Blade Plate Strength in Varus Derotational Osteotomies
A Biomechanical Study

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INTRODUCTION

Hip displacement in children with cerebral palsy (CP) is typically managed with varus derotational osteotomies (VROs) of the proximal femur using a 90° blade plate. The proximal fixation relies primarily on the blade of the implant, however most devices allow an option for inserting a screw within the proximal fragment. Strengthening the fixation of this construct would be beneficial to promote earlier ambulation, when appropriate, and potentially increase comfort during early postoperative range of motion exercises.

OBJECTIVES

The purpose of this study is to determine if the use of a proximal non-locked screw through a 90° blade plate, just distal to the blade and proximal to the osteotomy, increases the load to failure at the osteotomy site.

METHODS

18 Synthetic pediatric femurs that approximate BMD for patient population (0.5g/cm²)
35mm, 4-hole 90° blade plate inserted in proximal femur
Femur osteotomized 10mm below apophysis
3.5 mm non-locked cortical screw placed bicortically through proximal hole of plate (n=9)
No screw inserted (n=9)
Ramp to failure at 10mm/min Failure = 10° decrease in femoral neck-shaft angle
Outcome measure = Load (N) at Failure
Statistics: Paired t-test alpha = 0.05

RESULTS

We observed no statistically significant difference in failure load with or without the proximal non-locked screw. The mean ± SD for load to failure with and without the screw at the proximal femur were 89.89 ± 9.0 N and 84.6 ± 10.3 N (p=0.42).

CONCLUSIONS

• To our knowledge, no study has looked at the biomechanical strength of blade plate fixation in patients undergoing VROs. Furthermore, no study has compared strength with and without the addition of a proximal femoral screw.
• Enhancing the strength of the construct used for fixation of VROs would be useful as it may help decrease post-operative pain, and help promote earlier mobilization.
• This study provides biomechanical evidence that the blade plate construct is not enhanced with the addition of a non-locked cortical screw in the proximal fragment distal to the blade and proximal to the osteotomy.
• Future directions include study of the stability of a locking screw in the same location and study of other types of mechanical loads or potential modes of failure.

REFERENCES