Reconstructive Approaches for Scalp and Calvaria Following Pediatric Decompressive Craniectomy: A Case Report and Literature Review

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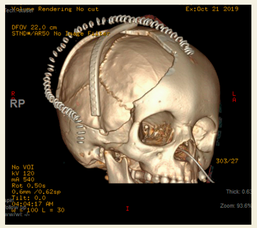
Introduction

- Full-thickness scalp and calvarial necrosis extending down to the dura is a rare complication of decompressive craniectomy (DC)
- Reconstruction options can vary widely
- We describe a case and corresponding reconstructive method utilized in a pediatric patient
- We also present the results of a systematic review of literature

Initial Presentation and Course

- 2-year-old male presented to the ED status post unknown trauma
- CT findings: subdural hematoma with midline shift
- Decompressive Craniectomy (DC) performed
- Post-operative necrosis on Day 14 (Figure 2)



Figures 1 and 2. Figure 1 (left) shows the Day 1 post-operative CT scan. Figure 2 (right) shows Day 14 post operative scalp and calvarial necrosis.

Systematic Review of Literature

- 14 patients within 12 studies
- Mean patient age was 9 months old
- Mean defect size = 61cm^2
- Common scalp reconstruction methods = combination local and free flaps
- Common calvarial reconstruction methods= bone grafts or autologous bone flaps

Study	No. of pts	Etiology of Injury	Age (mean)	Method of Scalp Reconstruction	Method of Calvarial Reconstruction	Successful Scalp Coverage (Y/N)	Hair Regrowth Achieved (Y/N)
Bajpai et al. 2003	1	ACC	Neonate	Scalp rotation flap	NR	Y	Y
Bayramicli et al. 2004	1	Scalp flap necrosis over encephalocele	Neonate	Latissimus dorsi flap + STSG	NR	Y	N
Campbell et al. 2002	2	Separation of craniopagus twins	6 mos.	Fascia lata grafts for dural repair. Scalp defect covered with rotation flap (n=1) or rotation flap + STSG (n=1)	Bone chips over bone defects	Y	Y
De Haas et al. 2019	1	Burn	6 yrs.	Integra® graft + eventual replacement of silicone layer with STSG	NR	Y	N
Di Rocco et al. 2004	2	Separation of craniopagus twins	4 mos.	Rotation flap + autologous cutaneous graft from anterior thigh	Homologous demineralized bone grafts + LTF	Y	Y
Iwayama et al. 2007	1	ACC	Neonate	Trafermin® (recombinant human FGF spray)	Potential later surgery + LTF	Y	N
Khashab et al. 2009	1	Adams-Oliver Syndrome	Neonate	Integra® graft	Potential later surgery + LTF	Y	N
Levine et al. 2012	1	ACC	Neonate	Initial dermal graft followed by STSG from right temporal cranium	NR	Y	N
Maeda et al. 2015	1	Congenital Defect	Neonate	Mepilex® Transfer Dressing only	Potential later surgery + LTF	Y	N
O'Neill et al. 2009	1	ACC	Neonate	Bipedicled scalp flap including skin, galea, and pericranium	Gradual bony regrowth observed	Y	Y
Singh et al. 2012	1	ACC	Neonate	Integra® graft + FTSG from groin	Gradual bony regrowth observed	Y	N
Vilela et al. 2018	1	Encephalocele	Neonate	MatriDerm® dermal substitute + STSG	Autologous bone flaps	Y	N

ACC: Aplasia cutis congenita, FGF: Fibroblast growth factor, FTSG: full-thickness skin graft, LTF: Long term follow-up, NR: Not recorded, STSG: split thickness skin graft

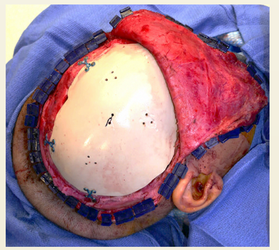
Reconstruction – Acute

- Initial debridement of the necrotic skin and bone
- Serial advancement of the tissue and placement of dermal tissue matrix over 35 days

Figures 3 and 4. Figure 3 (left) shows the initial post operative debridement and closure. Figure 4 (right) is 87 days post initial DC.

Reconstruction – Long Term

- Presented 1 year later to CHKD with persistent calvarial deformity (Figure 7)
- Following tissue expansion, calvarial reconstruction was performed using a customized PEEK cranial implant (Figures 5 and 6)



Figures 5 and 6. Figure 5 (left) shows the final tissue expansion prior to reconstruction. Figure 6 (right) shows perioperative images of exposed calvaria with expanded post-insertion of PEEK implant.

Figures 7 and 8. Figure 7 (above) Patient at initial presentation to CHKD. Figure 8 (below) Patient at three weeks post operative from definitive reconstruction.

Conclusion

- Tissue expansion and subsequent PEEK implant is a safe and effective method to restore head contour and allow for hair regrowth.
- Considerations: etiology of injury, patient age, and size and scale of the defect, and potential for hair regrowth.

References

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