Journal of Oral Medicine, Oral Surgery, Oral Pathology and Oral Radiology 2021;7(1):42–49

Content available at: https://www.ipinnovative.com/open-access-journals

Journal of Oral Medicine, Oral Surgery, Oral Pathology and Oral Radiology

Journal homepage: www.joooo.org

Original Research Article

Bite force measurement in maxillofacial trauma – A clinical prospective study

Abhinandan Patel K N[1], Girish G[1], Kora Ramya Reddy[1,*], Rajendra K S[1], Sneha T R[1], Akarsh R[1]

[1]Dept. of Faciomaixillary Surgery, Sanjay Gandhi Institute of Trauma and Orthopedics, Bengaluru, Karnataka, India

ARTICLE INFO

Article history:
Received 19-01-2021
Accepted 06-02-2021
Available online 18-02-2021

Keywords:
Bite force
Bite force device
Occlusal load
Maxillofacial trauma
Lefort fractures
Restoration of bite force

ABSTRACT

Introduction: Maxillofacial fractures not only cause a change in the skeletal architecture (anatomical) but also lead to changes in the masticatory apparatus (functional). Masticatory function refers to the ability to chew without any interference or pain. The major determinants of this is the range of mandibular motion, maximum occlusal forces, and the activity of the masticatory muscles. This function is affected in maxillofacial trauma and also pathological injuries to the jaws. Bite force measurements are an excellent criteria for the assessment of masticatory efficiency. The purpose of this study was to assess the effect of maxillofacial fractures on the bite forces of patients treated for such fractures.
Materials and Methods: 65 patients divided into 7 groups based on the kind of maxillofacial fracture. All the cases underwent ORIF. Bite force were measured on the immediate post-operative period, 1^{st}, 4^{th} and 12^{th} post-operative week. The bite force instrument (transducer) was positioned between the antagonizing cusps in the region of Left First Molar and Right First Molar.
Results: At the end of the 3^{rd} post-operative week, all the groups showed a statistically significant increase in the bite force measurement as compared to the immediate post-operative bite force recording.
Conclusion: Thus we conclude by saying that our study provides a basis for similar studies with a longer follow up period and larger sample size in order to assess the different kinds of maxillofacial trauma and its effect on bite force.

1. Introduction

Road traffic accidents have been reported to be one of the main causes of maxillofacial injuries in many studies in the entire world[1] with ever changing trends and modernization of lifestyle the need for high speed travel and increasing violent society has made maxillofacial trauma, kind of inevitable.[2] The prevalence of maxillofacial injuries varies from 17% to 69%, and this range of difference can be attributed to various other factors such as environmental factors, socioeconomic status, cultural backgrounds, and the implication of traffic rules.[2–4] Maxillofacial fractures not only cause a change in the skeletal architecture (anatomical) but also lead to changes in the masticatory apparatus(functional).[5,6] Masticatory function refers to the ability to chew without any interference or pain. The major determinants of this is the range of mandibular motion, maximum occlusal forces, and the activity of the masticatory muscles. This function is affected in maxillofacial trauma and also pathological injuries to the jaws. Over the years, management of maxillofacial fractures has changed with the advent of various types of fixation techniques. The main aim of surgically managing maxillofacial fractures is to not only restore the skeletal form but also the function and aesthetics. In the process of any such surgical treatment, the resultant soft tissue injury in the form of stripping of masticatory muscles and iatrogenic neurovascular injury can further affect the masticatory apparatus. By treating the fracture surgically restoration of the occlusal table can be achieved is a known

* *Corresponding author*.
E-mail address: kora.ramya@gmail.com (K. R. Reddy).

https://doi.org/10.18231/j.jooo.2021.008

fact, but whether the patient will be able to produce the same occlusal load secondary to these changes is not known.[7] Maximum occlusal forces is one of the important and significant parameter to assess masticatory function and also is comparatively easy to measure and analyze.[8] The purpose of this study was to assess the effect of Maxillofacial fractures on the bite forces of patients treated for such fractures.

2. Materials and Methods

A prospective study was conducted on patients who underwent open reduction and internal fixation for maxillofacial fractures in the Department of Oral and Maxillofacial Surgery from October 2019 to March 2020 were included in the study. The exclusion criteria were: (1) patients not willing to be a part of the study (2) edentulous patients, (3) patients below 18 years of age, and (4) medically compromised patients. Ethical clearance for the study was obtained from the ethical committee (Date of approval- 15/10/2019) and adheres to the guidelines. Written informed consent was taken from all the patients and were operated under general anesthesia following routine hematological, biochemical, general physical examination and routine radiological examination. Either intra-oral or extra-oral approaches were used based on the fracture site. Patients were divided into 7 groups as follows-

Group 1 – Isolated parasymphysis fractures

Group 2 – Isolated angle fractures

Group 3 – Parasymphysis with condylar fracture

Group 4 - Fractures of more than two sites of the mandidle

Group 5 – Isolated Lefort I fractures

Group 6 – Isolated Lefort II fractures

Group 7 – Panfacial fractures.

The bite force was recorded using a bite force device consisting of a stainless steel bite force sensor of strain gage type, capable of measuring up to 800N, requiring 5VDC power supply and a load cell indicator with 124x64 LCD display, (Figure 1) which displayed the force exerted in Newton. All measurements were made with the subject seated upright, looking forward and in an unsupported natural head position. The bite force instrument (transducer) could be conveniently positioned between the antagonizing cusps in the region of Left First Molar and Right First Molar. (Figure 2)

2.1. *Statistical analysis*

The study was analysed using "R" software. The values were compared using t-test and paired t test.

Fig. 1: – Bite force measurement device

Fig. 2: Bite force recording

3. Results

There were 65 patients who participated in this study. The age distribution is 18-45 years, Among the age distribution it was noted that maximum number of cases were seen in the age group less than 35yrs of age 47 (73%). Male patients formed a majority of 48 (74%) and female 17(26%) The main etiology of the injury was RTA 54 (78%) while assault constituted the rest, 14 (22%).

Group 1 - Isolated parasymphysis fractures, which included 15 cases.

Group 2 - Isolated angle fractures, which included 10 cases.

Group 3 - Parasymphysis with condylar fracture, which included 15 cases.

Group 4 - Fractures of more than two sites of the mandidle, which included 10 cases.

Group 5 – Isolated Lefort I fractures, which included 7 cases.

Group 6 – Isolated Lefort II fractures, which included 5 cases.

Group 7 – Panfacial fractures, which included 5 cases.

The percentage of males and females and the etiology of each of the groups (Figures 3 and 4)

All the patients in all the seven groups showed a significant increase in the bite force values from the post op to the 3rd month follow up postoperative week on both the fractured and non-fractured site. (Figures 5 and 6)

Each group showed a stastistical increase in the bite force at each interval (Figures 7, 8, 9, 10, 11, 12 and 13) The mean and std deviation of the groups at each interval and their p value has been stated in the tables below (Tables 1, 2, 3, 4, 5, 6, 7 and 8)

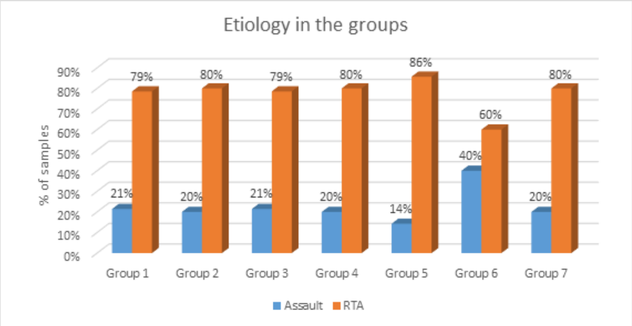

Fig. 3: Sex distribution among the groups

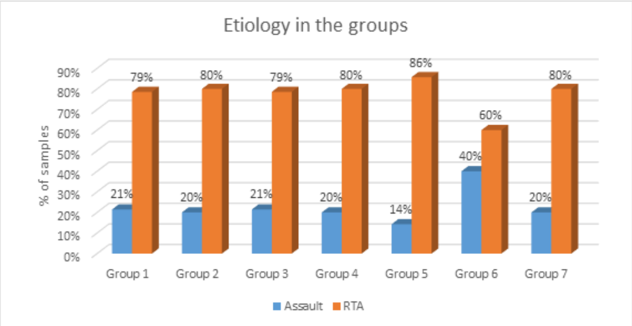

Fig. 4: Etiology among the groups

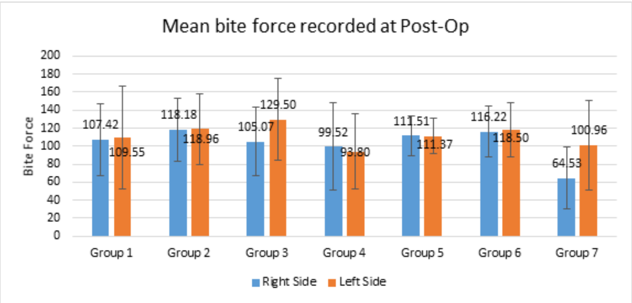

Fig. 5: Mean bite force immediate post op

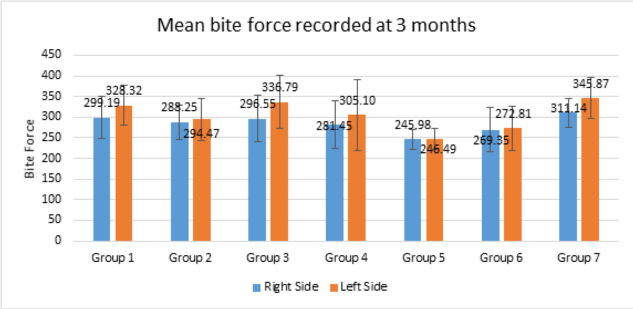

Fig. 6: Mean bite force at the 3rd month post-op

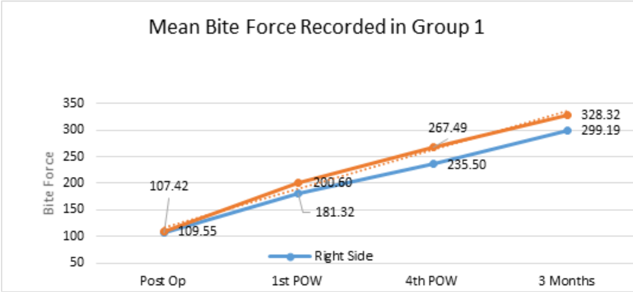

Fig. 7: Mean bite force at the 3rd month post-op

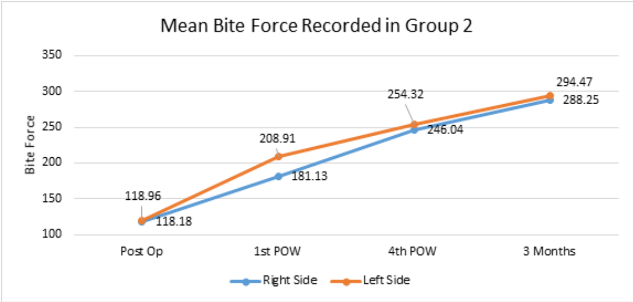

Fig. 8: Mean bite force in group 2

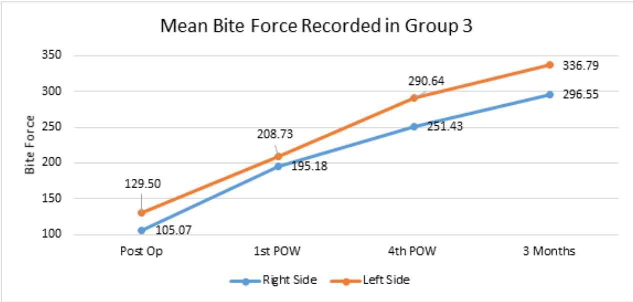

Fig. 9: Mean bite force in group 3

Table 1: Analysis of Bite Strength at Post Op – Right Side

Group	n	Mean	Std Dev	SE of Mean	95% CI for Mean		Min	Max	P-Value
					Lower Bound	Upper Bound			
Group 1	14	107.42	39.76	10.63	84.46	130.37	28.19	186.32	
Group 2	10	118.18	34.50	10.91	93.49	142.86	54.25	178.34	
Group 3	14	105.07	38.13	10.19	83.05	127.08	30.16	156.09	0.261
Group 4	10	99.52	48.16	15.23	65.07	133.97	30.16	186.32	
Group 5	7	111.51	22.56	8.53	90.65	132.37	82.90	143.78	
Group 6	5	116.22	28.15	12.59	81.26	151.17	86.96	150.76	
Group 7	5	64.53	34.26	15.32	22.00	107.06	28.19	98.66	

Table 2: Analysis of Bite Strength at Post Op – Left Side

Group	n	Mean	Std Dev	SE of Mean	95% CI for Mean		Min	Max	P-Value
					Lower Bound	Upper Bound			
Group 1	14	109.55	57.01	15.24	76.63	142.47	23.09	193.98	
Group 2	10	118.96	39.28	12.42	90.85	147.06	45.61	173.98	
Group 3	14	129.50	45.53	12.17	103.21	155.79	45.61	193.98	
Group 4	10	93.80	41.78	13.21	63.92	123.69	21.62	160.25	0.612
Group 5	7	111.37	19.90	7.52	92.96	129.77	88.60	140.60	
Group 6	5	118.50	29.98	13.41	81.27	155.72	85.71	156.75	
Group 7	5	100.96	50.03	22.37	38.84	163.08	23.09	160.25	

Table 3: Analysis of Bite Strength at 1st POW – Right Side:

Group	n	Mean	Std Dev	SE of Mean	95% CI for Mean		Min	Max	P-Value
					Lower Bound	Upper Bound			
Group 1	14	181.32	56.95	15.22	148.44	214.20	56.61	287.60	
Group 2	10	181.13	53.38	16.88	142.94	219.32	69.57	256.78	
Group 3	14	195.18	21.02	5.62	183.04	207.31	142.38	222.90	
Group 4	10	171.31	65.64	20.76	124.35	218.27	52.36	287.60	0.159
Group 5	7	135.07	14.64	5.53	121.54	148.61	111.50	158.44	
Group 6	5	151.81	29.34	13.12	115.37	188.24	109.30	180.35	
Group 7	5	171.86	40.33	18.03	121.78	221.93	102.45	203.52	

Table 4: Analysis of Bite Strength at 1st POW – Left Side:

Group	n	Mean	Std Dev	SE of Mean	95% CI for Mean		Min	Max	P-Value
					Lower Bound	Upper Bound			
Group 1	14	200.60	75.28	20.12	157.13	244.06	70.71	338.66	
Group 2	10	208.91	71.76	22.69	157.58	260.25	150.62	338.60	
Group 3	14	208.73	59.87	16.00	174.16	243.30	148.42	338.66	
Group 4	10	187.16	61.02	19.30	143.51	230.81	70.71	312.31	0.131
Group 5	7	136.45	16.38	6.19	121.30	151.60	110.50	159.50	
Group 6	5	151.82	30.49	13.64	113.96	189.69	105.96	182.22	
Group 7	5	213.64	68.66	30.71	128.39	298.90	120.38	312.31	

Table 5: Analysis of Bite Strength at 4^{th} POW – Right Side:

Group	n	Mean	Std Dev	SE of Mean	95% CI for Mean		Min	Max	P-Value	Sig Diff b/w
					Lower Bound	Upper Bound				
Group 1	14	235.50	64.08	17.13	198.50	272.50	78.31	389.63	0.003*	2 vs 5 (P=0.025)
Group 2	10	246.04	38.49	12.17	218.50	273.57	173.22	300.98		3 vs 5 (P=0.006)
Group 3	14	251.43	49.59	13.25	222.79	280.06	152.74	324.98		
Group 4	10	205.70	72.52	22.93	153.83	257.58	75.43	315.12		
Group 5	7	159.51	14.23	5.38	146.36	172.67	134.10	179.10		
Group 6	5	178.97	36.69	16.41	133.41	224.54	130.89	218.11		
Group 7	5	234.89	19.08	8.53	211.19	258.58	210.54	251.10		

*denotes significant difference

Table 6: Analysis of Bite Strength at 4^{th} POW – Left Side:

Group	n	Mean	Std Dev	SE of Mean	95% CI for Mean		Min	Max	P-Value	Sig Diff b/w
					Lower Bound	Upper Bound				
Group 1	14	267.49	76.82	20.53	223.14	311.84	103.12	389.63	0.002*	1 vs 5 (P=0.031)
Group 2	10	254.32	60.66	19.18	210.93	297.72	180.06	340.91		3 vs 5 (P=0.003)
Group 3	14	290.64	65.40	17.48	252.88	328.40	172.80	390.30		
Group 4	10	249.72	103.55	32.75	175.65	323.80	40.04	389.63		
Group 5	7	158.62	13.64	5.16	146.01	171.24	136.75	178.30		
Group 6	5	179.26	39.75	17.78	129.90	228.62	127.33	222.63		
Group 7	5	285.21	69.32	31.00	199.14	371.28	212.23	389.63		

*denotes significant difference

Table 7: Analysis of Bite Strength at 3 Months – Right Side:

Group	n	Mean	Std Dev	SE of Mean	95% CI for Mean		Min	Max	P-Value
					Lower Bound	Upper Bound			
Group 1	14	299.19	50.36	13.46	270.12	328.27	184.21	390.16	0.238
Group 2	10	288.25	41.64	13.17	258.47	318.04	215.31	326.54	
Group 3	14	296.55	56.48	15.10	263.94	329.16	160.62	399.06	
Group 4	10	281.45	57.17	18.08	240.55	322.35	176.30	334.70	
Group 5	7	245.98	24.09	9.10	223.70	268.25	212.20	274.56	
Group 6	5	269.35	54.37	24.31	201.84	336.85	200.35	326.45	
Group 7	5	311.14	35.08	15.69	267.58	354.70	259.18	350.63	

Table 8: Analysis of Bite Strength at 3 Months – Left Side:

Group	n	Mean	Std Dev	SE of Mean	95% CI for Mean		Min	Max	P-Value	Sig Diff b/w
					Lower Bound	Upper Bound				
Group 1	14	328.32	48.51	12.97	300.31	356.33	224.80	390.16	0.018*	3 vs 5 (P=0.034)
Group 2	10	294.47	51.43	16.26	257.67	331.26	190.51	356.52		
Group 3	14	336.79	64.41	17.22	299.60	373.98	215.25	430.10		
Group 4	10	305.10	86.94	27.49	242.90	367.29	156.18	426.30		
Group 5	7	246.49	25.10	9.49	223.28	269.70	208.35	279.40		
Group 6	5	272.81	54.58	24.41	205.04	340.58	206.45	327.94		
Group 7	5	345.87	49.85	22.30	283.97	407.77	295.23	426.30		

*denotes significant difference

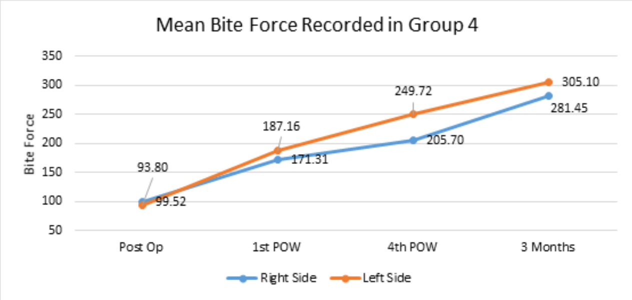

Fig. 10: Mean bite force in group 4

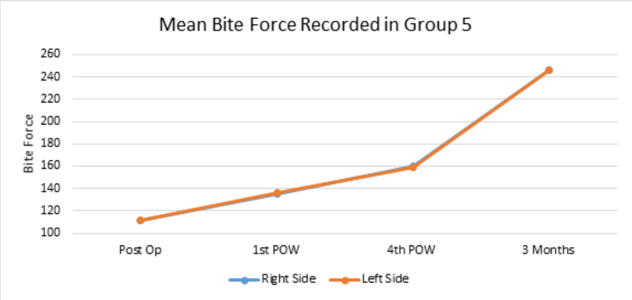

Fig. 11: Mean bite force in group

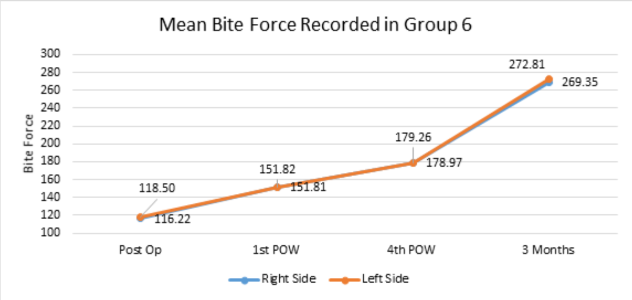

Fig. 12: Mean bite force in group 6

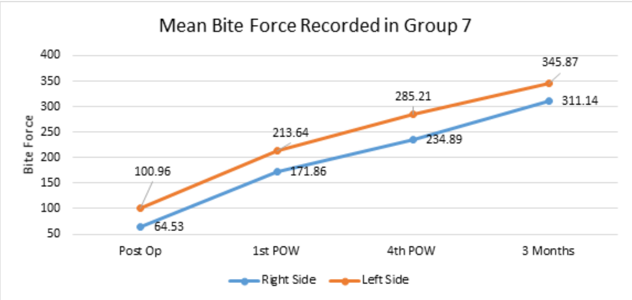

Fig. 13: Mean bite in group 7

4. Discussion

Maxillofacial trauma frequently results in injury to the soft tissues, teeth, and major skeletal components of the face. The management and rehabilitation of such patients requires a thorough understanding of the types of principles of evaluation and surgical treatment of facial injuries. Whenever facial structures are injured, the goal to be achieved is maximal rehabilitation of the patient. For maxillofacial fractures, goals of treatment include rapid bone healing, a return of normal function including ocular, masticatory and nasal functions and also reconstruction of speech and an acceptable esthetic result.[5]

Fractures of the facial skeleton, are a cause of concern for the patient because these fractures have a significant effect on mastication, a function that is unique to the craniofacial musculoskeletal system.

This study was thus conducted to assess the magnitude of damage to the masticatory system caused by maxillofacial fractures and its effect on the maximum bite forces.

Fractures of the mandible itself account for a large portion (70%) of maxillofacial injuries.[5] Mandible being a vital component of the masticatory apparatus, such injuries can significantly alter occlusion, range of motion, muscle activity levels.[9] The significant reduction of bite forces following treatment of mandibular fractures can be due to either traumatic or operative trauma to the masticatory muscles or to the protective neuromuscular mechanisms of the masticatory apparatus.[10]

Le Fort (maxillary) fractures are also among the injuries encountered most frequently in patients who suffer facial trauma. Fixation of these fractures by ORIF of the facial skeleton has become a routine treatment protocol. When the maxillary and mandiblular teeeth are in occlusion/clenched the anatomic support for the midface is provided by a series of struts or buttresses that distribute the masticatory forces from the teeth to skull base.[11] The 3 principal vertical buttresses of the maxilla are the nasomaxillary buttress, zygomaticomaxillary buttress, and the pterygomaxillary buttress.[12] In Le Fort fracture treatment, restoration of the correct midfacial vertical height and anterior projection and restoration of occlusion are critical.[3] Moreover the patient's compliance is another important factor to be considered. This can be attributed to the psychological status of the patient and also to the comfort of the teeth, especially within the first postoperative week.[5,13]

In the present study a total of 65 patients, maxillofacial fractures were observed in the age group of 18 to 45 yrs and higher incidence was noted in the age group between 20 to 35 yrs. Based on the age, patients were classified as young -18 to 30 years, middle aged - 31 to 50 years, and older age - above 50 years. Out of the 65 patients included in the study, 38 belonged to the young group, 21 to the middle age group, indicating that majority of the maxillofacial fractures occurred in younger age group, and road traffic accidents being the most common cause of it. This was in agreement with a retrospective study conducted by Hu Weihsin et al.[14] The high incidence of road traffic accidents involving young adults may be because people in this age group sometimes drive aggressively and carelessly. The various other reasons such as inadequate road safety awareness, use of alcohol or substance abuse, speed limit violation can also be held accountable. Our study consisted of 74% percent of males and 26% of females. This can be attributed to the fact that men are more prone to indulge in reckless driving and engaging in interpersonal violence.

In the study we noticed that the bite force values increase steadily both on the fractured side and on the non fractured side from the first postoperative week. There was a significant increase in the bite force values in all the three intervals of time. This result was in agreement with a study conducted by Deborah Sybil et al.[5] However, Deborah Sybil et al in their study had a longer follow up period than our study.

The result in this study did not show much of a difference in the restoration of maximum bite forces with respect to the different groups, this was due to small sample size and lesser follow up review. Ideally isolated parasymphysis have shown to have high value of bite force restoration, the reason being isolated fracture at the parasymphysis region is associated with very few components of the masticatory apparatus.

Injury to masticatory muscles at the time of trauma or surgery is nil at this region.[5,13] In cases of condylar fracture, the possible reasons for reduction in bite force restoration could be due to pain or discomfort on biting or clenching because of involvement of the TMJ complex and the muscles of mastication attached to it and another reason being change in the occlusal table causing an open bite.[8,9,15] When it comes to mandibular angle fractures the most important reason for the bite force restoration after treatment is due to the traumatic and surgical damage to the masseter and temporalis muscle. During the ORIF of the fracture, stripping of the masseter and part of the temporalis muscle insertion in order to accommodate the implants is one of the reason for the reduced bite force Another reason for this could be due to protective neuromuscular mechanism in the form of muscle splinting, wherein selective components of the neuromuscular system are activated or deactivated to take forces off the damaged system.[16]

In cases of lefort fractures, although the masticatory apparatus is not involved to a major extent the occlusal table being altered causes the reduction in bite force. However, the restoration of the bite force is better than the other groups. This can be attributed to the fact that restoration of the correct midfacial vertical height and anterior projection and restoration of occlusion are critical.[17] In Pan facial fractures although cases included in our study was less to deduce a significant conclusion, we noted that bite force was reduced compared to the other groups. Due to the fact that multiple facial bone injury during the initial trauma and the involvement of masticatory apparatus and its attachments (which is undoubtedly a primary factor), related to the effects of inflammation following surgical trauma at the site, as well as the incisions carried out around or through the muscles during the surgical procedures.[18,19] Not to forget the change in the occlusal table which again has an effect on the bite force.

Based on this study we conclude that maxillofacial fractures adversely affect maximum bite forces, although temporarily and as mentioned above each fracture has its own restoration period depending on the site of injury.

5. Conclusion

The present study could open avenues for studies with a larger sample size and a longer follow –up period. It can also be taken reference to conduct other interesting studies, such as bite force measurement in patients with facial deformity undergoing orthognathic surgery etc. Bite forces are a relatively underexplored area of maxillofacial surgery. With regard to trauma, the return to normal functional forces does not correspond to return of the maximum bite forces. Thus we conclude by suggesting a similar study with a larger sample size supplemented with electromyographic studies for postsurgical recruitment of the masticatory apparatus.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. Down KE, Boot DA, Gorman DF. Maxillofacial and associated injuries in severely traumatized patients: implications of a regional survey. *Int J Oral Maxillofac Surg*. 1995;24(6):409–12. doi:10.1016/s0901-5027(05)80469-2.
2. Gupta A, Singh V, Mohammad S. Bite Force Evaluation of Mandibular Fractures Treated With Microplates and Miniplates. *J Oral Maxillofac Surg*. 2012;70(8):1903–8. doi:10.1016/j.joms.2012.03.036.
3. Vujcich N, Gebauer D. Current and evolving trends in the management of facial fractures. *Aust Dent J*. 2018;63:S35–S47. doi:10.1111/adj.12589.
4. Singaram M, Vijayabala GS, Udhayakumar RK. Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. *J Korean Assoc Oral Maxillofac Surg*. 2016;42(4):174. doi:10.5125/jkaoms.2016.42.4.174.
5. Sybil D, Gopalkrishnan K. Assessment of Masticatory Function Using Bite Force Measurements in Patients Treated for Mandibular Fractures. *Craniomaxillofac Trauma Reconstr*. 2013;6(4):247–50. doi:10.1055/s-0033-1356755.
6. Koç D, Dogan A, Bek B. Effect of gender, facial dimensions, body mass index and type of functional occlusion on bite force. *J Appl Oral Sci*. 2011;19(3):274–9. doi:10.1590/s1678-77572011000300017.
7. Bngervall, Lindahl L. Masticatory muscle function in patients treated for condylar fractures of the mandible. *Int J Oral Surg*. 1980;9(5):359–

66. doi:10.1016/s0300-9785(80)80060-3.

8. Ellis E, Throckmorton GS. Bite forces after open or closed treatment of mandibular condylar process fractures. *J Oral Maxillofac Surg*. 2001;59(4):389–95. doi:10.1053/joms.2001.21873.
9. Throckmorton GS, Ellis E, Hayasaki H. Jaw kinematics during mastication after unilateral fractures of the mandibular condylar process. *Am J Orthod Dentofac Orthop*. 2003;124(6):695–707. doi:10.1016/j.ajodo.2003.03.002.
10. Gerlach KL, Schwarz A. Bite forces in patients after treatment of mandibular angle fractures with miniplate osteosynthesis according to Champy. *Int J Oral Maxillofac Surg*. 2002;31(4):345–8. doi:10.1054/ijom.2002.0290.
11. Manson PN, Hoopes JE, Su CT. Structural pillars of the facial skeleton: An approach to the management of Le Fort fractures. *Plast Reconstr Surg*. 1980;66.
12. Prein J, Assael LA, Klotch DW. Manual of Internal Fixation in the Cranio-Facial Skeleton. Berlin: Heidelberg, Spring- er-Verlag; 1998. p. 1109–1125.
13. Kshirsagar R, Jaggi N, Halli R. Bite Force Measurement in Mandibular Parasymphyseal Fractures: A Preliminary Clinical Study. *Craniomaxillofac Trauma Reconstr*. 2011;4(4):241–4. doi:10.1055/s-0031-1293521.
14. Weihsin H, Thadani S, Agrawal M, Tailor S, Sood R, Langalia A, et al. Causes and incidence of maxillofacial injuries in India: 12-year retrospective study of 4437 patients in a tertiary hospital in Gujarat. *Br J Oral Maxillofac Surg*. 2014;52(8):693–6. doi:10.1016/j.bjoms.2014.07.003.
15. Talwar RM, Ellis E, Throckmorton GS. Adaptations of the masticatory system after bilateral fractures of the mandibular condylar process. *J Oral Maxillofac Surg*. 1998;56(4):430–9. doi:10.1016/s0278-2391(98)90707-8.
16. Tate GS, Ellis E, Throckmorton G. Bite forces in patients treated for mandibular angle fractures: Implications for fixation recommendations. *J Oral Maxillofac Surg*. 1994;52(7):734–6. doi:10.1016/0278-2391(94)90489-8.
17. Wang H, Chen MS, Fan YB, Tang W, Tian WD. Biomechanical Evaluation of Le Fort I Maxillary Fracture Plating Techniques. *J Oral Maxillofac Surg*. 2007;65(6):1109–16.
18. Spagnol G, Palinkas M, Regalo SCH, de Vasconcelos P, Sverzut CE, Trivellato AE. Impact of midface and upper face fracture on bite force, mandibular mobility, and electromyographic activity. *Int J Oral Maxillofac Surg*. 2016;45(11):1424–9. doi:10.1016/j.ijom.2016.06.006.
19. de Abreu R, Pereira MD, Furtado F, Prado GPR, Mestriner W, Ferreira LM. Masticatory efficiency and bite force in individuals with normal occlusion. *Arch Oral Biol*. 2014;59(10):1065–74. doi:10.1016/j.archoralbio.2014.05.005.

Author biography

Abhinandan Patel K N, Associate Professor and HOD

Girish G, Assistant Professor

Kora Ramya Reddy, Fellow, Maxillofacial Trauma

Rajendra K S, Assistant Professor

Sneha T R, Fellow, Maxillofacial Trauma

Akarsh R, Fellow, Maxillofacial Trauma

Cite this article: Patel K N A, Girish G, Reddy KR, Rajendra K S, Sneha T R, Akarsh R. Bite force measurement in maxillofacial trauma – A clinical prospective study. *J Oral Med, Oral Surg, Oral Pathol, Oral Radiol* 2021;7(1):42-49.