

Improved Rehabilitation Efficiency after Cranioplasty in Patients with Sunken Skin Flap Syndrome

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Introduction

- Sunken Skin Flap Syndrome (SSFS) is an uncommon, delayed complication after craniectomy characterized by either a functional plateau or decline with variable neurologic symptoms improving after cranioplasty. Diagnosis is based on the presence of symptoms in the correct clinical picture, supported by neuroimaging (**Figure 1A-B**).
 - A physical exam finding is the appearance of the patient's craniectomy site (**Figure 2**), showing a markedly concave or "sunken" appearance with protruding cranium at the borders.
 - Clinical manifestations of SSFS can include positional headaches, weakness, cognitive deficits, speech difficulties, and decreased consciousness.
- These symptoms can be debilitating and negatively impact the rehabilitation course before receiving cranioplasty.
- The definitive treatment for SSFS is prompt cranioplasty, with cases in the literature detailing symptomatic improvement.
- Currently, no public studies assess the impact of cranioplasty on rehabilitation outcomes in patients with SSFS.

Objective & Design

- This study's objective was to assess if patients with SSFS had improved functional independence measure (FIM) efficiency after receiving cranioplasty.
- A retrospective chart review was conducted on patients in rehabilitation diagnosed with SSFS.
- Included patients had either a traumatic brain injury (TBI) or non-traumatic brain injury (NT-BI), undergone craniectomy, and were admitted to rehabilitation pre-cranioplasty and post-cranioplasty.
- Four patients met the criteria and were included in the analysis.
- A paired-samples t-test was used to examine the difference in mean Functional Independence Measure (FIM) efficiency (discharge FIM - admission FIM/ length of stay) pre-cranioplasty and post-cranioplasty, with results reported in means (m) and standard deviations (SD).

Results

- Patients were 23-74 years of age (m=51), with three males sustaining a TBI and one female sustaining a NT-BI. The mean pre-cranioplasty FIM efficiency was 0.153 (SD=0.128). The mean post-cranioplasty FIM efficacy was 0.860 (SD=0.270) (**Table 1**).
- There was a statistically significant difference between pre- and post-cranioplasty FIM efficiency (m= 0.703; SD=0.283; p<0.05) with a large effect size (Cohen's d= 2.48).

| Case | Pre-Cranioplasty Admission | | | | Post-Cranioplasty Admission | | | |
|------|----------------------------|---------|---------|---------|-----------------------------|---------|---------|---------|
| | Adm FIM | Dis FIM | LOS (d) | FIM Eff | Adm FIM | Dis FIM | LOS (d) | FIM Eff |
| 1 | 45 | 55 | 51 | 0.20 | 54 | 83 | 24 | 1.21 |
| 2 | 17 | 31 | 47 | 0.30 | 27 | 57 | 47 | 0.64 |
| 3 | 17 | 17 | 13 | 0.00 | 22 | 58 | 55 | 0.65 |
| 4 | 17 | 21 | 38 | 0.11 | 28 | 51 | 25 | 0.92 |

Table 1: Pre- and post-cranioplasty admission FIM (FIM Adm), discharge FIM (FIM dis), length of stay (LOS), FIM change and FIM efficiency (FIM Eff) for the four cases of SSFS.

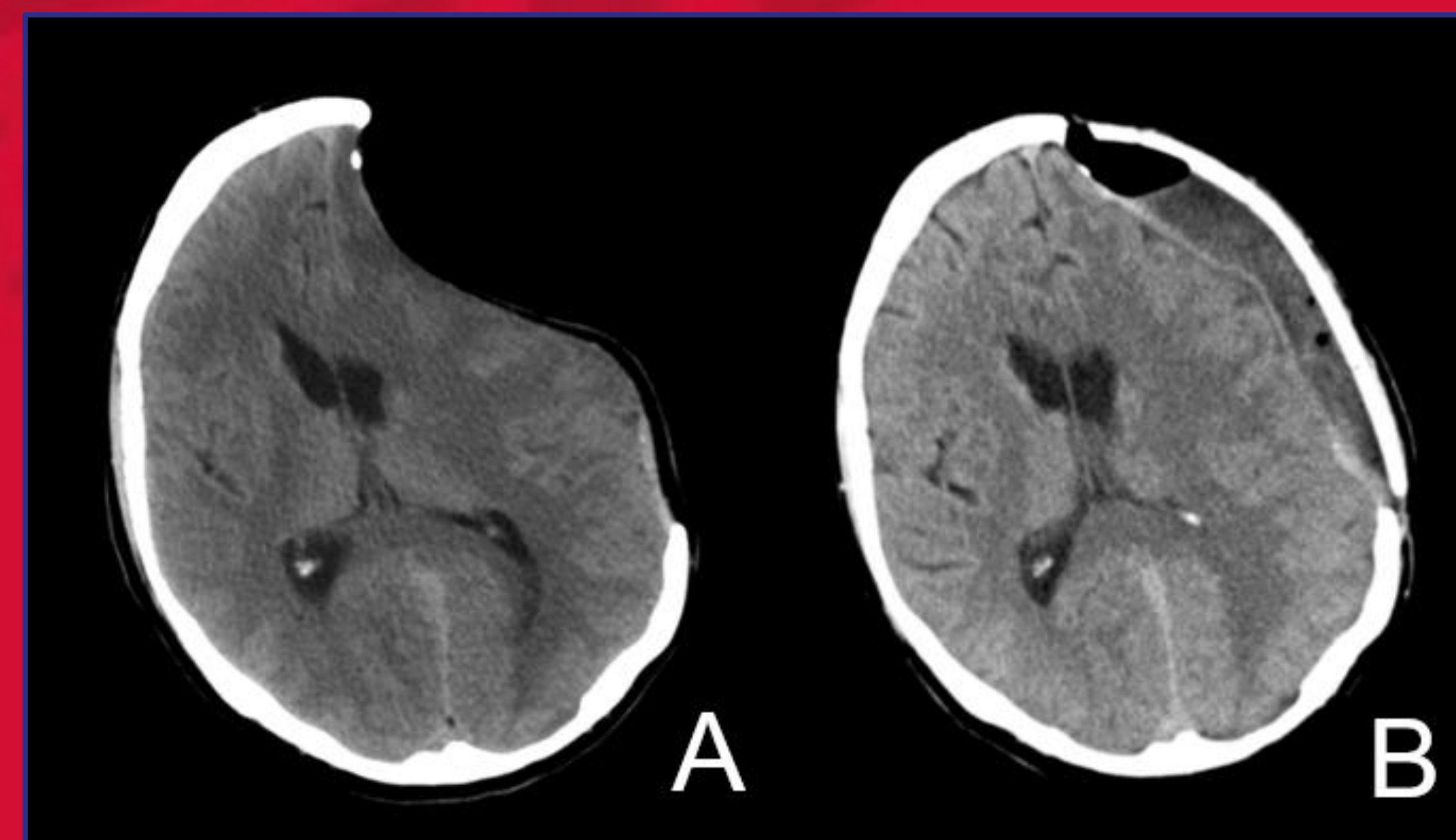


Figure 1A-B: Computed tomography of the head without contrast, axial images for case one. A) Performed on day 45 after left hemi-craniectomy showing sulcal effacement, mass effect of the left frontal lobe with paradoxical rightward midline shift of approximately 14mm. B) Performed 18 days after cranioplasty, showing a 5mm midline shift and fluid accumulation deep to the bone flap in the left frontotemporal extra-axial space.

Conclusions

- ✓ These findings suggest that FIM efficiency significantly improves after cranioplasty in patients experiencing SSFS, with a large effect size.
- ✓ This supports prompt cranioplasty to improve rehabilitation outcomes in this population.
- ✓ Additional studies with larger sample sizes are needed to replicate these findings and explore if improved rehabilitation outcomes are seen after cranioplasty in patients without SSFS.

References

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Figure 2: Image taken of the skull defect of case one. Note the markedly sunken appearance of the skin and prominence of the margins of the intact bone surrounding the skull defect.