

Role of Fenestrations in Acrylic Cranioplasty

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Abstract

Cranioplasty provides safety and cosmesis during rehabilitation phase after decompression craniectomy. Infection, implant exposure, seizures and hematoma are the complications associated with cranioplasty. There is high rate of reoperation after post cranioplasty hematoma and infection. Introducing fenestrations in the acrylic plate during cranioplasty is a simple and effective step to facilitate conservative management of patient after the unfortunate event of complication. It reduces the rate of reoperation and associated complications after cranioplasty. Here we present a case in which we successfully managed post cranioplasty extradural collection non-operatively.

Keywords: Cranioplasty; Complications; Hematoma; Acrylic plate.

Introduction

Decompressive craniectomy is performed for increased intracranial pressure secondary to trauma or any other pathology. Cranioplasty (surgical correction of the skull defects) is a part of the rehabilitation process following craniectomy. It provides neural tissue protection, cosmesis and improvement of cerebral function. Cranioplasty performed after decompressive craniectomy has remarkably high complication rate (16%-34%) [1]. Many of these complications require reoperation, which further increases risk of complication and mortality. Here we present a simple modification in

the operative procedure of cranioplasty which can reduce the reoperation rate after unfortunate event of complication.

Case report

A 25 year male patient with history of decompressive craniectomy for evacuation of post traumatic acute extradural and subdural hemorrhage has undergone subsequent cranioplasty after 12 months of primary surgery. Patient's autologous bone was not available because of comminuted fracture at the time of trauma. Prefabricated 3D-printed acrylic (Polymethyl-methacrylate; PMMA) [4] plate was used for the cranioplasty. Before fixing it with the screws we incorporated fenestrations in the acrylic plate using 2mm drill bit (Fig. 1). This simple modification of incorporating holes in the acrylic plate kept the subgaleal and extradural space communicating even after placing the plate in between. After fixing the plate hemostasis was achieved. Suction drain was placed in subgaleal plane and scalp flap was closed in layers.

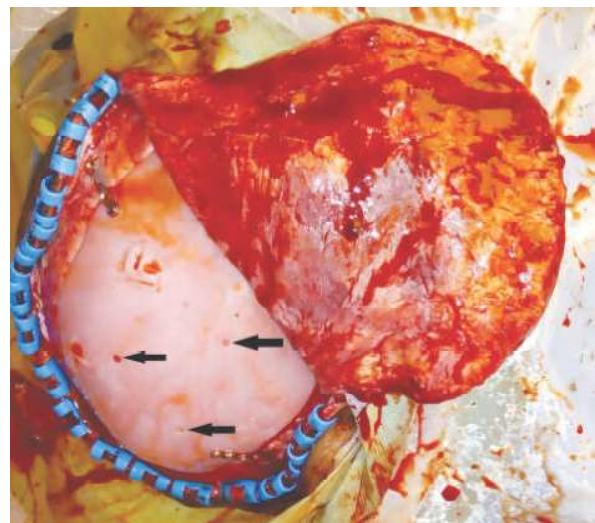


Fig. 1: Cranioplasty (intraoperative picture) with fenestrations incorporated in the acrylic plate

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On same postoperative day significant drain output was recorded which was sanguineous in consistency. On postoperative day 1 patient had an episode of seizures. Emergency CT scan was taken which showed acute blood collection in the subgaleal and extradural plane. The collection was not causing significant brain compression and there was no midline shift. Patient was maintaining Glasgow Coma Scale (GCS) score of 15/15. With the consultation of neurosurgeon it was decided to manage this complication non-operatively until the patient shows any clinical or radiological sign of expansion of hematoma or deterioration of neurological status. After taking informed written consent from patient he was kept under observation and serial CT scans were performed. The subgaleal and extradural spaces were connected through holes made in the acrylic plate, so it was expected that suction drain will clear the collection completely. Initially subgaleal collection decreased and by the postoperative day 5 CT scan started showing decrease in the extradural collection. Suction drain output was significant (>10 mL) till postoperative day 14. Consistency of drain content was collected dark coloured blood. Drain and sutures were removed on day 15th. On day 16th CT scan showed significant decrease in extradural collection. Patient maintained GCS 15/15 throughout the observation period and seizures did not recur. Thus we successfully managed post cranioplasty extradural collection non-operatively. This case shows significant role of fenestrations in acrylic plate cranioplasty.

Discussion

Complication rate after cranioplasty is 16-34% [1]. Most common complication is infection (3-12%) [1,2] followed by wound dehiscence and implant exposure, seizures and hematoma. Gooch et al reported 3.2% incidence of hematoma [2].

Among the patients with post cranioplasty complications 25%-76% require reoperation. Reoperation is required for removal of infected implant or evacuation of hematoma. Reoperation for hematoma evacuation has substantially higher mortality. Second operation further increases the risk of introducing infection, lengthens the hospital stay and associated with the same complication risk as the cranioplasty. Avoiding reoperation for these cases will improve the outcomes of cranioplasty [1,3]. Making the fenestrations in the acrylic plate makes the extradural and subgaleal

planes connected together. Drain placed in subgaleal plane slowly sucks out the extradural collection also through these holes. The drain is not placed directly over the dura so it does not increase risk of dural haemorrhage or infection. Size of the holes is recommended to be of sufficient caliber (>2-3 mm) to maintain their patency. There is no extra cost required for this modification.

Drawback of conservative approach of managing post cranioplasty EDH is the need for long ICU monitoring and serial CT scan. But again it is cost effective as compared to second surgery, postoperative care and physical and psychological trauma to the patient associated with that. Duration of hospital stay is expected to be same in conservative and operative approach and further studies are required for objective evidence of this.

Keeping drain for long period may introduce infection in the operated site. Strict asepsis is recommended while handling the drain. Also the prolonged course of antibiotics is required. The residual collection in the extradural space will take long time to get absorbed and may act as a nidus of infection in future. However risk of introduction of infection is more in reoperation compared to conservative approach.

Conclusion

Introducing fenestrations in the acrylic plate during cranioplasty is a simple and effective step to facilitate conservative management of patient after the unfortunate event of complication. It reduces the rate of reoperation and associated complications after cranioplasty.

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