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MEDIAL CLOSING WEDGE DISTAL FEMORAL OSTEOTOMY WITH INTERNAL FIXATION USING SINGLE K WIRE FOR GENU VALGUM IN CHILDREN & ADOLESCENTS.

Orthopedics

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ABSTRACT

Objectives: Among various options available for correction of genu-valgum deformity, medial closing wedge osteotomy distal femoral is commonly used but rarely fixed using K wires.

Material and methods: Patients of age between 8 and 15 years, with a standing radiological tibiofemoral angle ≥15° and intermalleolar distance of > 10 cm. Correction was done using medial closing wedge osteotomy technique and was stabilized by single Kirschner wire. Functional outcome was assessed using Bostman et al. score.

Results: Twenty four cases out of 27 limbs had excellent outcome, two patients had good functional outcome and one of the patients had an unsatisfactory knee score < 20.

Conclusion: Distal femoral medial closing wedge osteotomy and fixation with single K wire is a viable option for the correction of genu valgum in children and adolescents.

KEYWORDS

Genu valgum, medial closing wedge osteotomy, K wire

INTRODUCTION

Genu valgum is a common deformity seen in late childhood. Nutritional rickets is the leading cause of these deformities in developing countries. The deformity may originate from the distal femur, proximal tibia, or knee joint *(7,8,15)* however, genu valgum usually originates from the distal femur that may be confirmed by various angle measurements on standing radiographs of both lower limbs including hips, knees, and ankles (*15*). When the valgus deformity is significant, it needs to be corrected surgically*(9)*. Various types of corrective osteotomies of the distal femur have been described in the literature as: lateral opening wedge, medial closing wedge, dome osteotomy & wedge-less 'V'osteotomy.*(2,5,13,16)* The options listed has shortcomings such as prolonged immobilization, use of bulky, and costly implants violating a potentially viable physeal plate and risk of knee stiffness.*(2,5)* A closing-wedge osteotomy negates the need for bone grafting. Fixation of medial closing wedge osteotomy using locking plates in children and adolescents usually interfere with physeal growth while using K wires to fix the closed wedge, provides a window for further correction if required. Moreover non threaded K wires if removed early, usually do not hamper physeal growth and allow ease of implant removal. *(11)*

We here in describe our experience with this relatively well known osteotomy but less used implant for correction of genu valgum deformities in children and adoloscents.

MATERIAL AND METHODS

The study was prospectively conducted at NSCB Medical College, Jabalpur and included 15 patients of age group 8-15 years. Twelve of them had bilateral deformity, 3 unilateral (in total 27 limbs). All the patients were selected from the outpatient department of the institute considering the inclusion criteria. The patients with genu valgum deformity having a tibiofemoral angle of >15° and an intermalleolar distance of >10 cm were considered for inclusion in the study. Patients who had severe collateral ligament instability, unstable knee with evidence of subluxation, and sagittal plane deformity (fixed flexion deformity or genu recurvatum) were excluded. Patients with active underlying disorder first underwent medical management prior to surgery. Patients underwent deformity correction by a distal femoral medial closed wedge osteotomy and fixed with single K wire. The deformity assessment was done clinically *(Fig 1a & 1b)* and radiologically. Clinically, the intermalleolar distance was measured in a standing position with both patella facing forward.

Standing anteroposterior and lateral radiographs of the affected limb were taken including the hip, knee and ankle joint *(Fig. 2)*. The radiological tibiofemoral angle was measured as the angle formed between the anatomical axis of tibia and femur. The mechanical axis of the lower limb was defined as the line drawn from the centre of the femoral head to the centre of the ankle. The distance between the mechanical axis line and the centre of the knee in the frontal plane was calculated as the mechanical axis deviation (MAD). The lateral distal-femoral angle (LDFA) was calculated as the angle between the mechanical axis of the femur and the articular surface of the distal femur.

Fig 1(a) bilateral genu valgum deformity

Fig 1(b) unilateral genu valgum deformity

Fig -2 Standing anteroposterior radiograph of both limbs

SURGICAL TECHNIQUE

The operation is performed under anaesthesia (general/ spinal) with the patient supine on a radiolucent operating table under tourniquet control. The knee is flexed to 60° during the surgery to avoid pressure in the popliteal area by keeping a large bolster under it. During draping, care is taken to expose the ankle so that the centre of the ankle could be determined easily.

A medial longitudinal skin incision approximately 8-10 cm long is made extending from the level of the medial joint line to 5 cm above the adductor tubercle. Kirschner wires (K-wires) are used to mark the osteotomy cut both proximally and distally to allow for an appropriate wedge to be resected. The initial 2 wires are placed anteriorly and posteriorly to establish the inferior wedge of the osteotomy. Care should be taken to obtain a perfect antero-posterior fluoroscopic view of the distal femur to ensure that angular mal-alignment is not created. Once the desired wedge size is confirmed, a second pair of wires is placed in a convergent fashion, thus establishing the proximal margin of the wedge. The calculated wedge size should be equal to the distance between the 2 sets of wires. The saw is used to create both medial-to-lateral cuts under fluoroscopic guidance; the osteotomy is first performed only on the medial cortex using an oscillating saw. The osteotomy is then completed with a thin osteotome. It decreases the risk of heat necrosis and helps in thinning the lateral cortex without undue periosteal disruption. A gentle valgus thrust is applied to break the lateral cortex gently. After the osteotomy is completed, the knee is extended and the deformity is corrected with the application of a gentle manual varus force. The alignment of the leg is repeatedly checked in extension to obtain the final alignment of about 5 to 7 degrees of valgus. The osteotomy is then stabilized further by internal fixation with a single K wire directed laterally *(Fig 3).* Stability of the osteotomy in flexion and extension is checked on the table after correction of the deformity. Tourniquet is released and haemostasis achieved. A suction drain is inserted and the wound is closed in layers. A high above knee slab is applied from groin to ankle to immobilise the knee joint for 2 weeks followed by above knee cast application for next 6 weeks after suture removal.

POST-OPERATIVE CARE AND FOLLOW UP

The drain is removed at 24-48 hours after surgery & sutures at 2 weeks. The patients are kept non-weight bearing for 6 weeks to be followed by partial weight bearing with 2 crutches as tolerated. After removal of the cast, active assisted exercises are started. The patient is allowed full weight bearing after 8-12 weeks. Patients were reviewed at 2 weekly intervals. Standing radiographs both AP and lateral views were taken in the immediate post-operative period and at 4 weekly intervals. The patients were evaluated clinically *(Fig. 4)* and radiologically for the alignment and state of the union of the osteotomy and also evaluated for range of motion of the knee joint at each visit on OPD basis. Calcium and vitamin D supplementation was prescribed to each patient. The knee score as suggested by Bostman *et al* was used to assess the functional outcome (*3*). Patients with a score between 28 and 30 were classified as having excellent outcome. A score between 20 and 27 was good and a score below 20 was classified as unsatisfactory.

Fig -3 Postoperative radiograph following ostotomy and K wire fixation

Fig -4 Clinical picture after correction of deformity

STATISTICALANALYSIS

The student's paired t-test was used to analyze the difference of means for values preoperatively and postoperatively to determine whether the results were statistically significant. P value of < 0.05 was considered significant.

RESULTS

Twenty seven limbs were operated in 15 patients consisted of 9 females and 6 males. The mean age of the patients in our study was 11 years (range 8 years to 15 years). Twelve patients had evidence of nutritional rickets/ osteomalacia, and rest three idiopathic. The average amount of blood loss was 100 ml (range, 50 ml - 150 ml). The mean duration of hospital stay was 5 days (range, 3 days - 7 days). The mean period of follow-up was 14.8 months (range, 11 months to 24 months). The mean pre-operative inter-malleolar distance was 12.8 cm (range, 10 cm - 17 cm) that improved to a mean post-operative value of 1.8 cm (range1 cm - 6 cm, p < 0.001). The mean tibio-femoral angle was 18.5^0 (range, 15^0 to 25^0) before surgery, that improved to a mean postoperative value of 6^o (range, 2^o to 10^o) (p < 0.001). The mean preoperative lateral distal femoral angle (LDFA) was 76.23^0 (range, 72^0 to 83^0 SD 2.907) that improved to a mean value of 88.13^0 (range, 87^0 to 91^0 SD 2.029) after surgery (p < 0.001).The mean mechanical axis deviation (MAD) was 19.56 mm (range, 9 mm to 31 mm and SD 6.625) before surgery that improved to a mean postoperative value of 3.7 mm (range 0 to 5 mm SD 3.875 p< 0.001).

Twenty four cases out of 27 (88.8%) had an excellent outcome with a knee score ≥ 28, two patients had good functional outcome(7.4%) and had a knee score of less than 28 and one of the patients had an unsatisfactory knee score < 20 (3.7%). One case had a wound infection that required implant removal at 4 weeks. None of the cases had other complications like knee stiffness, recurrence of deformity, shortening, reversal of deformity or non-union of the osteotomy site.

DISCUSSION

Significant valgus deformity requires surgical intervention to improve the biomechanics, thus improving appearance, gait and function *(15).* We in our study have used medial closing wedge DFO with single K wire for fixation. Gupta *et al*. used this technique in adolescents and adults (age group; 15–23 years). They used buttress "L" plate to fix the osteotomy site and were able to achieve correction in all patients with 95.6% having an excellent functional outcome.*(10)* Similarly, Agarwal in his case series (age group, 12–16 years) used staples for fixation and achieved correction in all cases.*(1).* Our study group included a much younger age group (8–15 years) and used minimal implants (single K wire). In our series, 88.8% of cases had an excellent outcome, 7.4 % of patients had good functional outcome, whereas one of the patients had an unsatisfactory knee score. The distinct advantages of technique are: it is quick to perform with operating time <45 min. Simultaneous deformity correction can be performed in both limbs if desired, early union at osteotomy site, minor changes in alignment possible since fixation with Kirschner wires is non rigid, limited period of immobilization in above knee cast (6 weeks) and no second surgery under anesthesia for removal of implant.

CONCLUSION

Distal femoral medial closing wedge osteotomy with single K wire fixation is a relatively simple, low cost and viable deformity correction procedure. Simultaneous deformity correction in both limbs in single stage, minimum and cheaper implants, and faster recovery of knee range of motion make it a useful procedure for use in health-care facilities in developing countries like India. We advocate this technique for the correction of genu valgum deformity in children and adolescents with least interference in physeal growth.

REFERENCES

1. Agarwal S. Modified Aglietti procedure in supracondylar femoral osteotomy for correction of the post-rachitic valgus deformity of the knee in adolescents – A short case series. J Orthop 2013;10:196-9
2. Aglietti P, Stringa G, Buzzi R. Correction of valgus knee deformity with a supracondylar V osteotomy. Clin Orthop Relat Res 1987 ; 217 : 214-220.
3. Bostman, Yang Kh, Byun YS. Separate vertical wiring for fixation of communited fractures of the inferior pole of patella. J Bone Joint Surg Br 2003 ; 85 : 1150-1160.
4. Brinkman JM, hurscheler c, Agneskirchner Jd, Freiling D, Van- Heerwaarden . Axial and torsional stability of supracondylar femur osteotomies : biomechanical comparison of the stability of five different plate and osteotomy configurations. J Knee Surg Sports Traumatol Arthrosc 2010 ; 19 (4) : 579-587.
5. Dewilde Tr, Dauw J, Vandenneucker H, Bellemans J. Opening wedge distal femoral varus osteotomy using the Puddu plate and calcium phosphate bone cement. Knee Surg Sports Traumatol Arthrosc 2013 ; 21 (1) : 249-254.
6. Dietz FR, Weinstein SL. Spike osteotomy for angular deformities of the long bones in children. J Bone Joint Surg Am 1988 ; 70 : 848-852.
7. Espandar R, Mortazavi SM, Baghdadi T. Angular deformities of the lower limbs in children. Asian J Sports Med 2010 ; 1 (1) : 46-53.
8. Gautam VK, Maini L, Gupta R, Sabharwal A, Arora S. Flexion test in the coronal plane deformities of the knee. J Clin Orthop Trauma 2013 ; 4 : 115-118.
9. Gorji J. Genu valgum : treatment by osteotomy. Clin Orthop Relat Res 1971; 81 : 178-180.
10. Gupta V, Kamra G, Singh D, Pandey K, Arora S. Wedgeless 'V' shaped distal femoral osteotomy with internal fixation for genu valgum in adolescents and young adults. Acta Orthop Belg 2014;80:234-40
11. Healy WL, Anglen Jo, Wasilewski SA, Krackow KA. Distal femoral varus osteotomy. J Bone Joint Surg Am 1988 ; 70 (1) : 102-109.
12. Lin HP. Dome shaped osteotomy with external compression fixation in treatment of genu varum and valgum deformities. Zhonghua Wai Ke Za Zhi 1982 ; 20 (5) : 296-297.
13. Mcdermott AG, Finklestein JA, Farine I, Boynton EL, MacIntosh DL, Gross A. Distal femoral varus osteotomy for valgus deformity of the knee. J Bone Joint Surg Am 1988 ; 70 : 110-116.

14. Omidi-Kashani F, Hasankhani IG, Mazlumi M, Ebrahimzadeh Mh. Varus distal femoral osteotomy in young adults with valgus knee. J Orthop Surg Res 2009 ; 4 : 15.
15. Paley D, Tetsworth K. Mechanical axis deviation of the lower limbs. Preoperative planning of uniapical angular deformities of the tibia or femur. Clin Orthop Relat Res 1992 ; 280 : 48
16. Puddu G, Cipolla M, Cerullo G, Franco V, Gianni E. which osteotomy for a valgus knee Int Orthop 2010 ; 34 : 239-247.
17. Scheffer MM, Peterson HA. Opening-wedge osteotomy for angular deformities of long bones in children. J Bone Joint Surg Am 1994 :76 : 325-334.
18. Seah KT, Shafi R, Fragomen At, Rozbruch Sr. Distal femoral osteotomy : is internal fixation better than external Clin Orthop Relat Res 2011 ; 469 : 2003-2011.
19. Sharma L, Song J, Felson Dt, Cahue S, Shamiyeh e, Dunlop dd. the role of knee alignment in disease progression and functional decline in knee osteoarthritis. JAMA 2001 ; 286 : 188-195.
20. Smith DN, Harrison MH. the correction of angular deformities of long bones by osteotomy-osteoclasis. J Bone Joint Surg Br 1979 ; 61 : 410-414.