

Retrospective study of infection rate in cranioplasty cases at tertiary care centre

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Abstract

Background: Various studies indicate that the infection rate in post operative cranioplasty cases is up to 26%. Infection rate depends on material used for cranioplasty and it is more with metal implant material. We retrospectively reviewed the infection rate at our institute for the cases operated over last five years. **Methods:** we studied case records of 180 cranioplasty cases over last 10 years. Majority of the cases were operated for trauma. Craniectomy due to non trauma causes were not included. **Results:** After studying these patients we found that 30 patients had post operative infection among our cases. Persistent use of same head dressing applied immediately after operation seems to be a significant risk factor for operative wound infection. The relative risk for which was 15.30. Fourteen out of 30 patients needed debridement and daily dressing with antiseptic solutions, and eight required revision of scalp flap with the help from plastic surgeon. All patients improved and did well after treatment. **Conclusions:** There is always a chance of infection in cranioplasty cases even after utmost antiseptics. Contamination due to trauma and application of bandage for long appears to be the precipitating factors for infection. This study confirms that there needs a practice change with proper antiseptic techniques right from triage room to the post-operative care room to minimize the chances of infection.

Keywords: Cranioplasty, Bone flap, Titanium Mesh, Trauma.

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Introduction

Post operative wound infection is a serious complication in cranioplasty patients, it may lead to skin infection, scalp necrosis, underlying scalp bone necrosis. Incidence of infection in earlier studies is up to 26%[1]; higher chances of infection are reported in implant cases than in cases of autologous bone graft. We tried to analyse the risk factors associated with the infection in cranioplasty cases.

We tried our focus on methods in post operative dressing and other aseptic measures taken in the emergency room and post operative room. At our institute it was a common practice to keep the same dressing done post operatively for at least a week's time unless there is soakage of the dressing, this practice is to avoid the repeated exposure of post-operative wound to the external environment. However this seems to have adverse effect on some cases leading to infection

Methods

We studied case records of 180 cases operated for trauma at our centre over the last 10 years. Different neurosurgeons operated on cases at our centre. Case records were scrutinized for presence of infection episode[3]. Diagnostic criteria used is : (1) Discharge of pus from post op wound (2) Subtle infection detected by treating neurosurgeon or (3) Signs of inflammation of the wound (4) Positive culture report from the swab taken from the wound. Time frame used to frame that case as a post operative infection case was 3 months from the cranioplasty operation done.

Our study included only cases operated for trauma and excluded cases

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who needed cranioplasty at later stages due to other causes like tumour operation, removal of ICH, and clipping of aneurysm cases needing cranioplasty.

Many factors are responsible for infection after cranioplasty, few of them include 1. Cigarette smoking[2]. Patients suffering from DM[3]. ASA score >2,[4]. Use of steroids, and BMI > 30.

Statistics

Simple 2 × 2 tables were used to organize the data, and calculation of relative risk was done using formula (a/a + c)/(b/b + d). Relative risk more than 1 indicated that infection was more likely in the cranioplasty group and Relative risk less than 1 indicated infection was less likely. Calculation of 95% confidence interval was also done. RR of each known risk factor was calculated using Multivariate logistic regression analysis

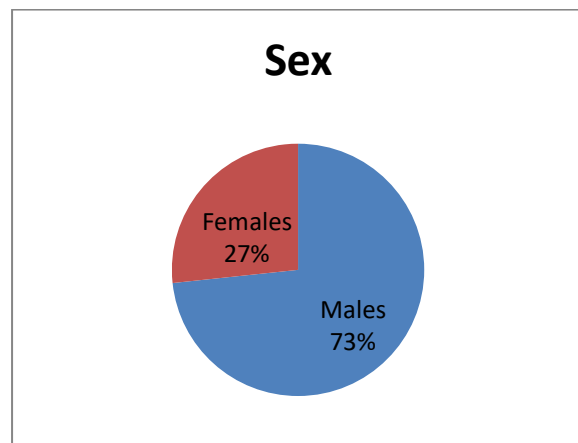


Fig. 1: Race (Males and Females)

Results

A total of 180 patient's case records were studied for last 10 years from 2011 to 2020. Only cranioplasty cases done for trauma cases were taken into consideration and cranioplasty done in other causes were excluded. Males outnumbered in our study. Most of these cases were operated in emergency OT and very few trauma cases were operated in Elective OT. 40 years was the mean age in our study ranging from 10 to 70. ASA score mean was 2.5 ranging from 1 to 4. In our study we found that 30 out of 180 cranioplasty patients had developed episodes of infection for which they received treatment as per their case records. Time interval between cranioplasty and development of infection ranged from 15 days post op to 3 months. Various organisms were responsible for causing infection. Main causative agent in our study was staphylococcus aureus, twelve of our patients were MRSA positive while fourteen were sensitive to methicillin. Four patients were culture negative, out of our 26 culture positive patients six were infected with multiple etiological agents. Fourteen patients needed wound reopening, wash, debridement and reclosure. Plastic surgery intervention needed for planning of scalp flap in eight patients and their proper management. Though osteomyelitis is not reported in any of our case and subsequently all of our cases did well.

Table 1: Micro-organism found

Micro-organism	No. of patient
MSSA	14
MRSA	12
No organism	4
Multiple organisms ^a	6

Table 2: Management of patient

Management	No. of patient
Debridement and reclosure	14
Skin flap requirement	8
Resorption of bone flap/ sequestrum	0
Titanium mesh removal	0

Table 3: Use of same dressing and infection

	Infection	No Infection	Total
Same dressing	28	58	86
Changed dressing	2	92	94
Total	30	150	180
Relative risk	15.30		

In 28 out of 30 infected patients post operative dressing was not changed for a week. Relative risk calculation suggested that those in whom dressing was not changed were 15.30 times more chances of development of post operative wound infection when compared with those in whom the dressing was changed. The 95% confidence interval was significant and confirms the risk of wound infection in patients in whom the original dressing was kept for a week. Other contributing factors were also studied, which include. Time interval between the time of injury and first operation done in emergency OT and second operation of cranioplasty was also a important contributing factor, patients in whom cranioplasty done before 3 months period showed inclination towards infection probability.

It is also observed that patients in whom infection was present were having longer operation time compared to others who did not develop infection.

Prophylactic antibiotics were given to all patients at or before induction, and were also given for three days postoperatively. Many of our patients in this study received one dose of ceftriaxone 1gram, 34 patients received triple antibiotics i.e ceftriaxone, amikacin, and metronidazole and 24 patients received vancomycin as prophylactic antibiotic. Triple antibiotic and vancomycin were associated with low risk of post operative wound infection with relative risk of 0.48 for vancomycin and 0.30 for triple antibiotic.

Many other factors are found to increase the risk of post-operative wound infection in cranioplasty. Smoking and use of steroids showed an upward graph of wound infection after

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cranioplasty but these were not statistically significant.

Discussion

In this study we have confirmed that there is quite a chance of infection in cases of cranioplasty. Use of same dressing for long period post operatively appears to contribute to the increased chances of post op wound infection.

HuiquanLiu et al[1] studied 86 cranioplasty patients retrospectively and found out that increased age, smoking, operative time, length of pre operative stay and post op hospitalization increases the chances of post op wound infection. In our study also we found correlation with these factors and chances of wound infection. Paolo Frassanito et. A[12]. commented on rate of infection with different materials used for cranioplasty in their study, we however did not use anything other than titanium mesh and autologous bone graft.

Table 4: Multivariate Regression Logistical Analysis

Risk Factor	p Value	Odds Ratio	95% Confidence Interval
Same dressing	<0.05	33.9	2.94–39.2
Use of steroids	0.4	3.4	0.16–72.1

Catherine le[3] found out the rate of MRSA colonization in cranioplasty patients is three times higher than the average seen on ICU admission screening (19% vs. 6%). Ryan P Morton et. A[14] noted that cranioplasty should be performed at least after 14 days of craniectomy. By far the number of patients included in our study outnumber many other studies done by various authors; though many of our study variables did not show statistical significance. Multivariate analyses of various study variables for post op wound infection did show increased chances of infection with smoking and use of steroids but did not show statistically significant association. Prospective study on this topic considering various other risk factors for infection with larger number of patients could throw more light on this important topic.

There is always debate on the quality of retrospective and prospective study and which one is superior with respect to coming to conclusion[5]. In retrospective study the data obtained is through the patient files from the medical record department, this data may have some missing points, sometimes it may give rise to conflicting points, it may not be readable[6]. In this study we strictly followed inclusion and exclusion criteria. There might be underestimation of infection problem in cranioplasty patients in this study due to patients not attending follow up clinic as patients come from various places remote and not easily accessible.

Conclusion

In our study we have found that use of same post-operative dressing for long period definitely bears causal association with wound infection in cranioplasty. We suggest that this dressing be changed regularly. Also care should be taken to minimize the ICU and hospital stay of the patient to avoid any chance of nosocomial infection. We changed our practices and noticed reduced rate of infection although this warrants a prospective study

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