps

Patient position: Patient is place supine with affected knee flexed so that the hamstrings are relaxed and fall posteriorly.

Perform the skin incision

- Make the skin incision along the anterior surface of the medial intermuscular septum to the lineaaspera and proximally till adductor tubercle.

Deepen the skin incision with sharp dissection and divide the fascia

- At the distal femur, divide the fascia of the vastusmedialis in line with its fibers, the medial genicular vessels are retracted and the growth plate is exposed. we don't disturb periosteum underneath since this may disturb the physis and cause growth arrest/physal bar formation

Positioning of the Plate

Place needle for centering the plate

- Insert a needle (keith or hypodermic) or small guidepin into the physis

Check the position with fluoroscopy in both AP and lateral planes

- Ideally the position of the needle should be at or slightly posterior to the midsagittal plane if pin is anterior to the midsagittal plane it may create recurvatum with growth

Insert guidepins

- insert the epiphyseal guide pin first as there is less room for this trajectory
- then insert the metaphyseal guide pin

After confirming guidepin position, predrill using a cannulated drill (3.2mm in most systems) to about 5mm drilling further than this may decrease screw purchase or displace guidepin

Insert screws

- insert a 4.5 mm cannulated screw over each guide pin

Wound Closure

Dressings and immobilization

- Occlusive dressings Close follow-up every 3-4 months after hemiepiphyseal fixation placement was done to monitor for abnormal angular or rotational correction as well as overcorrection. Fixation removal within 24 months was done to prevent permanent physeal growth arrest

Results

The median follow-up period was about 30 months The median age at implantation was 11.5. Of the 12 patients, 5 were girls. The Plates remained in place for a median period of 12 months. Irrespective of the location of hemiepiphyseal, the intermalleolar distance was corrected to a median of 1.1 cm while the anatomical femorotibial angle was corrected by on average 9degree .Mechanical lateral distal femoral

angle changed an average 8 +/- 1.5 degrees. Medial proximal tibial angle changed an average 5 +/- 1 degree

Discussion

Our study showed good to excellent result following treatment of genu valgum by temporary hemiepiphyseal using tension band plate. Anatomical femorotibial angle was corrected by on average 9degree .Mechanical lateral distal femoral angle changed an average 8 +/- 1.5 degrees. Medial proximal tibial angle changed an average 5 +/- 1 degrees .our results are comparable to that in literature, In 1993, Phemister et al.⁽¹⁰⁾ introduced epiphysiodesis as a therapy for knee angular deformity .

This arresting the growth on one side of the epiphyseal plate, but not on the other hence resulted in correction of deformity, however this was permanent procedure hence timing of surgery was important.

Bowen et al.⁽¹¹⁾ introduced percutaneous epiphysiodesis under fluoroscopic guidance to correct the deformity. This is a lesser invasive surgery. However, it was also permanent, so the timing of the operation was very important here as well. Under correction or overcorrection is a common problem using these techniques.

Stainless steel U-shaped epiphyseal nails designed by Blount ⁽¹²⁾ limited the growth of specific area temporarily and reserved the growth potential. After implant removal the epiphyseal plate showed growth.

This surgery was named temporary hemiepiphyseal. Compared with permanent epiphysiodesis, it did not require a strict operation time and could be used repeatedly.

In 2007, Stevens et al. reported that an improved 8-plate replacing traditional U-shaped epiphyseal nails.

We found this procedure to be simple, takes less time to perform ,less bleeding , early weight bearing and we did not come across any case of infection or hardware irritation .

Conclusion

Temporary hemiepiphysiodesis using tension band Plates is an easy and effective procedure used to treat genu Valgum. It affects by modulating growth. Slight overcorrection is desirable due to the rebound phenomenon, especially in young patients with high growth potential

Legend Figure



Figure 1: Pre op clinical picture



Figure 2: Pre op x ray



Figure 3: Post op x ray

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