



Complications of Cranioplasty Using a Bone Flap Sterilized by Autoclaving Following Decompressive Craniectomy

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Introduction

Increasing use of decompressive craniectomies has led to a corresponding number of cranioplasties performed to replace the subsequent bone defect created. We aimed to evaluate the morbidity associated with cranioplasty using autologous bone flap sterilized in an autoclave.

Methods

We retrospectively analyzed data in 149 patients who underwent cranioplasty following decompressive craniectomy during the time period January 1998 to December 2012. Autologous bone flaps were sterilized in an autoclave and stored in a refrigerator at a temperature of eight degrees above zero until cranioplasty was performed. Complications were registered and patient data was analyzed in order to identify risk factors for surgical site infection and bone flap resorption after cranioplasty. Only the patients with a follow-up period of > 24 months were included in the analysis of bone flap resorption (110 patients).

Bone flap sterilization and preservation

The bone flap removed during the initial decompressive hemicraniectomy was cleaned of any remaining soft tissue and boiled for 30 minutes in distilled water. The flap was then sterilized in a one-stage cycle (for 20 min at 121 °C) by using a steam autoclave. The bone flap, hermetically sealed in double sterilization bags and labeled with patients identification, was stored in a refrigerator at 8°C. When the time between sterilization and cranioplasty exceed three months the bone flap was autoclaved again immediately before cranioplasty.

Table 1. Demografic and perioperative data

Variable	n=150 (%)
No. of cranioplasty	150 (100%)
No. of patiens	149 (100%)
Age, mean (SD)	49 (15,8)
Male	107 (72%)
Female	42 (28%)
Indications	
Trauma	110 (73%)
Stroke	25 (17%)
Subarachnoid hemorrhage	11 (7%)
Intracerebral hemorrhage	4 (3%)
Timing (days), mean,(SD)	46 (35,6)
Operative time (min), mean, (SD)	98 (19,3)
Bone flap fixation	
Sutures	99 (66%)
Miniplates	51 (34%)
Side of cranioplasty	
Right	88 (59%)
Left	62 (41%)
Prophylactic antibiotics	150 (100%)
Subcutaneous drainage	150 (100%)
VP shunt	22 (14,7%)
Medical comorbidities	
Diabetes mellitus	13 (9%)
CHOPN	2 (1,3%)
In hospital infection	53 (35%)
Follow-up (months), median	11 (6-60)
Follow-up (months), median	32 (24-60)

Results

Surgical side infection occurred in only five patients (3,3%), whereas bone flap resorption developed in 22 patients (20%). The multivariate analysis of the presented data identified the operating time > 120 minutes (p=0.0277; OR 16.877; 95% CI 1.364- 208.906) and the presence of DM (p=0.0016; OR 54.261; 95% CI 4.529 - 650.083) as independent risk factors of development of infection and the presence of VP shunt (p<0,0001; OR 35.564; 95% CI 9.962 - 126.960) as independent risk factor of development of the bone flap resorption.

Table 2. Rate of complications

Complication	n=150 (%)
Surgical side infection	5 (3,3%)
Bone flap resorption*	22 (20%)
Wound dehiscence	1 (0,7%)
Removal of the bone flap (oedema)	1 (0,7%)
Extradural hematoma	3 (2%)
Subdural hydroma	5 (3,3%)
Epileptic seizures	13 (8,7%)
*110 patients with follow-up period > 24 months	

Conclusions

Reimplantation of the autoclaved autologous bone flap following decompressive craniectomy is a simple and cheap alternative to other techniques and is available to any institution that provides autoclaving sterilization services. This method is associated with a low rate of surgical site infection, but with significant rate of the bone flap resorption.

Learning Objectives

By the conclusion of this session, participants, when evaluating the need to perform decompressive craniectomy, should be aware that the patient is not only subject to the risk of the initial operation, but also the risk of subsequent cranioplasty.