TITLE: The Use of Distraction Osteogenesis in the Treatment of Rickets-Associated Craniosynostosis

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INTRODUCTION:
There is a known increased incidence of craniosynostosis in patients affected by the metabolic condition of rickets.[1-3] Due to abnormal bone development, and a tendency toward presentation at an older age than most craniosynostosis patients, cranial remodeling surgery in rickets patients may be complicated by inadequate post-operative cranial growth and a greater risk of sutural re-fusion. We present two cases of 3-year old boys with rickets-associated sagittal craniosynostosis, and demonstrate the effectiveness of distraction osteogenesis in the surgical management of this condition.

METHODS:
Two 3-year-old boys with rickets presented with sagittal synostosis and marked scaphocephalic deformity as an indication for surgical intervention. A *single* midline sagittal osteotomy extending from the bregma to the lambda was made. A sagittal suturectomy was not performed in order to ensure bone edge proximity across the sagittal osteotomy site at the commencement of the distraction phase. Transverse osteotomies were made bilaterally behind the coronal suture to the pterion, and just anterior to the lambdoid sutures to the asterion to allow for biparietal distraction of the bilateral parietal region. Transverse wedge ostectomies were performed anterior to the lambdoid sutures, and the occipital bone was barrel-staved to encourage anterior occipital movement resulting from scalp tension during the ensuing transverse distraction. The devices were activated for 30 days. Consolidation phase lasted 12 weeks. Breadth of distraction and quality of regenerate were confirmed clinically at the time of device removal. Head shape was documented photographically.

RESULTS:
In both cases :

- Distraction breadth was verified intraoperatively as 30mm.
- Clinical exam confirmed that the regenerate was solid bone, without palpable areas of incomplete osteogenesis.
- A significant improvement in cranial proportion was achieved in both patients, as assessed clinically.
- Estimated blood loss was high in both cases, presumably related to the hyperemic nature of rickets bone, rather than the surgical distraction approach employed.

CONCLUSIONS:
Distraction osteogenesis promotes bone growth and cranial remodeling in patients with craniosynostosis due to rickets. The technique allows for continuous, incremental expansion of both bone and scalp tissue to overcome the limitations of abnormal bone healing due to rickets, as well as inadequate scalp compliance due to older age.[4] We recommend consideration of distraction osteogenesis specifically for the treatment of craniosynostosis in older children with severe deformity, including those with rickets.

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