INTRODUCTION

Pediatric bowleg is common in infancy. Physiologic bowleg occurs in the majority of these cases but there are some pathological cases, of which Blount's disease is the most common cause. Tachdjian [1] described differential diagnosis between Blount's disease and physiologic genu varum. In his textbook, the metaphyseal-diaphyseal angle (MDA) of physiologic genu varum is less than 11 degrees, while the MDA of Blount's disease is greater than 11 degrees. Furthermore, in Blount's disease, the proximal medial tibial metaphysis is irregular and the epiphysis slopes medially. However, it is difficult to distinguish clearly between the two, especially in infants below the age of 2 [2].

The purpose of this study was to investigate the MRI characteristics of pediatric bowlegs and to detect cases that would otherwise progress to more severe varus deformities. This was accomplished by performing MR imaging of bowlegged children and evaluating these results in comparison with radiographs.

METHODS

We prospectively evaluated the MRI findings, radiological changes, and clinical results in 39 children (59 knees) with bowlegs. Serial roentgenograms and MRIs were performed for all cases, and the mean age at initial MRI was 2 years 3 months (range, 1 year 5 months to 5 years). Serial standing X-ray films of the lower extremities were reviewed and age-related changes in the femorotibial angle (FTA) and the metaphyseal-diaphyseal angle (MDA) were identified.

MRI scans were performed on a 1.5-Tesla unit using a circular surface coil. Spin-echo sequences were used in all cases and gradient-echo sequences were added in 22 cases. According to MRI findings of the medial physis of the proximal tibia, the knees were divided into 4 stages: Stage 1- the medial physis was smooth; Stage 2- the medial physis was irregular with ridged deformity but its continuity was not broken; Stage 3A- there was an abrupt drop in the medial tibial cartilage and continuity of the medial physis was partially broken; and Stage 3B- the continuity of the medial physis was completely broken (Figure 1, 2).

Twenty knees were categorized as Stage 1, 29 as Stage 2, 5 as Stage 3A, and 5 as Stage 3B.

Braces were applied in 29 cases, and corrective osteotomies were performed on 5 cases.

RESULTS

In all cases of Stage 1 and Stage 2, the varus deformity of the knee was corrected without and with bracing, respectively. The varus deformity was corrected gradually with brace in cases of Stage 3A; however, corrective osteotomy was performed on all knees of Stage 3B.

In knees of Stage 1, the mean FTA was 191°at the age of 1.5 years, decreasing to less than 180°at the age of 2.5 years without bracing. In knees of Stage 2, the mean FTA was 196°at the age of 2 years, which decreased to less than 180°at the age of 3.5 years. The FTA in knees of Stage 3A decreased gradually with brace; however, there was no decrease with brace in Stage 3B, and corrective osteotomy was performed.

The mean MDA in knees of Stage 1 was 9°at the age of 1.5 years, decreasing to 1°at the age of 3 years. In Stage 2, the mean MDA was 13°at the age of 2 years, decreasing to 6°at the age of 3 years. The MDA in knees of Stage 3A decreased gradually; however, there was no decrease in Stage 3B during the course.

DISCUSSION

In this series, deformity of the epiphysis or physis of the proximal tibia was observed by MRI from an early age, and MRI provided useful information about the shape of the epiphysis and physis of the proximal tibia.

MRI staging of pediatric bowlegs according to the shape of medial physis of the proximal tibia correlated well with the progression of varus deformity of the knee. The varus deformity of the knee was corrected without bracing in knees of Stage 1, and with bracing in those of Stage 2. Conservative treatment with bracing was effective for knees of Stage 3A; however, this was not effective for knees of Stage 3B, and corrective osteotomy was necessary.

Our results indicated the potential of deciding adequate treatment for pediatric bowlegs based on MRI staging.

CONCLUSION

The discontinuity of the medial physis of the proximal tibia is thought to be responsible for progression of varus deformity of the knee. The shape of the medial physis was clearly detected with MRI, and MRI staging is useful for decision making in the treatment of pediatric bowlegs.