Autologous bone flap cranioplasty surgical site infection

Bone flap infection following any cranial surgery is a serious and burdensome complication. This complication ranges from simple superficial wound infections to deeper infections, such as bone flap osteomyelitis, meningitis or brain abscesses [1].

The results of a prospective study provide valuable information for predicting outcomes following cranioplasty with autologous bone flaps stored with cryopreservation or in subcutaneous pockets. In conclusion, there is no difference in the incidence of post-cranioplasty SSI using autologous bone flaps stored either by cryopreservation or in subcutaneous pockets. However, undergoing multiple cranial operations following craniectomy is a significant risk factor for post-cranioplasty SSI. Attempts to reduce Cerebrospinal fluid fistulas, subgaleal haematoma and post-craniectomy haematoma are necessary in order to reduce repeated cranial operations before cranioplasty [2].

For Alkhaibary et al. blood glucose levels and skull defect size were the only identifiable risk factors associated with SSI. Storing bone flaps in subcutaneous abdominal pockets is cost-efficient but carries considerable risk of infection [3]

A literature review of multiple retrospective studies revealed that the rate of post-cranioplasty SSI with cryopreserved bone flaps ranges between 0% and 25.9%; for subcutaneous preserved bone flaps, the rate ranges between 2.3% and 5.1% [4]

Implantation of autologous cryopreserved bone has been associated with infection rates of up to 33%, resulting in considerable patient morbidity. Predisposing factors for infection and other complications are poorly understood.

The objectives of a study of Yeap et al. were to assess the predictive value of swab cultures of cryopreserved skull flaps during cranioplasty for surgical site infections (SSIs).

The authors conducted a retrospective review on the consecutive patients who underwent delayed cranioplasties with cryopreserved autografts between 2009 and 2017. The results of cultures obtained from swabs and infected surgical sites were assessed. The accuracy, sensitivity and specificity of swab cultures for SSIs were evaluated.

The study included 422 patients, categorized into two groups, the 'swab' and 'non-swab' groups, depending on whether swab cultures were implemented during cranioplasties. The overall infection rate was 7.58%. No difference was seen in the infection rates between both groups. There were 18

false-positive and no true-positive swab culture results. All bacteria between swab cultures and SSI cultures were discordant. Meanwhile, there were 19 false-negative swab cultures. The results showed high specificity but low sensitivity for swab cultures to predict SSI occurrence and the pathogens.

Due to low accuracy and sensitivity, swab cultures of cryopreserved autografts should not be routinely performed during delayed cranioplasties [5)]

Case series

Sixty-seven out of 166 patients (40.4 %) experienced at least one complication during a median follow-up time of 15 months (inter-quartile range 5-38 months). Thirty six patients (21.7 %) developed infection requiring antibiotics, with 27 (16.3 %) requiring removal of the cranioplasty. Nine of 25 patients (36 %) with bi-frontal defects developed an infection whereas 21 of the 153 patients (16.4 %) with a defect other than bi-frontal developed an infection (Chi square $p = 0.009$). Further surgery in the two groups was required in 16.4 % and 11.7, % respectively. Pseudomeningocoele (9 %), seizures (8.4 %) and poor cosmesis (7.2 %) were also commonly observed. Logistic regression analysis identified initial operation ($p < 0.03$), mRS at the time of cranioplasty ($p < 0.0001$) and complications ($p < 0.04$) as being predictive of neurological outcome at last follow-up. Age at the time of cranioplasty and the timing of cranioplasty were not predictive of last mRS score at follow-up.

Conclusions: Cranioplasty harbours significant morbidity, a risk that appears to be higher with a bifrontal defect. The complications experienced influence subsequent functional outcome. The timing of cranioplasty, early or late, after the initial operation does not impact on the ultimate outcome. These findings should be considered when making decisions relating to craniectomy and cranioplasty [6)].

Two hundred and forty-three cranioplasties were performed from 2000 to 2010, with a follow-up of at least 1 year. Age, sex, comorbidities, material, site of skull defect, time between decompression and cranioplasty, and rate of complications were collected from our database. Fischer's T-test and direct logistical regression were performed to identify factors that contributed to the rate of complications. $p < 0.05$ was considered significant.

Results: Post-cranioplasty seizures (14.81%), infection and exposed implant (9.05%), haemorrhage (1.65%) and others (0.82%) were identified complications. Total percentage of complications was 25.92%. Previous trauma ($p = 0.034$) and intracranial haemorrhage ($p = 0.019$) as well as pre-cranioplasty neurological deficit ($p = 0.046$) were related to seizures, while pre-cranioplasty neurological deficit ($p = 0.036$) and exposed implant extrusion ($p = 0.048$) contributed to infection of cranioplasties.

Discussion: Most of the seizures may be post-traumatic seizures or scar epilepsy from intracranial haemorrhage. Implant extrusions were found to be associated with infection of the implant, and they should therefore be treated early. Patient selection is important as patients with neurological deficits were susceptible to seizures and infection. Intracranial haemorrhage was caused by persistant bleeding, trauma or shunt overdrainge.

Conclusion: Cranioplasty has significant complications. A thorough understanding of factors that contribute to the different types of complications will benefit the management of cranioplasty patients

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