National Journal of Clinical Orthopaedics

ISSN (P): 2521-3466
ISSN (E): 2521-3474

www.orthoresearchjournal.com
2021; 5(4): 104-106
Received: 22-05-2021
Accepted: 03-07-2021

Dr. Deepak Singh Rajput
Assistant Professor, Department of Orthopaedics, M.G.M. Medical College, Indore, Madhya Pradesh, India

Dr. Ankur Bansal
Resident, Department of Orthopaedics, M.G.M. Medical College, Indore, Madhya Pradesh, India

Dr. Kumar Rahul
Senior Resident, Department of Orthopaedics, M.G.M. Medical College, Indore, Madhya Pradesh, India

Corresponding Author:
Dr. Ankur Bansal
Resident, Department of Orthopaedics, M.G.M. Medical College, Indore, Madhya Pradesh, India

Functional outcome of temporary hemiepiphysiodesis by using 8 plate in patients with genu valgum deformity

Dr. Deepak Singh Rajput, Dr. Ankur Bansal and Dr. Kumar Rahul

DOI: https://doi.org/10.33545/orthor.2021.v5.i4b.335

Abstract
Background: Idiopathic genu valgum is one of the common deformity encountered in OPD of orthopaedics. After a fair conservative trail to treat the deformity fails, temporary epiphysiodesis become the standard treatment. This deformity can also be treated with several types of osteotomies with additional risk of extensive soft tissue handling, infection, delayed union, non-union, malunion etc. various method of temporary epiphysiodesis are present but most of them are on the principle of compression such as stapling, transphyseal screws fixation etc. On the other hand 8 plate, works on the principle of tension band. Hereby the aim of this study is to see the functional outcome and complications related to 8 plate generated growth modulation.
Method: Study design was prospective and interventional, between June 2018 to May 2020.Eight plate was implanted on 16 patients aged between 6 years to 15 years suffering from genu valgum deformity. Plate was implanted over distal femur medially. Patients were evaluated pre-operatively and post-operatively by determining various joint angles both clinically and radiologically. Following are the various joint angles evaluated:
1. Tibio femoral angle
2. Medial proximal tibial angle
3. Lateral distal femoral angle
4. Mechanical axis zone

All these paraments were recorded in each follow up and data collected was analyzed statistically.
Result: 16 patients were included in the study with a median follow up of 16 months. Out of 16 patients operated 6 were females. A mean pre-operative and post-operative tibio femoral axis were recorded. We observed a p-value of 0.001 which is statistically significant.
Conclusion: Growth modulation using 8 plate method proves to be an effective method for correcting genu valgum deformity in skeletally immature patients. It is a reversible procedure and surgeon friendly and at the same time 8 plate adjust dynamically to the ever changing physeal anatomy.

Keywords: Septic arthritis, hip joint, children

Introduction
Method of hemi-epiphysiodesis was first introduced by Blount and Clarke in 1949. Since then this has become the gold standard treatment for treating angular deformity around knee. This also serves as superior alternative to osteotomies which comes with a bag full of complications. Various techniques for epiphysiodesis involving screws, staples and wires have been but association of various complications such as material fractures and implant loosening as well as damage to growth plates have frequently been reported [1]. The eight plate was introduced Dr. Peter M Stevens involving application of an extra-periosteal tension bend to a given physis. The divergence of 45 degree reduces the chances of screw bending and breakage.

Aim and Objectives
1. To assess outcome of genu valgum deformity correction by using 8 plate in skeletally immature patients.
2. To assess related complications associated with the technique.

Methods
The study was carried out in the Department of Orthopaedics& Traumatology, Mahatma Gandhi memorial medical college and Maharaja Yashwantrao Hospital, Indore.

The study was prospective in design and of interventional type that included cases that underwent temporary hemi-epiphysiodesis using 8 plate for genu valgum deformity from June 2018 to May 2020.

Patients who fulfilled all inclusion criteria were subjected to complete clinical and radiological examination and investigations. Full length scanograms were taken from pelvis down to the ankle joint with patella facing outward in standing position. Other associated deformity were ruled out. Flexion test was performed to see whether the deformity was present in tibia or femur. Clinical photographs of patients were taken.

Under general anesthesia, incision of 2-3 cm was taken centering over physis as confirmed on C-arm. K wire of 1.2 mm was passed through physis taking care of not to damage the same. 2 whole 4.5 mm titanium eight plate was then placed extraperiosteally and guide wires were passed through plate holes into metaphyseal and epiphyseal region avoiding damage to physis. 3.2 mm drill bit used to drill through guide wires and then 4.5 mm fully threaded self tapping screws fixed. Placement of plate and screws were checked on C-arm in AP and lateral views and incision closed with nonabsorbable sutures.

Definitions [2]

Mechanical axis of the lower extremity (MA-LE)

A line drawn from centre of femoral head, passing through center of patella till the center of ankle joint is referred to as mechanical axis of the lower extremity (Figure 1). When this line passes medially to canter of patella, varus deformity is said to exist while when it passes laterally to patella, valgus deformity is said to exist.

Femoral Shaft Axis

Line drawn from the center of the proximal femur to the center of the distal femur or center of the knee (Figure 1).

Mechanical axis of the femur

Line drawn from center of femoral head till the center of distal femur.

Tibial shaft axis (TShA) and mechanical axis of the tibia (MAT)

Corresponds to the line extending from center of proximal tibia to center of ankle.

Tibio femoral angle

It is defined as angle between anatomical axis of femur and anatomical axis of tibia. It indicates extent of mechanical misalignment/ deformity.

Medial Proximal Tibial Angle

The proximal tibia has 3 degrees of varus relative to its shaft; consequently, the medial proximal tibial angle (MPTA) is 87 degrees (Figure 1) [3].

Lateral Distal Femoral Angle

The distal femur normally has about 6 degrees of anatomic valgus relative to its shaft, expressed as a lateral distal femoral angle (LDFA) of 84 degrees (Figure 1) [3].

The Mechanical Axis Zones

When we divide knee into quadrants, ideally mechanical axis would bisect the joint (0) with medial (-1) and lateral (+1) being within physiological range. Any deviation from these parameter would manifest as deformity around knee.

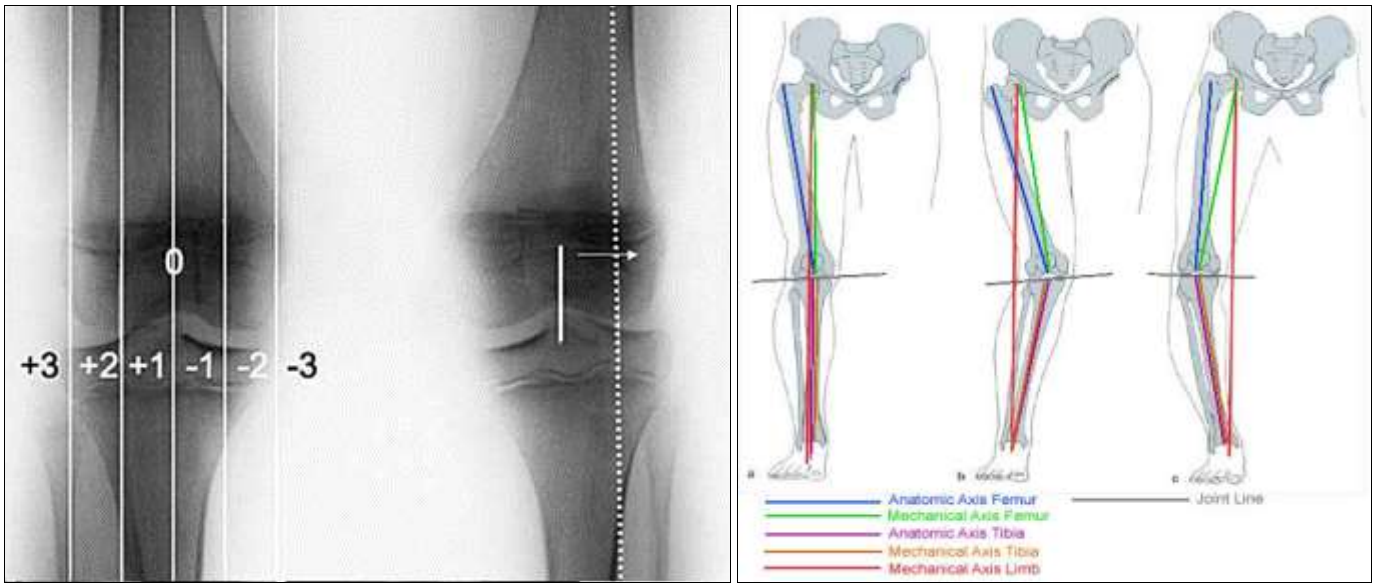

Fig 1: Lateral Distal Femoral Angle

Surgical implants

1. 8 plate (2 hole non locking titanium plate) of various sizes
2. 4.5 mm fully & partially threaded screws of different sizes
3. 3.2 mm cannulated drill bit
4. 1.2 mm K wire and guide wire

Post operative care

On post operative day 1, knee range of motion started and was discharged after satisfactory physiotherapy. Patient was followed up on 2 weeks for suture removal with full return to activity by 3-4 weeks. Then patients were followed up every 3 months and full length AP and lateral view X-rays were taken and parameters recorded.

Follow up

A minimum of 6 months follow up was done for the patients. Radiographs were taken and various parameters evaluated. Implant removal was done when no visible deformity can be seen and mechanical axis was corrected to zone 1 and in some cases over correction done to compensate any rebound deformity.

Inclusion criteria
1. Age group 6-15 years
2. Genu valgum deformity due to any of the following cause (idiopathic, post traumatic, post-infective, disorders affecting growth plate such as rickets, epiphyseal dysplasia etc.)

Exclusion criteria
1. Cerebral palsy
2. Physiological genu valgum: follow-up evaluation at 6-month intervals

Results

A total of 16knees were included in the study (N=16) of which 6 were females and 10 were males. Average age of surgery was 9.9 years with the youngest being 6 years and oldest being 15 years. Etiology of majority of the cases was idiopathic (10 patients). There were 06 cases of nutritional rickets. The mean pre-operative TFA was 17.56° (range: 10° to 32°). Rate of correction in completely corrected deformity was 1.5°/month with the highest being 2.83°/month and least being 0.67°/month. 4 patients showed overcorrection. 1 patient showed superficial infection. The mean follow up was 16 months. A paired t-test was applied to compare the pre-operative tibiofemoral angles and the tibiofemoral angle at the end of deformity correction.

Fig 2: 9 year/male, Preoperative clinic-radiological images, Same child showing full deformity correction

Discussion

In our study the mean age group of the patients was 9.9 years ranging from 6 years to 15 years.

Our study showed male preponderance with male comprising of 62.5% (N=10) while female consist 37.5% (N=6).

In the present study, we observed a statistically significant improvement (p-value= <0.001) in TFA from a pre-operative value of 17.56 to 6.19.

In accordance with our study, Sakti Prasad Das *et al.* observed an improvement in the mean pre-operative TFA from 17° to 9.56°. Similar study conducted by Ruta M Kulkarni *et al.*, mean pre-operative TFA was 19.89° which improved to 5.72° [2].

Table 1: The mean pre-operative TFA

	Pre operative TFA	TFA when correction was achieved
Sakti prasad *et al.* [4]	17°	9.56^0
Ruta M Kulkarni [2]	19.89°	5.72^0
Guzman *et al.* [5]	11.2°	6°
Boero *et al.* [6]	22^0	15°
Raju Vaishya *et al.* [7]	22.02°	6.14°
Present study	17.56°	6.19°

In study conducted by Guzman *et al.* pre-operative tibiofemoral angle calculated was 11.2° which improved to 6°. Similarly, studies conducted by Boero *et al.* and Raju Vaishya observed correction of 15 and 6.14, respectively from pre-operative values of 22 and 22.02, respectively.

Mean correction time was observed to be 16 months (range 11months to 26 months) after which implant was removed.

One case reported superficial infection (6.25%). There were 4 cases (25%) of overcorrection, which gradually corrected over time.

Conclusion

8 plate hemi-epiphysiodesis prove to be an effective method of growth modulation with least associated complications for skeletally immature patients. It is less invasive and leaves no permanent bone damage. It dynamically adapts to the changing anatomy of physis without going into failure. It also eliminates the need of corrective osteotomy. However as with all the new techniques, it too need more studies and refinement.

References

1. Zajonz D, Schumann E, Wojan M, Kübler FB, Josten C, Bühligen U, *et al.* Treatment of genu valgum in children by means of temporary hemiepiphysiodesis using eight-plates: short-term findings. BMC musculoskeletal disorders 2017;18(1):456.
2. Kulkarni RM, Rushnaiwala FM, Kulkarni GS, *et al.* Correction of coronal plane deformities around the knee using a tension band plate in children younger than 10 years. Indian J Orthop 2015;49(2):208-218.
3. Ajmera A, *et al.* Outcome of growth modulation using the tension band principle of 8 plate for paediatric genu valgum deformity. Jour of evidence based medicine and healthcare 2019;6(15):1198-1202.
4. Das SP, Pradhan S, Sahoo PK, *et al.* Our experience with correction of angular deformities of knee by flexible figure of 8-plate hemiepiphysiodesis. IJPMR 2012;23(2):68-73.
5. Guzman H, Yaszay B, Scott VP, *et al.* Early experience with medial femoral tension band plating in idiopathic genu valgum. J Child Orthop 2011;5(1):11-17.
6. Boero S, Michelis MB, Riganti S. Use of the eight-plate for angular correction of knee deformities due to idiopathic and pathologic physis: initiating treatment according to etiology. J Child Orthop 2011;5(3):209-216.
7. Raju Vaishya, *et al.* growth modulation by hemiepiphysiodesis using 8 plate in genu valgum in paediatric population. Journal of clinical orthopaedics and trauma 2018;9(4):327-333.