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COMMENTARY

Craniosynostosis—another look

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Craniosynostosis is commonly encountered in pediatric practice. With advances in CT and MRI over the last decade, imaging has become increasingly important in the diagnosis, characterization, identification of associated anomalies and post-treatment follow-up of this entity. In this month's CME article, Badve and colleagues [1] covered multiple aspects of craniosynostosis, including its anatomy, embryology and classification. The article provides an excellent review of imaging findings, particularly CT findings in different types of syndromic and non-syndromic synostosis. The authors suggest an imaging approach for evaluation of craniosynostosis starting with plain radiographs for low-risk healthy children for initial screening.

It is important to question the utility of post-op studies as well as how many post-op studies are routinely necessary. When necessary, they must be performed at the minimum dose possible. Badve et al. [1] have suggested a CT protocol for initial diagnosis, immediate post-operative study and subsequent follow-up studies with varying radiation doses to minimize radiation exposure. This protocol keeps the radiation exposure well below the guidelines suggested by the American College of Radiology for routine adult head CT. However, the ACR guidelines are for parenchymal evaluation in adults. We in children's hospitals need to lead the effort in reducing radiation dose and not concern ourselves with the percentiles but rather the reasons for examination, in this case the bones and sutures. In our opinion, the $CTDI_{vol}$ (computed tomography dose index volume) with the authors' full-dose protocol of 22.73 mGy in children <2 years of age and 34.91 mGy in those 2–15 years old could be reduced substantially to the values suggested for their quarter-dose protocol, i.e. 5.86 mGy and 8.86 mGy. At our institution, 3-D CT for craniosynostosis is performed at 80 kV, 64 mA and in 0.6 s, which keeps the $CTDI_{vol}$ to approximately 2.3 mGy in children <2 years of age and 2.5 mGy in those 2–15 years of age. Using this protocol the bony detail with 3-D reconstruction and reformatted images is diagnostic in all three orthogonal planes (Fig. 1). The drawback of this protocol is markedly limited soft-tissue evaluation. However, children with syndromic synostosis and others requiring parenchymal evaluation, in keeping with the authors' suggestion, receive preoperative MRI

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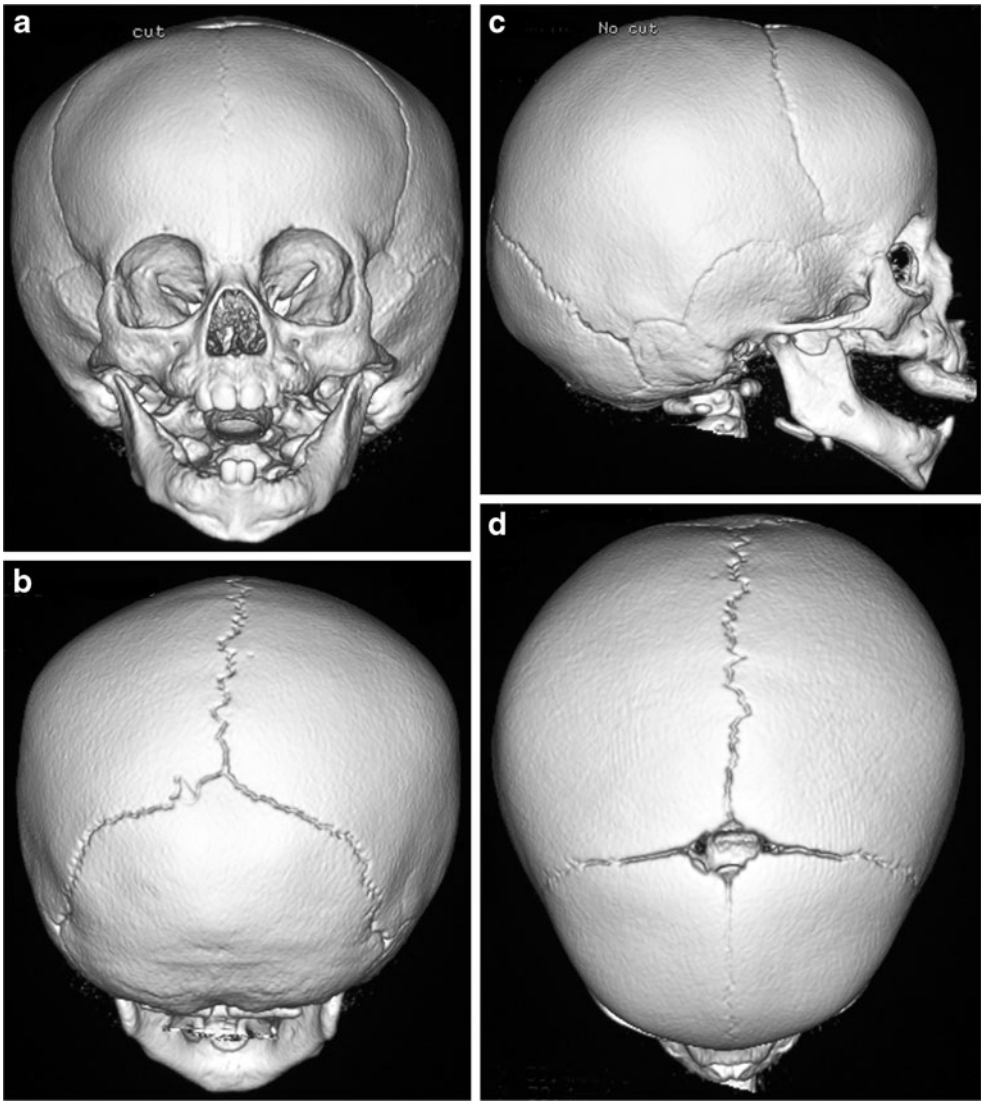

Fig. 1 Plagiocephaly in a 2-month-old boy. **a** Anterior, (**b**) posterior, (**c**) lateral and (**d**) superior views of 3-D CT performed with the described technique are suitable for evaluation of bone and sutures for craniosynostosis workup

and MR venography for evaluation of associated intracranial and maxillofacial soft-tissue and vascular anomalies. Because soft-tissue evaluation is performed primarily on MRI and 3-D CT is performed only for bony evaluation, CT radiation dosage can be reduced considerably in this vulnerable population.

Reference

1. Badve CA, Mallikarjunappa MK, Iyer RS et al (2013) Craniosynostosis: imaging review and primer on computed tomography. Pediatr Radiol. doi:10.1007/s00247-013-2673-6