

## Expanding Indications and Device Refinement in Posterior Cranial Vault Distraction Osteogenesis

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**Introduction:** Expansion of the posterior cranial vault can be used to treat cephalocranial disproportion and cranial vault dysmorphism. Posterior cranial vault distraction osteogenesis has been described in syndromic patients with craniosynostosis as a viable method for expanding the posterior cranial vault, and has potential advantages over traditional expansion. The purpose of this study was to demonstrate the utility of posterior cranial vault distraction osteogenesis for treating a variety of craniosynostosis and cranial vault anomalies, as well as to review the development of a cranial-specific distraction device.

**Methods:** A retrospective analysis was conducted of patients who underwent posterior cranial vault distraction osteogenesis to expand the posterior vault. 11 patients were identified for inclusion. Demographics, operative findings, distraction characteristics, perioperative course, complications, and evolution of distraction devices and protocol were reviewed.

**Results:** Of the 11 patients identified, 4 had syndromic multi-suture synostosis, 4 had nonsyndromic multi-suture synostosis, 1 had lambdoid synostosis, 1 had a posttraumatic cranial vault deformity, and one patient had recurrent shunt-related craniosynostosis. Clinical, radiographic, or ICP monitoring evidence of elevated ICP was found in 8 patients. 2 patients underwent asymmetric distraction osteogenesis to correct their deformity (Figure 1.) All 11 patients achieved bony union after distraction, and improvement of symptoms related to elevated ICP. At time of distraction, mean age was 39.8 months, and mean distraction was 22.5mm. Complications included CSF leak in 2 patients, one device failure, and minor scalp breakdown (Table 1.) Over the span of the 11 cases, non-specific midface distractors were adapted for cranial-specific use. Changes included a lower profile, smaller footplates designed for easier removal, and a hinged distal footplate attachment.

**Conclusions:** Posterior cranial vault distraction osteogenesis is an effective treatment for a variety of cranial dysmorphologies, including single-suture, syndromic, and multi-suture synostosis as well as acquired deformities of the cranium, in a wide range of pediatric age groups. Asymmetric distraction can be used to correct the underlying deformity. Refinement of a cranial-specific distraction process has allowed for fewer devices per distraction and greater patient compatibility with fewer observed device complications.

Patient	Diagnosis	Age (months)	OR Time (min)	EBL (ccs)	Length of Stay (days)	# Distractors	Distraction (mm)	Asymmetric?	Complications
1	Apert-Bicoronal Synostosis	8	144	300	8	4	17	No	None
2	Bicoronal Synostosis	8.5	156	100	5	3	28	No	None
3	Multi-suture Synostosis	11.33	155	75	4	3	23	No	None
4	Multi-suture Synostosis	21.67	245	30	6	3	27	Yes	None
5	Multi-suture Synostosis	24.5	203	50	6	3	30	No	None
6	Crouzon-Multi-suture Synostosis	59.33	193	150	5	3	14.5	No	CSF Leak
7	Apert-Bicoronal Synostosis	11	157	150	10	2	20	No	None
8	Crouzon	12.67	181	125	5	2	15	No	None
9	Right Lambdoid Synostosis	13.75	159	125	3	2	30	Yes	None
10	Post-traumatic Plagiocephaly	36	161	275	2	2	30	N	CSF Leak
11	Shunt-related Craniosynostosis	198	172	150	10	2	18	N	Device Failure
Mean		39.8	175.1	139.1	6.8		22.5		
SD		55.6	29.2	84	3.1		6.1		

Table 1: Patient Demographics, distraction results

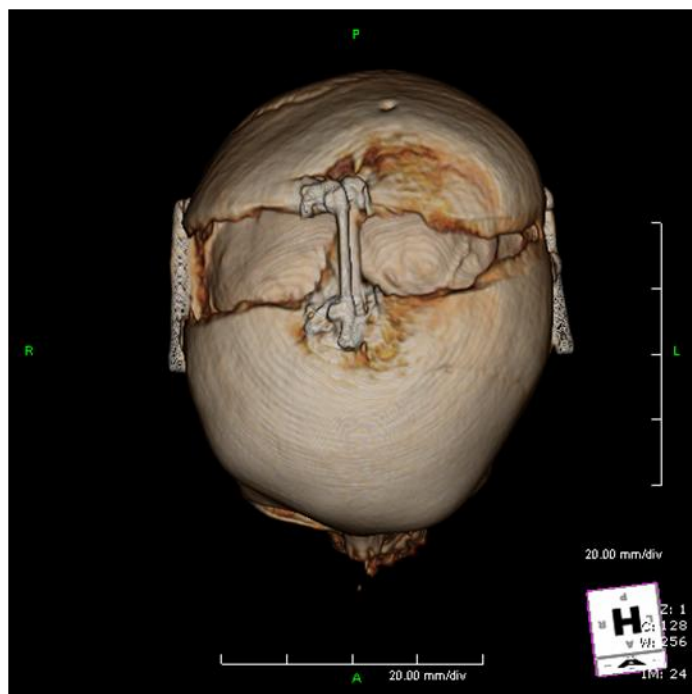


Figure 1: Asymmetric Distraction

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