

Removal of cranial springs after spring-mediated cranioplasty

*Christopher L. Kalmar, MD, MBA,¹ Jordan W. Swanson, MD,¹ Sameer Shakir, MD,¹ Alexander M. Tucker, MD,² Benjamin C. Kennedy, MD,² Phillip B. Storm, MD,² Gregory G. Heuer, MD, PhD,² Scott P. Bartlett, MD,¹ Jesse A. Taylor, MD,¹ and Shih-Shan Lang, MD²

Divisions of ¹Plastic and Reconstructive Surgery and ²Neurosurgery, Children's Hospital of Philadelphia, Pennsylvania

Cranial spring hardware is generally removed 3 months after placement for spring-mediated cranioplasty. Spring removal is performed as an outpatient procedure under general anesthesia in approximately 15 minutes through the incision locations of the index procedure. Herein, the authors provide a multimedia demonstration of cranial spring hardware removal after spring-mediated cranioplasty for sagittal craniosynostosis.

The video can be found here: <https://vimeo.com/511179695>

<https://thejns.org/doi/abs/10.3171/2021.1.FOCVID20102>

KEYWORDS sagittal; craniosynostosis; springs; removal; technique; video

Transcript

0:25 Timeline. Cranial springs are generally removed approximately 3 months after placement for sagittal craniosynostosis, which reflects several weeks of active expansion followed by about 2 months of consolidation.¹⁻⁸

0:42 Local Anesthesia. After general endotracheal anesthesia is induced, local anesthesia containing epinephrine is infused in the patient's scalp incision. The patient is generally left in supine position.

0:52 Incision. After prep and drape, the previous scalp incisions are opened to the subgaleal plane, with care taken to protect the underlying cranial bone regenerate.

1:00 Subgaleal Undermining. Subgaleal undermining is performed over the midportion of the springs.

1:07 Dissection of Spring Arms. Dissection of each of the spring arms is performed to its footplate using tenotomy scissors and Obwegeser elevator.

1:13 Springs Elevated and Cut. Each spring is elevated off of the regenerate and then cut with heavy wire cutters in the midline.

1:19 Springs Removed. Each hemispring is carefully isolated from its surrounding soft tissue. Heavy needle

driver is used to grasp each spring near its footplate; then the spring is axially rotated so that the footplate is retracted from its subcranial position and the hemispring is removed. Rarely, a Kerrison or narrow rongeur can be used to remove cranial bone immediately adjacent to the footplate if it does not easily retract.

1:47 Irrigation. Once all springs are removed, the subgaleal space is irrigated and hemostasis assured.

1:55 Closure. Layered closure of galea with 3-0 Vicryl and skin with 4-0 plain gut is performed. The spring removal procedure can be performed efficiently in approximately 15 minutes.

2:06 Dressing. Bacitracin is applied and a head wrap is optional.

References

1. Arko L IV, Swanson JW, Fierst TM, et al. Spring-mediated sagittal craniosynostosis treatment at the Children's Hospital of Philadelphia: technical notes and literature review. *Neurosurg Focus*. 2015;38(5):E7.
2. Lauritzen C, Sugawara Y, Kocabalkan O, Olsson R. Spring mediated dynamic craniofacial reshaping. Case report. *Scand J Plast Reconstr Surg Hand Surg*. 1998;32(3):331-338.
3. Shakir S, Humphries LS, Kalmar CL, et al. Hope springs

SUBMITTED November 5, 2020. ACCEPTED January 18, 2021.

INCLUDE WHEN CITING DOI: 10.3171/2021.1.FOCVID20102.

* C.L.K. and J.W.S. contributed equally to this work.

- eternal: insights into the durability of springs to provide long-term correction of the scaphocephalic head shape. *J Craniofac Surg*. 2020;31(7):2079–2083.
4. David LR, Plikaitis CM, Couture D, et al. Outcome analysis of our first 75 spring-assisted surgeries for scaphocephaly. *J Craniofac Surg*. 2010;21(1):3–9.
 5. David LR, Proffer P, Hurst WJ, et al. Spring-mediated cranial reshaping for craniosynostosis. *J Craniofac Surg*. 2004;15(5):810–818.
 6. Lauritzen CGK, Davis C, Ivarsson A, et al. The evolving role of springs in craniofacial surgery: the first 100 clinical cases. *Plast Reconstr Surg*. 2008;121(2):545–554.
 7. Rodgers W, Glass GE, Schievano S, et al. Spring-assisted cranioplasty for the correction of nonsyndromic scaphocephaly: a quantitative analysis of 100 consecutive cases. *Plast Reconstr Surg*. 2017;140(1):125–134.
 8. van Veelen ML, Mathijssen IM. Spring-assisted correction of sagittal suture synostosis. *Childs Nerv Syst*. 2012;28(9):1347–1351.
-

Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this publication.

Author Contributions

Primary surgeon: Lang, Swanson, Storm, Taylor. Assistant surgeon: Lang. Editing and drafting the video and abstract: Lang, Kalmar, Swanson, Shakir, Storm, Heuer. Critically revising the work: all authors. Reviewed submitted version of the work: Lang, Kalmar, Shakir, Kennedy, Heuer, Bartlett. Approved the final version of the work on behalf of all authors: Lang. Supervision: Lang, Bartlett. Filming of video: Kalmar.

Correspondence

Shih-Shan Lang: Children's Hospital of Philadelphia, PA. chens4@email.chop.edu.