INTRODUCTION

Decompressive craniectomy (DC) is still the treatment of choice for intractable high intracranial pressure (ICP) with mass effect secondary to traumatic brain injury (TBI) and stroke. Patients are left with a skull defect after the surgery and this necessitates the need to close back the defect after the acute period has passed to prevent secondary injuries due to exposed brain without a shield and also because it still remains as a cosmetic defect which needs correction.

Cranioplasty is the surgical intervention to repair cranial defects. There are various choices for cranioplasties which involve lifting the scalp and restoring the contour of the skull with either autografts or allografts.

CASE PRESENTATION

A 27-year-old car driver was involved in a traffic accident. He sustained severe TBI with a Glasgow Coma Scale (GCS) score of 8. An urgent computed tomography (CT) scan of the brain was performed which showed multiple contusions mainly at the bifrontal region with traumatic subarachnoid hemorrhage. There was a significant mass effect with obliterated basal cisterns and bifrontal DC was performed (Fig. 1). The bone flap was cryopreserved in a bone bank freezer.

He gradually improved after multidisciplinary team management and received active rehabilitation and physiotherapy. At discharge, his GCS score was 11 being E4V2M5. Five months after the first surgery, he was planned for autologous cranioplasty and was electively admitted for surgery. His operative site was not bulging and his scalp was free from infection with a well-healed surgical scar. He had an uneventful surgery and was discharged home three days later.

The bone flap is retrieved from the freezer and thawed at room temperature during surgery by placing it in sterile gentamycin solution before being washed with copious povidone mixed hydrogen peroxide solution and finally washed again in sterile gentamycin solution.

The patient was positioned supine and the head was turned so that the skull defect side is on top. The scalp was incised at the previous wound and dissected from the remaining cranium. The underlying dura...
DISCUSSION

Craniotomy or skull trepanation along with corrective cranioplasty existed since ancient days with some dating back to 7000 BC. This procedure has seen tremendous evolution in the types of materials and techniques used. As the number of various ideas increases with different efforts being spent on research; new technologies are developed for the ease of the surgeon and the benefit of the patient. Despite all of these, there is no ideal implant if it is compared to the autologous bone flap because any other implant is considered a foreign material. An ideal cranioplasty must have the following features as seen in Table 1 but still, there is no perfect material to fit all these criteria.1,2

The decision of when to do the cranioplasty also matters as there is no clear guideline on the ideal timing of cranioplasty after craniectomy. A study of 157 patients, showed the least amount of complications were associated with a postoperative interval of fewer than 4 weeks or more than 20 weeks after DC, thus using both as acceptable timing for cranioplasty. This study concluded that if clinically safe and feasible, cranioplasty during the same hospitalization as DC for trauma can be undertaken without increasing complication risks. On the whole, the optimal timing of cranioplasty after DC still remains unknown.3

As most surgeons would avoid unnecessary surgeries especially in vegetative or bed-bound patients, cranioplasty is often indicated in DC patients with sunken flap syndrome causing neurologic deficits. A cranioplasty flap is required to prevent the atmospheric pressure to cause inward herniation of the skin flap leading to compression of the brain structures. This condition can be severe and cause irreversible damage if not identified and treated early.4

Cranioplasty is also indicated to recreate the solid skull covering that protects the brain from injury. It also cosmetically gives patients a near-normal skull appearance if possible. Post-DC patients are often required to wear helmets to protect them from further traumatic force especially during falls as the brain lacks a solid protective covering. Cranioplasty helps protect the brain from external injury.3

Complications following cranioplasty can be divided into early and late. Early complications are hematoma, screw failure, implant breakage, and wound breakdown. Late complications are bone graft resorption, implant loosening, and implant extrusion. Infections and seizures can be both part of early and late complications.5 Surgeons should always ensure proper methods are undertaken in order to minimize or avoid these complications.

CONCLUSION

Cranioplasty is a common procedure but involves many complications if not properly planned or done. There is no absolutely ideal material for cranioplasty and the closest to the ideal is autologous bone flaps but the risk of bone absorption is always
present. The ideal timing of cranioplasty is still debatable and is mostly based on the surgeon's preference. Deliberate care must be taken during the perioperative period to prevent complications to ensure a good postoperative outcome.

CONFLICT OF INTEREST
The authors declared no conflict of interest regarding the preparation of this manuscript.

AUTHOR CONTRIBUTION
The authors contributed equally to preparing this manuscript.

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