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Understanding Adolescent Idiopathic Genu Valgus: A Guide to Managing Knock Knees by Distal femur Closed Wedge Corrective Osteotomy

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Abstract

Genu valgum, also known as "knocked knees," is a coronal plane misalignment of knee characterized by inward bending of the knees. When individuals with genu valgum stand with their knees together, there is a noticeable gap of 3 inches or more between their ankles due to the pronounced inward curvature of the knees. This coronal plane deformity of knee joint is one of the commonest disorders presenting to orthopaedic clinic in adult patients with rheumatoid arthritis, however its prevalence in adolescent is rare. Paediatric age group presenting with bilateral genu valgum can be either physiologic or pathologic. While the physiological genu valgum typically starts around age 2 and becomes most prominent between ages 3 to 4, gradually stabilizing by age 7, pathological genu varum persists more than 10 years of age. In adolescents, minimal change back to normal alignment is expected. Pathologic genu valgum, on the other hand, may be associated with metabolic disorders (e.g., Rickets), local issues (infection, tumour growth, or trauma), idiopathic or other factors. Treatment options vary based on the cause and severity. Conservative approaches include exercise programs, NSAIDs, and orthotic insertions. Surgical interventions, such as osteotomy or guided growth surgery, may be necessary in severe cases. We here report a rare case of idiopathic bilateral genu valgus deformity presented with progressive valgus deformity of both knees. Since the misalignment was more on the femoral side, corrective osteotomy was done in the distal femur to achieve proper mechanical alignment of the knee. This case report seeks to provide healthcare workers about this condition and the differential diagnosis and a detailed management.

Keywords: *Corrective Osteotomy, Genu Valgum, Idiopathic, Knee Deformity.*

Introduction

Adolescent idiopathic genu valgum, commonly known as knock knees, is a prevalent orthopedic condition affecting teenagers [1]. Characterized by an abnormal inward angulation of the knees, genu valgum can impact adolescents' mobility, self-esteem, and overall quality of life. While often considered a harmless condition, untreated genu valgum can lead to long-term complications, such as osteoarthritis, joint pain, and decreased athletic performance. Normally physiological genu valgum starts around age 2 and progresses between ages 3 to 4 to gradually stabilize by 7 years of age [2]. If the deformity progresses in adolescent age, then it is pathological. Genu valgus deformity presenting in late adolescent cannot be managed by hemiephiphysiodesis or physeal tethering [3]. Most commonly deformity occurs in distal femur. Corrective osteotomy remains the treatment of choice. Hence medial closed wedge distal femur osteotomy is used for correcting the mechanical axis. This article

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aims to provide an in-depth understanding of adolescent idiopathic genu valgus, its causes, symptoms, diagnosis, treatment options, and management strategies, empowering parents, caregivers, and healthcare professionals to support affected teenagers in achieving optimal bone health and well-being.

Case Report

An 18-year-old male presented with progressive deformity of both knees for the past 5yrs. No H/o trauma, no pain, swelling and restriction of movements. Clinical examination revealed bilateral valgus deformity in the knee which was measured and found as Right 40^0 & Left 35^0(Figure 1). Serum calcium and phosphate levels were normal. No history of multiple fragility fractures and normal serum parathyroid hormone (PTH) levels ruled out hyperparathyroidism bone disease.

A scanogram of both lower limbs was done to know the deviation of the mechanical axis and plan for corrective osteotomy (Figure 2).

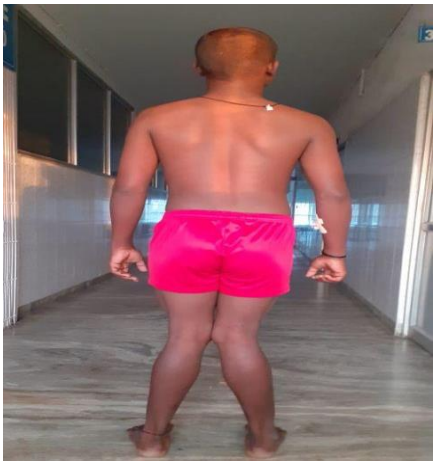

Figure 1. Preoperative Clinical Picture Showing Knock Knee

Figure 2. Preoperative Scanogram Showing B/L Genu Valgum

Surgical Procedure

Distal femoral varus osteotomy was planned for the patient.

This technique utilizes the medial closing wedge where the distal femur is approached medially.

The base of the wedge needed to achieve the correction was accurately measured and

osteotomized using bone saw as per the preoperative template.

The Osteotomy site stabilized using medial femoral locking plate. The post-operative period was uneventful. He was put to non-weight bearing/partial weight bearing gait for three weeks and gradually rehabilitated. Clinical and radiological follow up at six weeks post-op showed good correction of deformity along with healing at osteotomy site (Figure 3). Further follow up at 6 months and 1-year post-op was in line with the achieved correction and dint show any change in alignment (Figure 4).

Figure 3. Post-Operative Clinical Picture Showing Corrected Valgus Deformity

Figure 4. Follow-up X-Ray at 6 months post-op

Discussion

Adolescent patients presenting with both knee valgus can be due to varying reasons, but most commonly due to excessive parathyroid hormone secretion as a result of parathyroid tumours like adenoma [4]. Our patient presented with bilateral genu valgum without any metabolic or skeletal condition and was diagnosed as adolescent idiopathic genu valgum. Very few cases have been reported in this regard. Studies have shown that obesity can be an added factor in adolescents who present with genu valgum [5]. Our patient was within the normal BMI range and didn't have overweight as a risk factor for genuvalgum.

Literature review showed that it has been investigated about limb alignment changes in adolescent idiopathic genu valgum. Knee valgus in children which is physiological

gradually reduces by 10 years of age. The valgus malalignment in older children is much on the distal femoral side than the tibia and joint line as it is in younger children. Their findings suggest that patients should have their limb alignment closely monitored until it stabilizes, usually around the age of ten. Only then can corrective surgery be carefully planned and carried out, taking into account the patient's changing bone alignment [6]. Since our patient presented in late adolescence at skeletal maturity, there would be less likely to notice any further change in limb alignment.

One of the safe and efficient procedures, temporary isolated medial femoral hemiepiphysiodesis (TIMFH), helps to correct idiopathic genu valgum before skeletal maturity. Patients with an inter malleolar distance of more than 8 cm, along with a minimum of 8 years of age are required for TIMFH. In 6-7% of cases, the deformity had reappeared [7]. The function of corrective osteotomy in adolescents with skeletal maturity has been reported in an article along with the numerous techniques for the tibial and femoral sides of the joint [8]. A thorough operating procedure for a medial closure wedge distal femoral osteotomy was noted in the article [8].

Another retrospective cohort study reported that a characteristic finding that is frequently linked to patellofemoral instability (PFI) is lower extremity valgus especially in adolescent age group [9]. Their study concluded that adolescent patients with PFI have a high frequency of lower extremity valgus (60%) with nearly one in four presenting with high-grade valgus. This association should be known to the treatment team because it can be a s-ignificant factor to take into account while treating the adolescent valgus knee populations [9]. Despite having a higher-grade valgus, our patient did not have any finding of PFI which needed attention.

The technique of percutaneous transverse metaphyseal femoral osteotomy and above-knee casting seems to be minimally invasive in correcting genu valgum in adolescents and that requires expertise [10].

Conclusion

Severe and progressive genu valgum in children over 7 years may require surgical intervention. While techniques like hemiephiphysiodesis or physical tethering can be useful for younger children with open epiphysis, the corrective osteotomy is ideal for the adolescent age group with closed physis. Medial closed wedge distal femur osteotomy is a safe and effective procedure for correcting the mechanical axis in adolescents with skeletal maturity.

Ethical Approval

The patient has given written and oral consent for their photos and medical records to be published in this journal. Although every attempt will be made to preserve the patients' identity, total anonymity cannot be ensured.

Conflict of Interest

The authors declare that there are no conflicts of interests.

Author Contributions

Ganesh M T contributed towards diagnosis and treatment protocol for the patient. Ajitha R contributed to preparing the case report, editing and drafting case report. Aizel S Contributed collecting follow up data from the patient.

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