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Osteosynthesis Removal Post Orthognathic Surgery: An Omani Experience

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Abstract

Objective

This study was designed to determine the prevalence and the risk factors led to osteosynthesis removal post orthognathic surgery in Oman and to compare between Omani population and international populations.

Methods

The study was conducted in patients who underwent orthognathic surgery between the years 2010 to 2015. Data collected from the Al Nahdha hospital in Oman. Different factors were investigated using statistical tools.

Results

There was a total of 319 patients who were investigatedin this study. Among these patients 42.3% were

males while 57.1% were females. Different factors were identified that led to the removal of the oseosynthesis. Eight and half percentage of the study sample had some osteosynthesis removed. Local infections around the hardware was the highest (4.4%) followed by pain complaining (2.8%) of all cases.

Conclusion

Infection prevalence in patients with orthognathic surgeries was reported to bevery low, however it is the main reason for the removal of osteosynthesis. Highest percentage (44%) of bone plates were removed from mandibular osteotomy sites.

Keywords

Orthognathic; Osteosynthesis; Hardwarefixation; Bone plates; Screws

Introduction

Different surgical techniques of orthognathic were introduced to treat maxillofacial deformities [1]. Orthognathic surgery is a corrective surgical procedure that corrects jaw and facial abnormalities that are secondary to growth disturbance, congenital abnormality and trauma. There are various forms of miniplates and screws used in osteosynthesis that could be utilized in the Maxillofacial skeleton during the orthognathic surgeries [2,3]. This method nowadays is increasingly used to fix and strengthen the bone segments [4].

Some mini plates used in some cases are necessary to be removed [5, 6]. There are somecomplications, which are associated with the orthognathic surgery; including the routine surgical complications like infection and swelling. The characteristics of patients requiring the removal of plate were analyzed in addition to the number and location in which the bone plate was removed [7]. The main purpose of the study is to comparatively examine the prevalence and risk factors that are associated with the removal of bone platespost orthognathic surgery in Omani patients. In addition, acomparison betweenOmani patients and international patients were done in this study. This will be helpful to develop interventions that are highly helpful to overcome the clinical complication.

Research Rationale

This study focused the prevalence and risk factors in Omani patients and compares it with international population. There is no such study conducted previously by any researcher in our region. Therefore, this is considered to be unique research.

Methods

In this study clinical record of 319 patients were collected from the electronic data information system from AlNahdha hospital. Both male and female patients were investigated. AlNahdha hospital is the main hospital in the country which performs orthognathic surgeries. This study included who were operated in the period from 1st Jan 2010 to October 2015 with two years minimum followup.According to the observation, there were different variables that were set and examined individually. The data was further analyzed using excel program and SPSS [8].Different statistical calculations were carried out using these statistical software's. In addition, different positively related factors to bone plate removal

that were reported in Omani patients were investigated. Statistical analysis was done in terms of duration of surgery, time post initial placement of the hardware, relationship between plate removal and the characteristics of patients required to remove the plates. Moreover, more analysis was carried out to find the association between characteristics of patients requiring plate removal and the location in which the plates were removed. Complications of surgery as well as reason of the plate removal were also investigated in this study.

Results

Proper investigation of Omani patients on the basis of data collected from the Al Nahdha hospital. According to the observed results, patients with orthognathic surgery and need a bone plate and screws removal showed that 50.2 % of the patients were below 25 year old and 44.8% of the patients were between 25 to 34 year old while the remaining 4.4% of the patients were above 35 year. Both males and female patients were investigated in this study, in which 42.3% were males while 57.1% were females. The study foundthat37.0% of the patients were reported with one bone plate and screws removal and 33.3% of the patients were reported with removal of two bone plates and screws. In our study the results revealed removing 3 bone plates and screws was 3.7% of patients, while we observed 11.1% of the patient with 4 bone plates and screws removed and a total of 14.8 % of the patients with all bone plates and screws.

Further investigation on the basis of the need for plate removal reported that most of the patients requiring bone plate removal were less than 25 years of age. The number of patients who were more than 25 years old were 150, in which (93.8 %) of the bone plates placed were not removed while (6.2 %) of the patients required removal. The number of patients who were in the age group between25 and 34 were 127. Most of them, (88.8%) did not required bone plate removal, while (11.2%) required removal. Patients above the age of 45 years mostly did not require bone plate removal with a percentage of (7.1%). There were some surgical complications associated with patients undergone the surgery. According to our observation 93.8% of the patients did not report any complications while 6.6% of the patients reported surgical complications. In addition, this study found that the prevalence of bone plate was observed in 8.5% of the patients.

In association to the time after initial placement of the bone plate, the removal of these bone plates and screws were reported at the mean of 11.4 months and the median time observed was 9 months. It was observed that some patients have different location of plate removal, in which 3.7 % of the patients were reported to remove plate from the chin post genioplasty procedure. The highest percentage of the patients reported a removal of plate from the mandible location with 44.4%, while 33.3% of the patients the hardware was removed from the Maxilla. In the study it has been reported that highest number of surgeries for bone plate removal were conducted in the year 2013 and 2014 with a percentage of 23.2% to 28.8% respectively.

There are different factors that are associated with bone plate removal. According to the observed results 3.7% of the patient's bone plates were removed due to the exposure and bone resorption. Nonetheless, 51.9% of the patients in this case were reported to remove bone plate due the infections

after surgery while 33.3% of the patients reported to remove bone plate due to severe pain.Additionally, 7.4% of the patient's bone plates were removed due to the fact that the plates were palpable. Statistical analysis revealed that the study was not statistically significant in relation to the age and gender of the patients with a p value of 0.301 and 0.071 respectively. The mean value of age was 25.22 and median was 24.00 while 5.497 was the observed standard deviation (Table 1-Table 10).

N	**Valid**	317
	Missing	2
Mean	25.22	
Median	24	
Standard Deviation	5.497	
Minimum	16	
Maximum	52	

Table 1: Age.

Age categories		**Frequency**	**Percent**	**Valid Percent**
<25 years		160	50.2	50.5
25 - 34 years		143	44.8	45.1
>=35 years		14	4.4	4.4
Total		317	99.4	100
Missing	**System**	2	0.6	
Total		319	100	-

Table 2: Age categories.

Male		**Frequency**	**Percent**	**Valid Percent**
Female		135	42.3	42.6
Total		182	57.1	57.4
Missing	**System**	317	99.4	100
		2	0.6	
Total		319	100	-

Table 3: Gender.

Age	**Removed**	**Not removed**	**p value**

	n (%)	n (%)	
<25 years	10 (6.2)	150 (93.8)	0.301
25-34 years	16 (11.2)	127 (88.8)	
>=35 years	1 (7.1)	13 (92.9)	
Sex			0.071
Male	7 (5.2)	128 (94.8)	

Table 4: Characteristics of patients requiring plate removal.

No	**Frequency**	**Percent**
	298	93.4
Yes	21	6.6
Total	319	100

Table 5: Complications during the surgery.

	Frequency	**Percent**
No	292	91.5
Yes	27	8.5
Total	319	100

Table 6: Outcome-Bone plate removal.

N	**Valid**	27
	Missing	292
Mean	11.44	
Median	9	
Standard Deviation	8.684	
Minimum	1	
Maximum	34	

Table 7: Time to plate removal (months).

LA	**Frequency**	**Percent**	**Valid Percent**
	11	3.4	40.7
GA	16	5	59.3

Missing	**Total**	27	8.5	100
	System	292	91.5	
Total		319	100	

Table 8: Percentage.

Genio		**Frequency**	**Percent**	**Valid Percent**
		1	0.3	3.7
Mandible		12	3.8	44.4
Maxilla		9	2.8	33.3
Mandible &Genio		1	0.3	3.7
Maxilla &Genio		2	0.6	7.4
Maxilla & Mandible		2	0.6	7.4
Total		27	8.5	100
Missing	**System**	292	91.5	
Total		319	100	

Table 9: Location of the plate removal.

Bone resorption		**Frequency**	**Percent**	**Valid Percent**
		1	0.3	3.7
Exposed		1	0.3	3.7
Infection		14	4.4	51.9
Pain		9	2.8	33.3
Palpable		2	0.6	7.4
Total		27	8.5	100
Missing		292	91.5	
Total	**System**	319	100	

Table 10: Cause of the removal.

1	**Frequency**	**Percent**	**Valid Percent**
	10	3.1	37
2	9	2.8	33.3
3	1	0.3	3.7
4	3	0.9	11.1
5	4	1.3	14.8

Total		27	8.5	100
Missing	**System**	292	91.5	
Total		319	100	

Table 11: Number of hardware removed.

Discussion

Patients who undergo orthognathic surgeries are highly associated with different number of complications. These complications are depending on different factors which are highly influencing the surgical outcome and the rate which is associated with bone plate removal [9]. There were also different types of complications that could take place after exposing the patient for a second procedure for bone plate removal. However, the fixation of the plate by Osteosynthesis consider as the most safe and reliable procedure [10].

According to our results, the majority of the plate removal was due to infections. These results were contradictory with the published literature in which about 13.7% of the plates placed for orthognathic surgery were removed due to recurrent infections episodes [11]. The average time of the removal of the hardware in our studied samples was 11.4 months; these would seem acceptable since most of bone healing have already taken place. Previous studies conducted reported the average of 9.9 months duration until removal of hardware. These studies also reported 79.65%of the patients had their plates removed within the first year after placement [12]. In the case of results obtained by our observations, majority of the patients were young, in which more than half (50.2%) of the patients were below 25 year old. According to the previously study conducted by Yang et al. [13] in which same results were observed as the most of the patients in this study was below 30 years old [13].

According to the results reported in the literature in majority of the cases the removal of 2 plates per sides was done which may cause high risk among the patients were involved in the particular illness [14]. Majority of the patients were observed in our studies with only one bone plates and screws replacement following by (33.3%) were reported to remove two bone plates and screws. Surgical complications are also associated in the patients with post orthognathic complication in our study only 6.6% of the patients were involved in post-surgical complications. These results are contradictory with the previously reported literature. According to the Davis et al. [15] there are several numbers of evidences regarding the post-surgical complications were associated with the patients with post orthognathic surgery complications [15]. Highest number of surgeries reported in the year 2013 and 2014 in Oman. While similar results were reported in another country but in different era. The reported results in the number of plate removal cases were increased in patients in the year 2004 to 2007 [16].

Conclusion

After the proper data collection and analyzing the collected data, it has been found that,Othognathic surgeries carried in Al Nahdha Hospital has low percentage of post surgery complications that need to remove the osteosynthesis. The most appeared reason for the bone plate's removal was found to be the local infections followed by pain and palpability.The data shows the osteosynthesis removal was more in females and the middle age category of 25 to 34. Our findings are comparable to that reported in the

literature. Further studies are advised to investigate the reasons of such infections and the commonality to happen in mandibular region.

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