Depressed calveria over superior sagittal sinus

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Abstract
The use of surgical treatment for depressed skull fractures that are located over major venous sinuses is a matter of controversy. However, if clinical and radiological findings of sinus obliteration and related intracranial hypertension are present, surgical decompression is indicated. Depressed skull fracture over superior sagittal sinus (SSS) 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. The use of surgical management in these cases is a matter of controversy. Here, we are reporting surgically treated twelve cases of SSS injury due to depressed skull fracture with good outcome.

Keywords: Head injury, Skull fracture, Superior sagittal sinus.

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. Significant dural sinus injury occurs in 1.5-5% of all head injuries and injury to superior sagittal sinus (SSS) accounts for 70-80% of these. The clinical presentations of patients with significant venous sinus injury vary with both mechanism and location of injuries. 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.[7,10] 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.[2,4,8,11,14] In support, we report the surgically treated twelve cases of SSS injury with good outcome.

Materials and Methods
All cases admitted for last four years with depressed skull fracture over superior sagittal sinus were operated. Most common source of injury was assault (7 cases) followed by road side accident (5 cases).

Result
Mortality rate was zero percent in our series. Infection was seen in 3 cases, reexploration was done in 2 cases, SSS thrombosis was seen in 4 cases. Small tear over SSS was found in 7 cases and was managed with head elevation and compression with Gelfoam® and in five cases there were large tear, which was managed with sinoraphy.

Discussion
Significant dural sinus injury occurred in 1.5-5% of all severe head injured patients. Meirowsky reviewed 100 cases of dural sinus injury, emphasized the need for wide proximal and distal control of damaged sinus, described repair techniques using Gelfoam, muscle strips and silk sutures and reported mortality of 12% only.[9]

Classical teaching is to treat these cases conservatively because of risk of fatal venous haemorrhage.[7,11] 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.[2,3,5,11,13,15] 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.[12] Literature has shown immediate normalization and rapid resolution of symptoms and signs as well as SSS patency improvement after elevation.[1,15] Coagulation studies must be obtained during the perioperative period because coagulopathy usually occurs due to massive transfusion after significant blood loss. Thrombocytopenia occurs in 85% cases and defibrination in 69% cases. Hence, arrangements for fresh frozen plasma or platelet concentrate should be done before surgery. 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.[4] In such cases, operative debridement with or without elevation of fracture fragments and primary dural closure where appropriate can prevent associated sequelae,[4] however, it is not clear that fracture elevation aids in prevention of post-traumatic epilepsy.[6] 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.[2] More recently, another patient with an open parietal depressed fracture and partial SSS obstruction underwent fracture elevation, leading to immediate intraoperative ICP reduction.[4] 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.

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Conflict of Interest

None.

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