

## Guided growth for misalignment in children - *Consultant Q&A*



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Guided growth presents a powerful but minimally invasive technique to correct limb deformity in children. This is combined with minimal morbidity for the patient and rapid resumption of normal activities.

### **Common presentations and resolutions in children**

Most children who present with knocked knees, bow legs or 'turned in' feet will represent a variation of normal and they will spontaneously

'grow out of it'. As all parents know, however, kids occasionally need some gentle guidance and correction. For those with deformities that do not self-resolve in the early years, problems with mobility and running may be in store for adulthood and even the potential for early joint arthritis. Traditionally, an acute correction of the bone would be carried out, which usually represented major surgery with an osteotomy (break) in the bone and implantation of large metal plates. A modern approach, however, involves a minimally invasive technique that utilises the child's own growth potential.

### **What causes bony deformities in kids?**

In normal skeletal growth, limbs are equal in length and properly aligned from the hips to the ankles. Sometimes, however, congenital abnormalities or syndromes, infection, injury or endocrine conditions, such as rickets, can cause long bones of the leg to grow out of alignment. This misalignment may result in joint deformities of the leg known as valgus (knock knees) or varus (bowed legs). In these situations, normal use of the leg is impaired and walking or running may be painful. Unfortunately, bracing is usually not effective in managing these conditions. The correction of limb deformities requires one of two surgical procedures: either an osteotomy or the minimally invasive hemi-epiphysiodesis procedure.

### **Acute corrective surgery versus guided growth**

Correction using the osteotomy method is a significant surgical procedure that involves cutting the misaligned bone, adding or removing a wedge of bone (depending on the type of deformity) and realigning the bone. The realigned bone must be fixed into place, usually with plate and screws and sometimes followed by a cast. There are inherent risks of such surgery, the child often requires a significant hospital stay and delayed weight bearing, followed by a course of physiotherapy. In some cases, multiple osteotomy surgeries may be necessary to fully correct the leg's alignment. Hemi-epiphysiodesis is a much less invasive surgical method for correcting pathological angular deformities. A metal implant is inserted into one side of the physis (growth plate) of the deformed bone, restricting its growth while permitting continued growth on the opposite, non-instrumented side. The goal is to permit realignment through growth or to 'guide growth' to correct the deformity. Gradually, the bone realigns and the misshapen bone is corrected. Since the bone is not cut (as with an osteotomy), there is less risks of complications such as instability, neurovascular damage and non-union.

### **How does guided growth occur with the eight-Plate™?**

Hemi-epiphysiodesis to correct deformity has been performed for many years using implants such as staples. These had little flexibility and could be fraught with problems such as mal-placement, bending and breakage which could compromise the outcome.

The new eight-Plate™ technique of guided growth overcomes many of the drawbacks associated with traditional hemi-epiphyseal stapling. The eight-Plate™ is a figure-eight shaped device about the size of a paper clip. It has holes for two screws and holds one side of the growth plate. As the opposite side of the physis continues to expand and grow, the screws diverge within the plate, effectively serving as a hinge. This hinge action also avoids compressing the growth plate that is being guided helping to prevent damage and allowing growth to proceed normally on this side when it is removed. As it is manufactured from titanium it is flexible and there is less chance of it breaking.

### **How is the device fitted?**

Surgical implantation is performed under general anesthesia and most patients can be treated on a day-case basis. A 2-3cm incision is made at the level of the physis of the bone to be corrected and it is inserted using X-ray control, ensuring optimum placement. Multiple deformities can be addressed during the same procedure, inserting one eight-Plate™ per physis.

### **What is the recovery time?**

Post-operative recovery is usually rapid with crutches for comfort only if needed. Normal activities can be resumed, including sports, typically within three weeks.

### **How long does correction take?**

The implant restrains growth on one side of the growth plate while natural growth is allowed to continue on the opposite side. Gradually, typically from several months up to two years, the deformity is corrected. Regular follow-up with full length X-rays of both legs is required until the desired correction is achieved. Once the deformity is corrected, the eight-Plate™ is removed under general anesthesia. If the deformity were to recur with further growth of the child, the procedure can be repeated, if enough growth potential remains. It is not applicable in all circumstances, for example if the child is almost skeletally mature (fully grown) or there is a rotational component to the deformity.



Pre-op

6 months post-op

3 years post-op