The results of epiphysiodesis for treatment of limb length discrepancy

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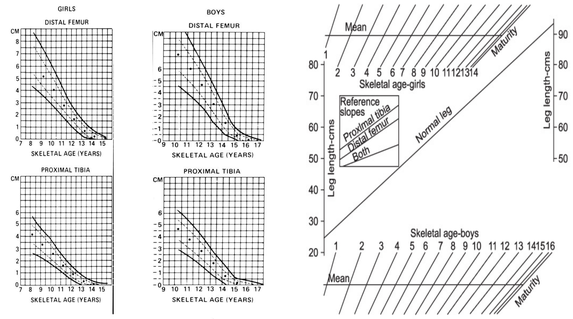
INTRODUCTION

Patients with a congenital or developmental limb length discrepancy (LLD) undergo epiphysiodesis on the longer leg with the intent of minimizing the final discrepancy by the time skeletal maturity is reached. There exist several methods in the literature that predict the timing of epiphysiodesis. The purpose of our study was to retrospectively compare the efficacy of three methods of prediction in an attempt to identify the most accurate and precise method for predicting the proper timing of performing epiphysiodesis.

METHOD

Out of 469 patients who have undergone an epiphysiodesis for LLD at the Texas Scottish Rite Hospital for Children between 1991-2011, 84 patients were selected for the study. The inclusion criteria were availability of three pre-operative x-rays and bone age data before the surgery, with at least a six month interval between scans. Each patient must have been followed to skeletal maturity with limb length measurements at that time and not have suffered growth arrest of traumatic etiology or postoperative complications. Using radiographic limb measurements, we compared the accuracy of the growth remaining method by assessing predicted limb lengths and LLD with White-Menelaus, Moseley/Rotterdam, and Green-Anderson methods or their variants. Where applicable, the predictions were made with and without accounting for growth inhibition rate (GIR), which is a quantification of decelerated growth in the short leg.

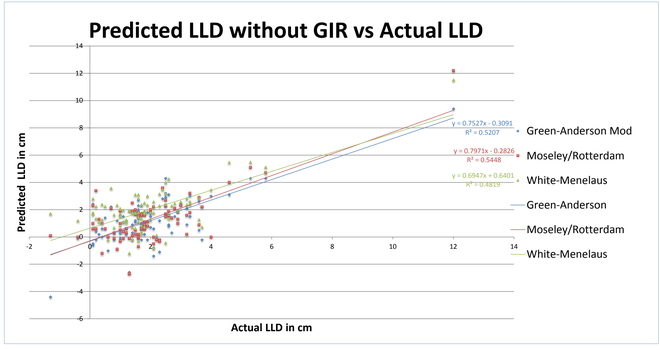


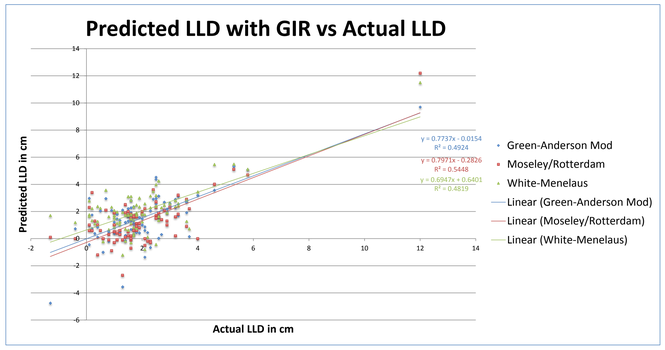
White-Menelaus Equations

*LLD after surgery= (current LLD + annual increment*years of growth remaining)-effect of epiphyseodesis*years of growth remaining*

Annual Increment=0.317cm per year
Effect of Epiphysiodesis= 0.953cm per year at Distal femur and
0.635cm per year at Proximal Tibia

RESULTS





CONCLUSIONS

The White-Menelaus, Moseley/Rotterdam, and Green-Anderson methods of prediction are nearly indistinguishable, with the White-Menelaus being slightly better. Modifying the existing models to include GIR did not improve the accuracy of the predictions. We advocate that the White-Menelaus be the preferred method as it is as accurate as the others, and from the clinical perspective, has the advantage of simplicity; requiring only one limb length measurement and chronological age, as opposed to bone age. It also does not require the physician to create graphs or consult growth charts.

FUTURE DIRECTIONS...

Our investigations raised further questions as to how the predictions might be affected by accounting for additional variables, such as comparing skeletal vs chronological age or accounting for the patient's individual height percentile. There are other considerations such as gender and ethnicity that may impact the accuracy of the predictions.
There is a fourth method of prediction, the Multiplier Method, that is increasing in popularity due to the existence of a downloadable smart phone application. However, our preliminary investigations suggest that this method may have no inherent advantages. We hope to incorporate this method into our analysis and and will pursue publication in surgical journals.

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