Blount's disease and Bilateral Medial Femoral Condyle Osteochondritis Dissecans in a 12 year-old-boy

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ABSTRACT

This article reports the case of an adolescent boy with untreated Blount’s disease who developed bilateral medial femoral condyle osteochondritis dissecans (OCD). OCD is a condition of the articular surface of a joint that involves subchondral bone avascular necrosis and possible separation of an articular cartilage fragment and subchondral bone from the joint surface. Though the etiology of OCD is controversial, repetitive trauma has been implicated. The development of knee OCD in a patient with Blount’s disease has not been previously reported.

A twelve-year-old African-American boy, BMI of 32.5 kg/m², presented with bilateral knee pain exacerbated by activity for the past several months. Knee radiographs were pertinent for lucent areas bilaterally in the medial femoral condyles, which were confirmed as stable OCD lesions by MRI. Proximal tibial growth modulation with arthroscopic transchondral microfracture was performed. Three months after surgery, the patient had no knee pain and radiographs showed significant OCD healing with subchondral bone formation. Nine months after surgery, his knee pain had completely resolved and he was back to full function. Final follow-up 2 years after initial surgery showed complete healing of the OCDis and correction of his genu varum.

Our patient had bilateral lesions located in the center of the medial femoral condyles, his weight-bearing surfaces. The bilateral nature of his disease and the uncommon locations on the medial femoral condyles suggests that his genu varum caused by Blount’s disease may have played a role in OCD development. With this case report, we describe an unreported potential complication of untreated Blount’s disease and recommend treatment through growth modulation and microfracture, pending classification of the Blount’s disease and OCD.

INTRODUCTION

Blount’s disease, first described in 19371 and classified in 1952,2 is a tibial deformity characterized by inhibited growth of the proximal medial physis leading to genu varum.3 The condition is often bilateral, and there is an increased predisposition in obese African-American children. With increasing severity of the disease,
which can be described by radiographic Langenskiöld classification, permanent closure of the medial physis can occur. The excessive pressure in the medial compartment of the knee in patients with Blount’s disease often leads to knee pain and early arthritic changes. Generally, there are two distinct forms of Blount’s disease: early-onset/infantile Blount’s, and late-onset Blount’s. A case is deemed infantile Blount’s disease if the deformity develops prior to the age of four. Late-onset Blount’s was further divided into adolescent type, occurring after 10 years of age, and juvenile type, occurring between the ages of 4 and 10. While the exact etiology of Blount’s is unknown, early walking, obesity, and bone mineral content are thought to con
tribute to the disease, although this does not fully describe development of unilateral cases.

Standing full-length anteroposterior (AP) radiograph of both lower extremities is used to diagnose Blount’s disease and to determine the primary sources of medial axis deviation. A treatment plan should be devised based on severity and origination of the deformity in each case. Treatment of Blount’s disease includes both surgical and nonsurgical interventions that attempt to redistribute weight-bearing forces and promote correction of the deformity. In less severe cases, orthoses or gradual correction using external fixation may suffice. Additionally, a variety of operative techniques such as valgus osteotomy, hemiepiphyseodesis, hemiepiphsal stapling, and guided growth pin systems are also used. A valgus osteotomy requires a removal of a portion of the tibial joint surface, allowing the femur and tibia to bend away from the affected area. Hemiepiphyseodesis, hemiepiphsal stapling, and guided growth pin systems all involve insertion of hardware across the epiphysis in order to halt growth across a portion of the physis and subsequently correct the weight-bearing axis. Complications as a result of operative treatment include limb length discrepancy, neurologic injury and compartment syndrome. Recurrence of varus deformity varies depending on patient age of onset, degree of deformity, timing of intervention, and amount of overcorrection. Studies have shown recurrence rates exceeding 50%. Excessive obesity, Langenskiöld stage >III, and age greater than 4.5 years have all been identified as correlated to recurrence. The knee joint of overweight or obese patients is under excessively high compressive forces relative to patients of normal weight, which can exacerbate the deformity. Adolescent obesity may be particularly detrimental to lower limb health. Early life obesity has been linked to osteoarthritis (OA) of the knee and hip, as well as rapid progression of OA in the knee. Similar associations have been found between obesity and
severity of meniscal tears and cartilage defects, illustrating the effects of increased weight on the knee joint. Additionally, untreated Blount’s disease often leads to growth suppression, knee joint laxity as a result of mechanical strain, and in severe cases, compensatory ankle valgus.11

Osteochondritis dissecans (OCD), a term used to describe lesions in articular cartilage and subchondral bone, is most typically found in the knee and is thought to possibly arise from repetitive trauma. This micro trauma can be a result of normal activity, but adolescents with sports injuries or lack of coordination may be at an increased risk. The cause of OCD is not completely understood,13,14 but at the current time it is not commonly considered a complication of Blount’s disease. The varus axis in Blount’s disease can lead to increased stress in the medial surface of the knee, which may predispose the patient to development and/or worsening of an OCD in the medial femoral condyles. We present a case of bilateral medial femoral condyle OCD in an adolescent, obese African-American boy with early onset Blount’s disease. We are unaware of any reports of this finding in the literature.

**CASE PRESENTATION**

An obese twelve-year-old African-American boy, 161 cm in height and 84.3 kg in weight with a BMI of 32.5 kg/m², presented with complaints of bilateral knee pain exacerbated by activity for the past several months. He was found to have bilateral genu varum on exam and standing hips to ankles radiographic evaluation revealed the deformity existing through the proximal tibia.

Figure 4. Arthroscopic probing of OCD lesions B) OCD lesions post transchondral microfracture

Figure 5. Lateral and notch view radiographs at 7 months postoperative.
with medial tibial physeal changes consistent with Blount’s disease. His family said that he was first noted to have this deformity as an infant, suggestive of early onset Blount’s disease, and corrective surgery was recommended on initial consultation with a pediatric orthopaedic surgeon. The specific surgery is unknown, but based on family discussion it was likely proximal tibial osteotomies. The family declined surgical correction and did not return for follow-up. At age ten, the patient began experiencing knee pain, and repeat physical exam and radiographic imaging confirmed bilateral genu varum due to proximal tibial physeal alterations consistent with Blount’s disease, Langenskiöld stage III, and bilateral medial femoral condyle OCD. MRI staging of his OCD lesions was consistent with stage 4, based on Hefti classification. Preoperative radiographic images are shown in Figure 1. The metaphyseal-diaphyseal angles were 6 degrees on the left and 5 degrees on the right with anatomic axis of 6 degrees of varus on the left and 2 degrees on the right. The locations of the OCD lesions were in the middle of the medial femoral condyles, as shown by areas of radiolucency best seen in the notch view radiograph. This is not the typical anatomic area for an OCD to be found as they most commonly present with a defect on the posterolateral surface of the medial femoral condyle. The radiographs generally show radiolucency in the subchondral bone with depression or non-displaced fragment, but can have displaced fragments. The patient’s MRI images obtained after the initial presentation can be seen in Figure 2. The chondral surfaces appeared to be intact with host bone changes consistent with osteochondritis dissecans.

The patient underwent uneventful bilateral proximal tibial lateral growth modulation through hemi-epiphysodesis using a plate and screw construct and bilateral knee arthroscopy with arthroscopic OCD transchondral microfracture. The goal of the hemi-epiphysodesis is to arrest growth of the patient’s lateral tibial physis while allowing continued growth through the medial tibial physis, correcting the deformity and the axis of the lower limb. An area of subchondral collapse consistent with OCD is identified if the chondral surface is found to be intact with no fractures, but chondral softening to manual probing is present during arthroscopy. In this situation, bone healing can be stimulated through a microfracture procedure which encourages mesenchymal stem cell release from the bone marrow and stimulates articular cartilage healing. This can be done in a transchondral or antegrade fashion. If the OCD has fractured then surgical treatment with stabilization is indicated and generally performed with arthroscopic fixation. When there is an unstable fracture or loose body, then open reduction with internal fixation and occasionally bone grafting is undertaken. Post-operative images of the bilateral hemi-epiphysiodesis are shown in Figure 6.
Figure 3. During knee arthroscopy, the femoral cartilage was noted to be intact and stable bilaterally with some chondral softening. Microfracture was guided with intraoperative c-arm and by observing areas of softening with depression of the cartilage with probing (Figure 4A). Bleeding was confirmed during arthroscopy after the microfracture was performed (Figure 4B). The patient recovered uneventfully from surgery and was discharged home in stable condition.

The patient was allowed to bear weight for daily activities, although impact activities were restricted for 3 months postoperatively. Three months after surgery, the patient had no knee pain, and radiographs showed significant OCD healing with subchondral bone formation. His genu varum was clinically improving but not checked radiographically at that time. Lateral and notch view radiographs were obtained 7 month post-operatively (Figure 5). At 9 months after the surgery, his knee pain had completely resolved and the patient had returned to full activities (Figure 6). At 16 month follow-up, he had overcorrected his genu valgum to 9 degrees of valgus. Removal of the plate and screw construct was performed to allow continued growth of the proximal tibia. At 18 months after the surgery and two months post-hardware removal, radiographs demonstrated complete healing of the OCDs and the patient was pain free with full activity (Figure 8). Most recent standing hips to ankles radiograph at 18 month post-operative visit showed correction of the right varus to 7 degrees of valgus and correction of the left to 6 degree of valgus, based on anatomic axis (Figure 8). Final follow-up visit 2 years after hemi-epiphysiodesis showed complete healing of the OCDs and correction of his genu varum. He is currently participating in full activities with no pain. The patient will be monitored every 6 months for recurrence of genu varum.
DISCUSSION

Two distinct forms of Blount’s disease are recognized in the literature: early-onset and late-onset.\textsuperscript{3,14} The classification is based on whether the disease occurs before or after four years of age. Valgus proximal tibial osteotomy has been shown to prevent recurrence of the deformity if done before the age of four.\textsuperscript{3,16,17} Unfortunately, this patient was lost to follow-up initially and presented again at a much later age. In addition, he had bilateral medial femoral condyle OCD lesions when he later presented with a complaint of knee pain.

With Blount’s disease, the knee is found to be in anatomic varus due to proximal tibial deformity with the mechanical axis falling medial to the knee joint. Bruns et al.\textsuperscript{17} showed that medial compartment pressures are higher than lateral compartment pressures in neutral and varus knee alignment. In addition, obesity compounds the problem by increasing the compressive forces in the knee joint. With the predisposition of Blount’s disease in overweight and obese patients,\textsuperscript{18} these factors combine to cause increased stress in the medial compartment of the knee.\textsuperscript{19} This can contribute to the development of medial condyle stress based on the theory of repetitive microtrauma, possibly leading to chondral wear and arthritic changes. Furthermore, Jacobi et al.\textsuperscript{20} reported on the association between mechanical axis malalignment and OCD lesion location. It was noted that there was a positive association between medial condyle OCD and varus axis, a possible explanation for the OCD observed in this patient.

While the etiology of OCD remains controversial, many would agree that trauma and microtrauma play a major role in the development of pain and other symptoms.\textsuperscript{21} The juvenile form and the adult form are differentiated based on the epiphyseal plate.\textsuperscript{22} OCD can develop in many joints in the body and has been described in the knee, elbow, ankle, shoulder, hand, wrist, and hip. The knee is the most common site, with the majority of lesions in the medial femoral condyle.\textsuperscript{5} However, the lesion is usually located in the posterolateral aspect of the medial condyle, according to the theory that traumatic contact with the tibial plateau is possibly the inciting factor.\textsuperscript{23} The disease is usually unilateral, but bilateral involvement is seen in 20-30% of cases. Our patient had bilateral lesions located in the middle of the medial femoral condyles, the area typically considered the weight-bearing surface of the femur. The bilateral nature of his disease and the uncommon locations on the medial femoral condyles suggests that his OCDs are not of the typical nature and may have underlying risk factors that led to the development and progression of these lesions. His genu varum caused by Blount’s disease may have played a role, as this anatomic deformity will likely change the stress patterns in the joint surfaces.

As Blount’s disease is often bilateral and further complicated by obesity, the development or worsening of bilateral medial condyle OCD lesions is a possibility because of the varus knee alignment. With this case report, we describe a thus far unreported potential complication of untreated Blount’s disease and recommend treatment through growth modulation and tranchondral microfracture, pending classification of the Blount’s disease and the OCD.

LEARNING POINTS

1. A general association between Blount’s disease and osteochondritis dissecans (OCD) of the medial femoral condyle should be considered.
2. Early intervention in cases of Blount’s disease is preferred, but correction of associated genu varum through hemi-epiphysiodisis is still attainable in patients older than four years.

3. Clinicians should examine patients with Blount’s disease for OCD and other joint surface pathologies due to the altered weight-bearing axis and magnification of compressive forces associated with this condition.

REFERENCES


