

Post-cranioplasty Infection: A Retrospective Study and Risk factor Analysis

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Introduction

Cranial defects resulting from craniotomy, decompressive craniectomy or trauma can cause disconcerting sensations to patients. Cranioplasty serves as a tool to restore a natural configuration and to provide cerebral protection. Infection remains the most common complication, either in the form of wound infection, epidural abscess or infected flap. This study aimed to evaluate the predisposing factors of post-cranioplasty infection.

Method

This was a 10-year retrospective study of all cranioplasties performed in Pamela Youde Nethersole Eastern Hospital between 1/1/2011 and 31/12/2020. The included patients were stratified into infection group and no infection group. Risk factor analysis was performed according to patients' age, sex, comorbidities, history of previous intracranial infection or surgical site infection, indication of craniectomy, interval between craniectomy and cranioplasty, flap material and defect size.

Results

A total number of 119 patients were included in this study. 11 patients (9.2%) suffered from post-cranioplasty infection and 8 of them underwent removal of bone flap post operatively. The mean age in infection group and no infection group were 54.2 and 52.6 respectively. The infection risks were comparable among different age groups. The male to female ratio was slightly higher in infection group. Of note, history of intracranial infection or surgical site infection after neurosurgical operation was a predisposing factor for post cranioplasty infection (OR 7.73, 95% CI [1.56, 38.34], $p < 0.05$). Patients with hypertension, diabetes or hyperlipidemia also carried higher infection risk (OR 2-3), although the difference was not statistically significant ($p > 0.05$). Furthermore, a higher infection rate was reported in patients who underwent craniectomy due to infection (OR 7.78, 95% CI [1.47, 52.75], $p < 0.05$). Although not reaching statistical significance, the data showed a lower infection rate among patients who underwent early cranioplasty within 3 months. The choice of flap material and cranial defect size did not show significant impact on the infection risk. Using vancomycin alone for flap irrigation intra-operatively may help prevent infection. Patients' demographics and data analysis are summarised below.

	Infection (n = 11)	No Infection (n = 108)	Odds Ratio (95% CI)	p-value
Mean age ± SD	54.18 ± 15.7	52.6 ± 10.71		
Age < 50	5 (45.5%)	39 (36.1%)	1.47 (0.42, 5.15)	0.271
Age 50–70	5 (45.5%)	55 (50.9%)	0.80 (0.23, 2.79)	0.365
Age > 70	1 (9.1%)	12 (11.1%)	0.80 (0.09, 6.81)	0.419
Sex				
Male	7 (63.6%)	58 (53.7%)	1.51 (0.42, 5.46)	0.265
Female	4 (36.4%)	50 (46.3%)	0.66 (0.18, 2.40)	0.265
Comorbidities				
HT	5 (45.5%)	26 (24.1%)	2.63 (0.74, 9.32)	0.067
DM	2 (18.2%)	10 (9.3%)	2.18 (0.41, 11.51)	0.180
Hyperlipidemia	3 (27.3%)	12 (11.1%)	3.00 (0.70, 12.87)	0.070
Intracranial infection / SSI	3 (27.3%)	5 (4.6%)	7.73 (1.56, 38.34)	0.006
Indication of craniectomy				
Cerebrovascular disease	6 (54.5%)	58 (53.7%)	1.03 (0.30, 3.60)	0.479
Trauma	1 (9.1%)	29 (26.9%)	0.27 (0.03, 2.22)	0.112
Neoplasm	2 (18.2%)	18 (16.7%)	1.11 (0.22, 5.58)	0.449
Infection	2 (18.2%)	3 (2.8%)	7.78 (1.47, 52.75)	0.018
Time interval of cranioplasty				
Less than 3 months	3 (27.3%)	54 (50%)	0.38 (0.09, 1.49)	0.082
4 to 12 months	6 (54.5%)	42 (38.9%)	1.89 (0.54, 6.57)	0.160
More than 12 months	2 (18.2%)	12 (11.1%)	1.78 (0.34, 9.22)	0.247
Cranioplasty material				
Autologous	8 (72.7%)	78 (72.2%)	1.03 (0.26, 4.13)	0.486
Prosthesis	3 (27.3%)	30 (27.8%)	0.98 (0.24, 3.92)	0.486
Cranial defect size				
≤ 10cm	3 (27.3%)	40 (37.0%)	0.64 (0.16, 2.54)	0.262
> 10cm	8 (72.7%)	68 (63.0%)	1.57 (0.39, 6.26)	0.262
Antibiotics used for irrigation				
Vancomycin only	2 (18.2%)	35 (32.4%)	0.46 (0.10, 2.26)	0.171
Amikacin only	4 (36.4%)	25 (23.1%)	1.90 (0.51, 7.01)	0.169
Vancomycin + amikacin	1 (9.1%)	7 (6.5%)	1.44 (0.16, 12.94)	0.372
None	4 (36.4%)	41 (38.0%)	0.93 (0.26, 3.39)	0.459

Conclusion

Previous history of intracranial infection and craniectomy for infective causes are significant risk factors of post cranioplasty infection. It is crucial to emphasize the infection risk and chance of re-operation when we offer cranioplasty to this group of patients. Whether or not early cranioplasty and flap irrigation with vancomycin are effective in preventing infection remains controversial and warrants more trials.