International Journal of Research in Medical Sciences
*Khaladkar SM et al. Int J Res Med Sci. 2016 Nov;4(11):5085-5086*
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20163824

**Case Report**

# Post craniectomy paradoxical brain herniation: a case report with radiological review

**Sanjay M. Khaladkar, Raunak Raj*, Rajul Bhargava, Rohan Khujat, Amaya Mahajan**

Department of Radiodiagnosis, Dr D.Y Patil Medical College and research Centre, Pimpri, Pune, Maharashtra, India

**Received:** 10 September 2016
**Accepted:** 04 October 2016

***Correspondence:**
Dr. Raunak Raj,
E-mail: raj.raunak10@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

Sinking skin flap (SSF) syndrome and paradoxical brain herniation are rare complications after craniectomy. On CT scan, there is shrunken appearance of the skin flap at craniectomy site. The meningogaleal complex is drawn inwards and is resting on underlying deformed brain with resultant concave surface. It results due to altered CSF hydrodynamics. Paradoxical brain herniation is rare complications which occur in patients who undergo cerebrospinal fluid (CSF) drainage procedures like lumbar puncture (LP), external ventricular drainage, ventriculo-peritoneal shunting and post craniectomy. Its early detection on imaging is essential as it is a neurosurgical emergency. We report a case of 75 year old male previously operated for left chronic subdural hematoma in the left fronto-temporo-parietal region presenting with altered consciousness and inability to walk. Plain CT scan showed craniectomy defect in the left fronto-temporo-parietal region with indrawing of meningogaleal complex suggestive of Shrunken Skin Flap. There was mass effect on the left lateral ventricle and third ventricle with shift of the midline structures towards right (1cm) with evidence of subfalcine herniation suggestive of paradoxical brain herniation.

**Keywords:** Meningogaleal complex, Mesodiencephalic dysfunction, Post craniectomy, Paradoxical brain herniation, Sinking flap syndrome

## INTRODUCTION

Sinking skin flap (SSF) syndrome is one of the rare complications after craniectomy, also called Trephine Syndrome. It manifests as headache, dizziness, seizures, mood changes, easy fatigability. On CT scan, there is shrunken appearance of the skin flap at craniectomy site. The meningogaleal complex is drawn inwards and is resting on underlying deformed brain with resultant concave surface. It occurs between 28 to 188 days after decompressive craniectomy.[1]

It results due to altered CSF hydrodyanamics which occurs due to exposure of the intracranial contents to atmospheric pressure. As a result there is reduction in cerebral perfusion and deformity of the brain.2 Sinking Skin Flap may progress to paradoxical brain herniation when atmospheric pressure exceeds intracranial pressure.

## CASE REPORT

A 75year old male patient presented with altered consciousness and inability to walk. He was previously operated for left chronic subdural hematoma in the left fronto-temporo-parietal region (Figure 1A and 1B).

Plain CT scan showed craniectomy defect in the left fronto-temporo-parietal region. The meningogaleal complex was displaced inwards with concave deformity of the underlying left cerebral hemisphere suggestive of shrunken skin flap. Underlying sulcal spaces were effaced.

There was mass effect on the left lateral ventricle and third ventricle with shift of the midline structures towards right (1cm) with evidence of subfalcine herniation (Figure 2A-C). Diagnosis of paradoxical brain herniation (with midline shift opposite to operative site) was given.

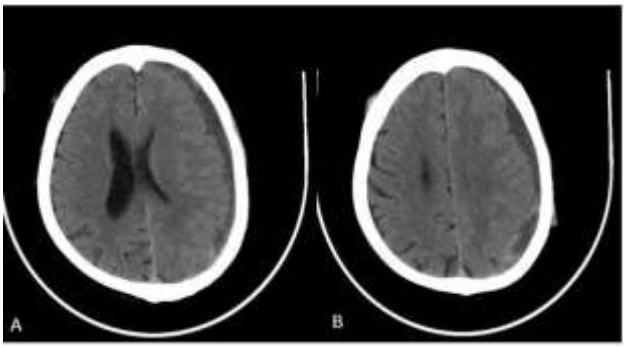


**Figure 1 (A and B): Plain CT scan showing hypodense chronic subdural hematoma in left fronto-parietal region causing mild ventricular mass effect.**

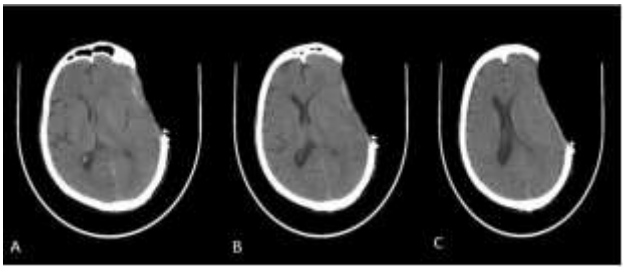


**Figure 2 (A-C): Plain CT scan of brain showing sinking flap at craniectomy site with paradoxical brain herniation on right side.**

## DISCUSSION

Paradoxical brain herniation is a rare complication which occur in patients who undergo cerebrospinal fluid (CSF) drainage procedures like Lumbar Puncture (LP), external ventricular drainage, ventriculo-peritoneal shunting and post craniectomy.[3,4] It presents as focal neurological deficit, altered level of consciousness, autonomic instability and signs of brain stem disease.[5] Post-surgery or following CSF drainage, there is decrease in CSF pressure with resultant reduction in intracranial pressure.

The intracranial contents are exposed to external positive atmospheric pressure. Hence the intracranial contents deviate away from the site of craniectomy due to pressure gradient. This results in subfalcine and transtentorial herniation away from craniectomy defect with resultant mesodiencephalic dysfunction.

Its early detection on imaging is essential as it is a neurosurgical emergency. Treatment aims at restoring continuity of the calvaria, stoppage of the CSF leakage and methods to increase intracranial pressure. Treatment options are administration of the intravenous fluid, placing the patient in the Trendelenburg position especially with craniectomy site down, clamping of the ventricular shunts or drains and early performance of cranioplasty.[5] It can be effectively and quickly reversed with a lumbar epidural blood patch.[6]

Subtle neurological symptoms due to paradoxical brain herniation may be difficult to elicit in patients due to pre-existing neurological deficits from prior insults. Hence early radiological evaluation is must to establish the diagnosis. CT or MRI show shrunken skin flap with brain herniation away from craniectomy defect with resultant midline shift, subfalcine and transtentorial descending herniation, effacement of the basal cisterns and compression of the ventricles.[5]

## CONCLUSION

Paradoxical brain herniation following craniectomy is a rare complication. Its early recognition and treatment is must as it may eventually lead to coma and death.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: Not required*

## REFERENCES

1. Yang XF, Wen L, Shen F, Li G, Lou R, Liu WG, ET AL. Surgical complications secondary to decompressive craniectomy in patients with a head injury: a series of 108 consecutive cases. Acta Neurochir (Wien). 2008;150(12):1241-7.
2. Akins PT, Guppy KH. Sinking skin flaps, paradoxical herniation, and external brain tamponade: a review of decompressive craniectomy management. Neurocrit Care. 2008;9(2):269-76.
3. Fields JD, Lansberg MG, Skirboll SL, Kurien PA, Wijman CA. Paradoxical transtentorial herniation due to CSF drainage in the presence of a hemicraniectomy Neurology. 2006;67(8):1513-4.
4. Vilela MD. Delayed paradoxical herniation after a decompressive craniectomy: case report. Surg Neurol. 2008;69(3):293-6.
5. Sinclair AG, Scoffings DJ. Imaging of the post-operative cranium. Radiographics. 2010;30(2):461-82.
6. Seinfeld J, Sawyer M, Rabb CH. Successful treatment of paradoxical cerebral herniation by lumbar epidural blood patch placement: technical case report. Neurosurgery. 2007;61(3 Suppl):E175.

**Cite this article as:** Khaladkar SM, Raj R, Bhargava R, Khujat R, Mahajan A. Post craniectomy paradoxical brain herniation: a case report with radiological review. Int J Res Med Sci 2016;4:5085-6.