

Intraparenchymal Hemorrhage after Cranioplasty in a Patient with Sinking Flap Syndrome

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ABSTRACT: Decompressive craniectomy has been increasingly used in recent decades for the treatment of uncontrollable intracranial hypertension caused by trauma, malignant strokes, cerebral venous thrombosis, among others. Sinking flap syndrome (SFS) is a rare complication characterized by neurological deterioration after craniectomy. Here, we report the case of a 73-year-old female patient who presented with disorientation, lip rhyme deviation to the right and left hemiparesis after cardiac catheterization. In view of the presence of a malignant stroke, as well as the willingness of the family members to make a total investment to save the patient's life, decompressive hemicraniectomy was indicated. Subsequently, due to occasional headache attacks, nausea and vomiting, in addition to progressive depression of the subcutaneous flap, the possibility of SFS was suggested and cranioplasty was indicated, which occurred without perioperative intercurrents. Although the patient maintained a stable neurological status, a post-surgical computed tomography (CT) scan of the head showed a right intraparenchymal hemorrhagic lesion, associated with parenchymal expansion and midline deviation. To the best of our knowledge, intraparenchymal hemorrhages are not common complications after performing cranioplasty, and additional studies are needed to understand the reasons why this occurs. The mechanisms responsible for this type of injury are not well understood, but involve reperfusion damage and loss of brain compliance. Despite representing an uncommon complication, post-cranioplasty hemorrhage can cause severe morbidity to the patient, and early diagnosis and intervention are of great importance in these cases.

KEYWORDS: *Sinking flap syndrome, Cranioplasty, Decompressive craniectomy, post-operative hemorrhage.*

Introduction

Decompressive craniectomy has been increasingly used in recent decades for the treatment of uncontrollable intracranial hypertension caused by trauma, malignant strokes, cerebral venous thrombosis, among others.

Sinking flap syndrome is a rare complication characterized by neurological deterioration after craniectomy.

Its symptoms include headache, focal deficits and mental status changes. SFS alterations, as defined by Yamaura and Makina [1], could be explained due to the concavity of the skin flap and the paradoxical herniation process allied to the pressure of the atmosphere on the underlying brain tissue.

Cranioplasty is the treatment of choice for SFS, aiming to recover the protective and aesthetic function of the skull.

Next, we report the occurrence of reperfusion edema and intraparenchymal hemorrhage after cranioplasty in a patient with SFS.

We will also discuss possible flow mechanisms responsible for post-cranioplasty bleeding.

Case Report

A 73-year-old female patient presented with disorientation, labial rhyme deviation to the right and left hemiparesis after cardiac catheterization.

A computed tomography (CT) scan of the skull was performed, which showed an area of ischemia in the region of the right middle cerebral artery (MCA).

Ischemic stroke was diagnosed early, and the patient had an indication for thrombolysis, which was performed according to the standard protocol. Subsequently, the patient developed significant cerebral edema and midline deviation on the control CT, showing dense left hemiparesis and 9 points on the Glasgow Coma Scale (GCS).

In view of the presence of a malignant stroke, as well as the willingness of the family members to make a total investment to save the patient's life, decompressive hemicraniectomy was indicated.

The procedure was uneventful and there were no complications in the postoperative period.

Four months after surgery, the patient returned for consultation at the Neurosurgery service, presenting with dysarthria and left hemiplegia.

A new CT scan of the head showed signs of hydrocephalus, and the patient was hospitalized for installation of Ventricular Peritoneal Shunt, which also occurred uneventfully.

After 30 days, the patient evolved with clinical improvement, but still had occasional attacks of

headache, nausea and vomiting, in addition to progressive depression of the subcutaneous flap over the hemicraniectomy.

The possibility of sinking flap syndrome was suggested and cranioplasty was indicated, which occurred without perioperative intercurrents.

Although the patient maintained a stable neurological condition, a post-surgical CT scan of the head showed a hemorrhagic intraparenchymal lesion on the right, associated with parenchymal expansion and midline deviation (Figure 1).

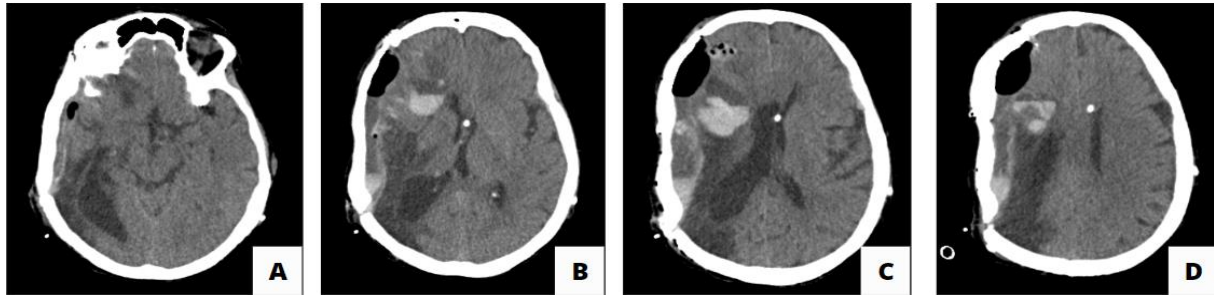


Figure 1. CT sections presenting intraparenchymal hemorrhagic lesion, with parenchymal expansion and midline deviation.

Subsequently, given the absence of deterioration in the clinical picture, absence of signs of herniation and deviation of midline structures, conservative treatment was chosen.

The patient remained stable and was discharged after the required observation period, and is currently under outpatient follow-up.

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Discussions

Decompressive craniectomy is a common procedure in the setting of trauma or cerebral infarction, with the patient being required to subsequently undergo a second procedure for cranial reconstruction.

To the best of our knowledge, intraparenchymal hemorrhages are not common complications following cranioplasty.

In analyzes by the Department of Neurosurgery at Albany Medical Center, a prevalence of 34% of postoperative complications was observed in patients undergoing the procedure.

None of the 62 cases analyzed presented intraparenchymal hemorrhage, with infections,

surgical wound dehiscence, epidural and subdural hematoma, bone resorption, hydrocephalus and deep vein thrombosis being the most common complications in the analysis.

Therefore, as we reported, intracerebral hemorrhages after cranioplasty are a dramatic and unpredictable event.

Additional studies are needed to understand the reasons why this occurs.

However, we believe that some possibilities for this to happen are considerable.

The first hypothesis is that there is an excessive increase in cerebral blood flow above metabolic needs (reperfusion-hyperperfusion), which may favor intracerebral hemorrhages, since the mechanism of hyperperfusion after cranioplasty must occur in all patients, whereas hemorrhage post-cranioplasty is a rare event.

Furthermore, Sae Min Kwon et al [2] suggest that the injured cerebral hemisphere slowly progresses to encephalomalacia.

As tissue elastance is likely to be decreased, a pressure change must progress to a volume change, as cerebral vascular resistance (CVR) is decreased.

Thus, brain expansion by drastically decreasing CVR when subjected to sudden reperfusion leaves the parenchyma much more susceptible to reperfusion damage.

Thus, analyzing cases already reported, dramatic and unpredictable outcomes are noted,

although rare in which reperfusion damage was considered to be the cause.

Thus, concomitantly similar to the reports of P. C. Cecchi [3] and Zongyu Xiao [4], who demonstrated that the impaired self-regulation of cerebral pressure can lead to a decrease in cerebral blood flow and metabolism when the bone is deficient, considering that after the addition of artificial bone and its protection against atmospheric pressure, patients did not respond in a timely manner to adapt to these changes, thus resulting in increased perfusion pressure and cerebral edema, leading to hemorrhage.

Given this similarity of complications after cranioplasty [5], we question the possible underreporting of cases and the importance of considering this fatal condition.

This is a report of an uncommon complication, but of severe morbidity to the patient.

In our opinion, edema and intracerebral hemorrhage should be included in the list of possible complications of cranioplasty in patients with large cranial vault defect and paradoxical herniation [6], because, despite its rarity, this situation can be extremely serious, and the diagnosis and early intervention should be advocated.

It is suggested that an important mechanism of sudden change in cerebral blood flow is related to the development of such complications.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Availability of data and materials.

All data generated or analyzed during this study are included in this published article.

Conflict of interests

None to declare.

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