

## Is the Elevation of Depressed Calveria over Superior Sagittal Sinus (SSS)-(No Men Land) Rightly Contraindicated?

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### Abstract

Depressed skull fracture over superior sagittal sinus (SSS) is most common type of dural venous sinus injury with significant morbidity and mortality. Significant dural sinus injury occurs in 1.5 to 5% of all head injury cases and SSS injury accounts for 70 to 80%. Depressed skull fractures over SSS occasionally lead to occlusion of SSS, resulting in secondary intracranial hypertension and neurological deficit. Classical teaching is to treat these cases conservatively because of risk of fatal venous haemorrhage. The use of surgical management in these cases is a matter of controversy. However, some series documented safe fracture elevation over the SSS with clinical and radiographic resolution. Here, we are reporting surgically treated three cases of SSS injury due to depressed skull fracture with good outcome.

**Key words:** Depressed skull fracture, Dural venous sinus, Superior sagittal sinus.

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### Introduction

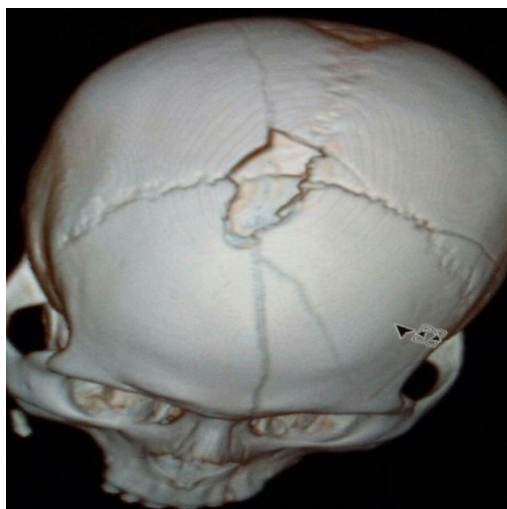
Depressed skull fracture presents after a high energy direct trauma to a small surface area of skull. Superior sagittal sinus injury (SSS) due to depressed skull fracture is most common type of dural venous sinus injury with significant morbidity and mortality. Depressed skull fractures over SSS occasionally lead to occlusion of SSS, resulting in secondary intracranial hypertension and neurological deficit. Classical teaching is to treat these cases conservatively because of risk of fatal venous haemorrhage<sup>(7,9)</sup>. The use of surgical management in these cases is a matter of controversy. However, some published series documented safe fracture elevation over the SSS with clinical and radiographic resolution<sup>(2,4,8,13)</sup>. In support, we report the surgically treated three cases of of SSS injury with good outcome.

### Case Report

**Case 1:** A 50 year old patient came with externally compound depressed fracture on the top of skull due to fall from height with grossly contaminated wound. CT head with 3D reconstruction revealed depressed bone over middle 1/3<sup>rd</sup> of SSS. The depressed bone was elevated and tear over SSS repaired with gel foam and muscle patch. After haemostasis wound was thoroughly cleaned. Patient was discharged on post-op day 10 (Fig. 1, Fig. 2).

**Case 2:** A 36 year old male came with externally compound fracture on posterior parietal region. NCCT head revealed depressed bony fracture over post 1/3<sup>rd</sup> of SSS with thin extradural hematoma and right temporal contusion. Burrhole was made on right parietal bone near depressed segment, which was then partially removed and EDH evacuated. Postoperative CT scan revealed temporal contusion only. Post-op MR Venography was suggestive of normal SSS. Patient got improved and was discharged on post-op day 8 (Fig. 3, Fig. 4).

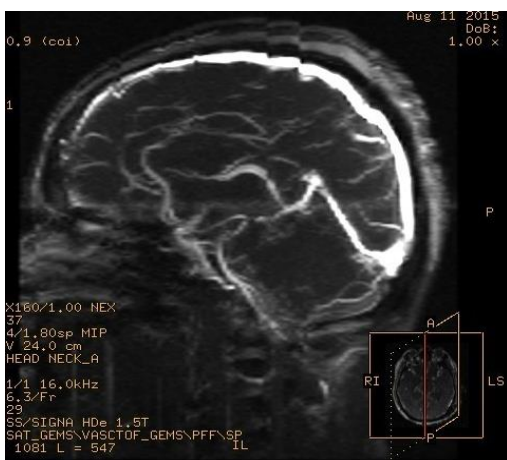
**Case 3:** A 38 year old male came with externally – internally compound fracture with CSF leakage from wound and nose due to RTA. NCCT head revealed depressed bone over anterior portion of SSS. Bifrontal craniotomy was done and SSS was ligated safely. Dural repair was done with pericranium and frontal sinuses were exteriorized. Postoperative course was uneventful.



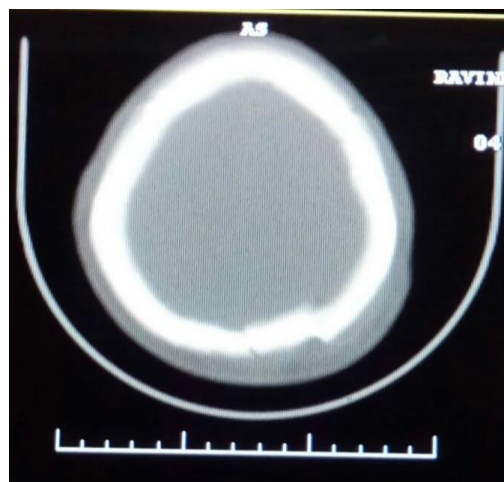
**Fig. 1: 3 D CT image showing depressed fracture of skull**



**Fig. 2: Photo graph of patient showing depressed fracture intraoperative**



**Fig. 3: MR VENOGRAPHY showing patent superior sagittal sinus after elevation of depressed fracture**



**Fig. 4: CT scan showing depressed fracture skull**

### Discussion

Classical teaching is to treat these cases conservatively because of risk of fatal venous haemorrhage<sup>(7,9)</sup>. In Cushing series and Meirowsky series mortality noted in dural sinus injury were 78% and 12% respectively. Depressed calverial fracture may lead to SSS occlusion. SSS occlusion leads to raised intra-cranial pressure, cortical vein thrombosis, and encephalopathy<sup>(2,3,5,10,12,14)</sup>. Successful conservative management with repeated human lumbar puncture, oral acetazolamide and anticoagulants has been described for SSS thrombosis leading to raised intra-cranial pressure. Spontaneous recanalization is also reported<sup>(11)</sup>. Literature has shown immediate normalization and rapid resolution of symptoms and signs as well as SSS patency improvement after elevation<sup>(1,13)</sup>.

Factors justifying surgical treatment include presence of CSF leak suggestive of dural tear, open fracture suggestive of risk of infection, significant mass effect on underlying parenchyma and marked cosmetic disfigurement<sup>(4)</sup>. In such cases, operative debridement with or without elevation of fracture fragments and primary dural closure where appropriate can prevent associated sequelae<sup>(4)</sup>, however, it is not clear that fracture elevation aids in prevention of post-traumatic epilepsy<sup>(6)</sup>.

Several published reports document safe fracture elevation after failed conservative management. In a patient with traumatic SSS injury leading to total SSS obstruction, elevation of the bony fragments leads to resolution of headache and obtundation<sup>(2)</sup>. More recently, another patient with an open parietal depressed fracture and partial SSS obstruction underwent fracture elevation, leading to

immediate intraoperative ICP reduction<sup>(4)</sup>. Although all patients deserve individual consideration, Surgical exposure led to safe decompression followed by resolution of all neurological findings attributable to secondary intracranial hypertension.

### Conclusion

Hence, it is recommended that if expertise in neuro-trauma is available, all patients with significant calverial fracture over superior SSS should be surgically treated with follow up intracranial hypertension and MR Venography for patency and flow in SSS.

**Conflict of Interest: None**

**Source of Support: Nil**

### References

1. Binder DK, Sarkissian V, Schmidt MH, Pitts LH. Resolution of intracranial hypertension after elevation of depressed cranial fracture over the superior sagittal sinus: case report. *Neurosurgery* 55:986,2004.
2. Caudill CM, French LA, Haines GL: Increased intracranial pressure following compression of the superior sagittal sinus. *Neurology* 3:231–233,1953.
3. Curry DJ, Frim DM. Delayed repair of open depressed skull fracture. *Pediatr Neurosurg* 31:294-297,1999.
4. du Plessis JJ: Depressed skull fracture involving the superior sagittal sinus as a cause of persistent raised intracranial pressure: A case report. *J Trauma* 34:290–292, 1993.
5. Fuentes S, Metellus P, Levrier O, Adetchessi T, Dufour H, Grisoli F. Depressed skull fracture overlying the superior sagittal sinus causing benign intracranial hypertension. Description of two cases and review of the literature. *Br JNeurosurg* 19:438-442,2005.
6. Jennett B, Miller JD, Braakman R: Epilepsy after non-missile depressed skull fracture. *J Neurosurg* 41:208–216,1974.
7. Le Feuvre D, Taylor A, Peter JC. Compound depressed skull fracture involving a venous sinus. *Surg Neurol* 62:121-126,2004.
8. Meltzer H, LoSasso B, Sobo EJ: Depressed occipital skull fracture with associated sagittal sinus occlusion. *J Trauma* 49:981,2000.
9. Miller JD, Janett WB. Complication of depressed skull fractures. *Lancet* 2: 991-995,1965.
10. Ozer FD, Yurt A, Sucu HK, Tektas S. Depressed fractures over cranial venous sinus. *J Emerg Med* 29:137-139,2005.
11. Tamimi A, Abu- ELrub M, Shudifat A, Saleh Q, Kharazi K, Tamimi I. Superior sagittal sinus thrombosis associated with raised intracranial pressure in closed head injury with depressed skull fracture. *Pediatr Neurosurg* 41:237-240;2005.
12. Tanaka H, Kobata H, Superior sagittal sinus occlusion caused by a compound depressed skull fracture: a case treated by emergency surgery. *No Shinkei Geka* 32:753-758,2004.
13. Uzan M, Çiplak N, Dashti SG, Bozkus H, Erdinçler P, Akman C: Depressed skull fracture overlying the superior sagittal sinus as a cause of benign intracranial hypertension. *J Neurosurg* 88:598–600,1998.
14. Yadav YR, Parihar V, Sinha M, Jain N. Simple depressed skull fracture causing posterior third superior sagittal sinus occlusion and elevated intracranial pressure. *Neurology India* 57:830-831,2009.