



Anterior distal femoral hemiepiphysiodesis in children with cerebral palsy: Establishing surgical indications and techniques using the modified Delphi method and literature review

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To the Editor,
Dear Sir

A Letter to the Editor has expressed some concerns regarding our paper “Anterior Distal Femur Hemiepiphysiodesis (ADFH) in Children with Cerebral Palsy.”¹ First, we would like to thank the author for their interest in our study. We appreciate the opportunity to elaborate on some of the salient points of this modified Delphi analysis and literature review.

We agree that guided growth for the correction of knee flexion deformity is not a novel procedure. While there has been an evolution of surgical technique from staples to tension band anterior plates to percutaneous screws, the literature has lacked consensus regarding optimal surgical indications for this surgery in children with cerebral palsy. Therefore, the purpose of this paper was to describe the results using a modified Delphi technique to develop consensus regarding the surgical indications for ADFH in children with cerebral palsy.

While tension band plating has been previously described by Klatt and Stevens,² a series of papers have observed increased prevalence of pain associated with plate and screw constructs in children with cerebral palsy.^{3,4} The technique of anterior percutaneous distal femur hemiepiphysiodesis has been well described previously.⁵ When comparing plate and screw versus percutaneous screws constructs, percutaneous screws have been shown to have equivalent rates of knee flexion contracture correction with a lower prevalence of postoperative pain compared to plate and screw constructs.³ It is for the above reasons that this group of experts prefers screws

compared to plate and screws for ADFH in children with cerebral palsy.

We agree with this author that ADFH is a much less-invasive procedure than distal femoral extension osteotomy, and perhaps explains why in our Delphi we achieved consensus in indicating this procedure for both ambulant and non-ambulant children. We believe that the discomfort and crepitation associated with plate and screw constructs can be avoided using percutaneous screws.

As identified in our modified Delphi process, this group of experts recommended performing ADFH toward the end of growth when there is at least 2 years of growth

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remaining. We would agree that if the screws are placed flush to the bone, hardware removal may be more challenging. Leaving the screws 2–4 mm proud at the time of insertion facilitates later hardware removal. While screws can bend due to the power of the distal femur physis, we have not had a problem removing them if they are proud 2–4 mm.

Finally, we respectfully disagree with the author's statements regarding the utility of gait analysis following ADFH for knee flexion contracture. The decision regarding patellar tendon advancement surgery is more nuanced than simply achieving full extension on radiographs.^{6,7} Correction of knee extensor insufficiency is often necessary to correct crouch gait. Full passive knee extension does not preclude the possibility of a deficient knee extensor mechanism, and patellar tendon advancement or shortening may be necessary to achieve optimal improvement of crouch gait and lever arm function. The results of our modified Delphi demonstrate that consideration of patella tendon advancement or shortening should occur when clinical extensor lag exists. Review of the radiographs here demonstrate correction of knee flexion contracture; however, this alone does not rule out the possibility of persistent knee extensor insufficiency during gait. The radiographs demonstrate the presence of patella alta, suggesting that there is a possibility of persistent lever arm dysfunction. The determination of the need for patellar tendon advancement or shortening should be based on the presence of an extensor lag on clinical examination and kinematic/kinetic evidence of knee extensor deficiency during gait, not solely on the radiographic absence or presence of full knee extension, or the absence or presence of patella alta. The X-ray is, at best, an intermediate variable in the decision-making process.

Once again, we thank the author for their interest in our study. Their comments and questions have given us the opportunity to elaborate on the surgical indications for ADFH in children with cerebral palsy. These indications can provide a template for future prospective study.

Sincerely,

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B.J.S. contributed to the conception and design, drafting of the article, acquisition of the data, critical revision of the article for important intellectual content, and final approval of the article.

J.M. contributed to the conception and design, drafting of the article, acquisition of the data, critical revision of the article for important intellectual content, administrative, technical, or logistic support; final approval of the article.

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The remaining authors contributed to conception and design, drafting of the article, critical revision of the article for important intellectual content, and final approval of the article.

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R.M.K. owns stock in Zimmer/Biomet, Medtronic, Pfizer, and Johnson and Johnson, is on the Editorial Board of the Journal of Pediatric Orthopedics and his son works for Intrinsic Therapeutics, outside the scope of the submitted work.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

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Informed consent

No patients or clinical subjects, informed consent was not required.

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