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Hinge Plate™ – Innovating Where Others Have Failed

Plate and screw constructs have gradually replaced rigid staples to become a leading treatment option for lower extremity angular deformity correction in growing children. The overall success rate of plate-mediated guided growth has been satisfactory with around 87% of patients achieving the desired correction [2]. However, as the use of plate constructs increased, clinical failures and complications also increased and were most frequently reported in overweight or obese children with Blount's disease, mostly involving the metaphyseal screw (Figure 1).

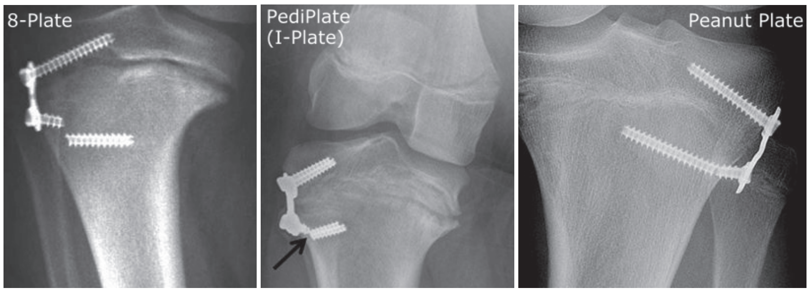

Figure 1 - *Metaphyseal screw failures predominantly occur at the screw-bone interface.*

The presumed mechanism of metaphyseal screw breakage is thought to be the result of tensile forces generated by the physis. When the plate does not conform to the underlying anatomy, the exposed portion of the distal screw is at risk due to cantilever forces. It is unclear whether the constant state of tension due to growth forces (around 500N) leads to shear facture of the screw or whether cyclic compression and distraction of the physis causes screw failure secondary to fatigue [1,3,4].

The high rates of reported implant failures have been alarming enough to warrant a procedural modification in obese children with Blount's disease and severe deformity [5]. The use of solid instead of cannulated screws, implants made of stainless steel instead of titanium, and double plates (i.e. H or I plate) per hemiepiphysiodesis instead of single, have been recommended to strengthen the construct and avoid implant failure. Another proposed strategy is bending the plates before insertion to better conform to the underlying bone surface. While bending increases the risk of plate failure, better conformity to the bone surface decreases the risk of screw failure.

The Hinge Plate (Pega Medical Inc, Canada), first introduced in 2009, consists of an articulated construct (two members that are connected by a pivot joint) and a set of two solid screws for fixation. All components are manufactured in stainless steel for increased strength. More importantly, the Hinge Plate overcomes the limitations of other plate and screw constructs due to its unique hinge design (Figure 2), which ensures continuous plate conformity to the underlying anatomy with growth. Consequently, the plate passively articulates to adapt with physis growth over time without causing additional bending, compression and distraction forces at the screw-bone interface.

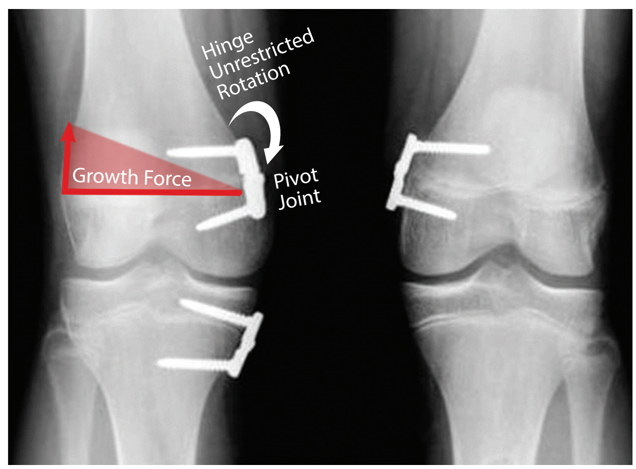

Figure 2 - *AP x-ray showing the Hinge Plate.*

An animal [6] study demonstrated that a hinged plate design has an equivalent correction rate compared to deformable plate and screw constructs. This correlates with the results of clinical studies [7-10] comparing the safety and efficacy of the Hinge Plate to other plate constructs. The authors in all studies report no significant difference in the deformity correction rate among the implant types, as well as no screw-related or plate-related complications (0 of 77) with the Hinge Plate only.

The results of these studies indicate that the Hinge Plate facilitates plate placement against any bone morphology and mitigates the risk of implant-related failures at the screw-bone interface due to its unique hinge design.

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Pega Medical
1111 Autoroute Chomedey, Laval, Quebec, H7W 5J8, Canada
www.pegamedical.com | info@pegamedical.com | +1 450 688-5144

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