J. Maxillofac. Oral Surg. (Oct–Dec 2019) 18(4):551–554
https://doi.org/10.1007/s12663-019-01238-5

COMPARATIVE STUDY

Are Bondable Buttons a Better Option than Intermaxillary Fixation Screws for Achieving Maxillomandibular Fixation? A Prospective Randomized Clinical Study

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Received: 1 March 2019 / Accepted: 9 May 2019 / Published online: 13 May 2019

Abstract

Aim The aim of this study was to identify a better option in achieving maxillomandibular fixation (MMF) comparing bondable buttons and Maxillomandibular Fixation screws in achieving Maxillomandibular Fixation.

Patients and Methods In this randomized clinical trial, study sample was derived from the population of patients who reported with minimally displaced mandibular fractures and who required Maxillomandibular Fixation. The patients were divided into two groups. In Group I (n = 20), Maxillomandibular Fixation was done with Maxillomandibular Fixation screws; on the other hand, in Group II (n = 20), bondable buttons were used. In both the groups the patients were analyzed for the time duration required in minutes for securing and removal of Maxillomandibular Fixation, plaque accumulation and postoperative stability. Plaque accumulation was evaluated using TURESKY–GILMORE–GLICKMAN modification of the Quigley-Hein plaque index. The complications encountered during and after the surgery were also analyzed.

Results The plaque accumulation and time required for placement and removal in group I were more as compared to group II. In Group I, there were more complications as compared to Group II such as tooth root damage, screw loosening, screw breakage and infection.

Conclusion Bondable buttons are a better choice for achieving Maxillomandibular Fixation in comparison with Maxillomandibular Fixation screws for the treatment of minimally displaced mandibular fractures. Further studies with a bigger sample size must be carried out.

Keywords Maxillomandibular fixation · Mandibular fractures · Maxillomandibular fixation screws · Bondable buttons

Introduction

In order to achieve a meticulous reduction followed by proper fixation of mandibular fractures, a perfect maxillomandibular fixation (MMF) is must. Numerous modalities of achieving MMF are being used worldwide with inherent merits and demerits. A proper MMF technique is the one which gives proper stability with minimal or no complications.

Arthus and Berardo [1] introduced MMF screws for the first time in 1989 for achieving MMF. Tooth root damage, screw loosening and mucosal coverage over the screw head were disadvantages mentioned in the literature by the use of MMF screws [2, 3]. It is considered that all these drawbacks of using MMF screws can be eliminated by the use of bonded button brackets, which were first documented in the literature by Burke and Mitchell [4] for the conservative treatment of mandibular fractures.

Hence, the present study was designed and conducted prospectively, to identify the better method for performing MMF in the treatment of mandibular fractures, by comparing MMF screws and bondable buttons, with plaque accumulation, postoperative stability and complication being the parameters of comparative assessment.

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Patients and Methods

The study included 40 patients reporting to our outpatient and emergency department; patients aged 18 years or older with minimally displaced favorable mandibular fractures indicated for open or closed reduction. The patients from January 2016 to December 2018 were alternately assigned to the two groups.

Patients with dentoalveolar fractures, panfacial fractures (more than two fractures), comminuted fractures of the mandible, crowding of teeth and the presence of systemic conditions such as rheumatoid arthritis and bronchial asthma were excluded from this study.

A written informed consent was obtained from all the patients before recruiting in the study. Under local anesthesia, open reduction and internal fixation (ORIF) was done using mini-plates for mandibular fractures other than condylar fracture. Condylar fractures were treated by closed reduction with placement of MMF screws or bondable buttons. The patients were kept with MMF for 4 weeks.

Group I comprised 20 patients who were treated using stainless-steel MMF screws (Ortho Max Shreerang Apartments, Kothi, Baroda, India) with or without open reduction. Four stainless-steel, self-drilling/tapping screws of 2.0 mm diameter (12-mm length) and 26-gauge wire were used for achieving the MMF in each patient (Fig. 1). The most preferred site was between the canine and first premolar [5]. Postoperative orthopantamograms were used to evaluate screw placement (Fig. 2).

Group II also included 20 patients treated using bonded buttons. Buttons can be bonded using light or self-cure composite adhesive. Bonding of buttons was done preferably on the first premolar (Figs. 3 and 4). However, in cases where the first premolar was involved in fractures, the buttons were bonded to canines. Four buttons were sufficient for MMF using a 26-gauge wire. Follow-up examinations were performed weekly and biweekly and extended until fracture healing was complete.

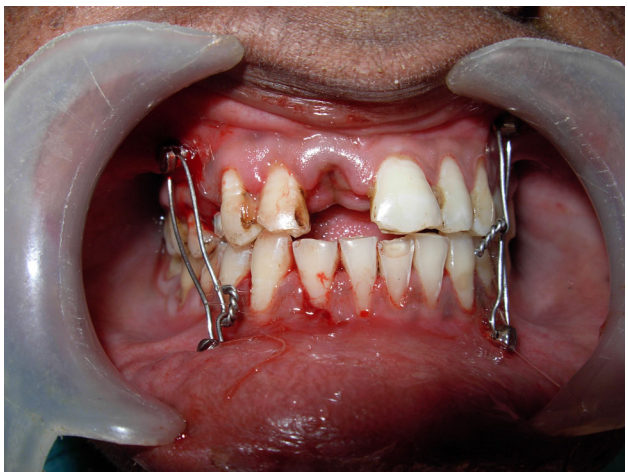

Fig. 1 Photograph showing MMF with MMF screws

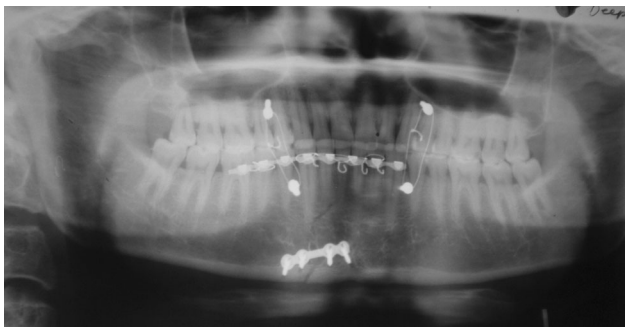

Fig. 2 Orthopantamogram showing MMF with MMF screws

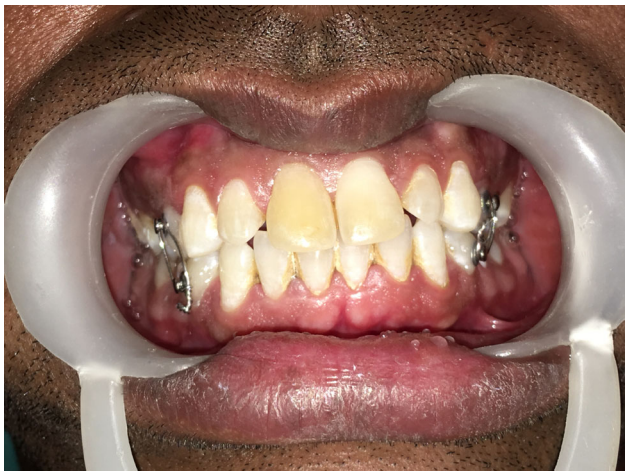

Fig. 3 Photograph showing MMF with bondable buttons

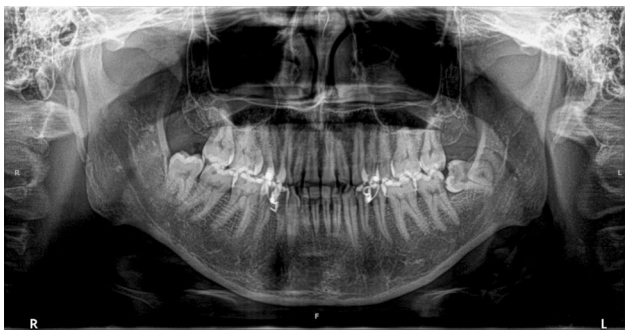

Fig. 4 Orthopantamogram showing MMF with bondable buttons

The patients were evaluated for the following variables, and the outcome was statistically analyzed using SPSS software version 17 applying Chi-square test and unpaired t test.

1. The duration required for both techniques in minutes.
2. The plaque accumulation in both groups using TURESKY–GILMORE–GLICKMAN modification of

Table 1 Distribution of patients in two groups and the treatment given to them

	Group I	Group II	Total	Treatment given to patients
Symphysis #	1	1	2	ORIF
Parasymphysis and condyle #	8	9	17	ORIF for parasymphysis and CR for condylar #
Body #	1	1	2	ORIF
Ramus #	1	1	2	ORIF
Parasymphysis, angle #	4	5	9	ORIF
Body, angle #	5	3	8	ORIF
Total	20	20	40	ORIF

ORIF open reduction and internal fixation, *CR* closed reduction, # fracture

the Quigley-Hein plaque index [6]. Plaque was assessed on the labial, buccal, and gingival surfaces at the gingival third of all the teeth using a disclosing agent.

3. Postoperative stability after achieving the MMF of both groups.
4. The complications encountered during and after the surgery.

Results

The etiologies of fractures were road traffic accidents in 28 patients, assault in 2 and fall in 10 patients. Out of these 40 patients included in the study, 37 were male and 3 were female. The overall age range was 19 years to 43 years with a mean age of 28.5 years. In Group I, the age range was 19–38 years with a mean age of 27.35 years, whereas in group II, the age range was 21–43 years with a mean age of 29.65 years.

All patients remained in MMF postoperatively with 26-gauge wire for 4 weeks, and those patients with condylar fractures were later transitioned to guiding elastics for 2 weeks. The study variables and treatment assigned to them are shown in Table 1.

The mean value of plaque index in group I was 2.8 and in group II was 1.2. This signifies that plaque deposit is significantly more in group I ($p < 0.05$). As shown in Table 2, the average working time for placement and removal of MMF screws was significantly higher than bondable buttons ($p < 0.05$). Table 3 shows the complications that were encountered in both the groups indicating that the complications were more when MMF screws were used. No occlusal disturbances were seen in either group.

Table 2 Time required for securing and removal of MMF in both the groups

Group	Number of patients	Average time required for achieving MMF (min)	Average time required for removal of MMF (min)
I	20	11.35	9.28
II	20	7.64	5.95

Table 3 Complications in both the groups

Complications	Group I	Group II
Instability of fracture	0 (0%)	0 (0%)
Infection	0 (0%)	0 (0%)
Glove perforation	2/40 (5%)	0 (0%)
Needle stick injury to finger	1 (5%)	0 (0%)
Screw/button breakage	1 (1.25%)	0 (0%)
Screw loosening/button removal	5/80 (6.25%)	2/80 (2.5%)
Tooth/root damage	8	0

Discussion

This study was carried out to identify a better method for achieving MMF. Specifically, the intent was to determine the efficacy of bondable buttons in comparison with MMF screws, as well as to compare the plaque index between two groups. The results of this study confirmed that use of bondable buttons was a quicker method of achieving MMF. Furthermore, the mean plaque index value was less in Group II, which suggests that oral hygiene maintenance was better in patients treated with bondable buttons. Oral hygiene maintenance was poor when arch bars and eyelet wiring were used for achieving MMF [7]. The MMF was quick when bondable buttons were used, as the time required for placement and removal of buttons was less as compared to MMF screws. The average working time can be reduced by experience in any of the technique. Erich arch bars took longer time (95.06 min) in achieving MMF [2]. The average time required when eyelet wiring was used for achieving MMF was 18 min and 30.50 min when direct interdental wiring was used for achieving MMF [8].

The screw breakage occurred in one patient (5%). Rai et al. [2] reported 3.33% of screw breakage, and Coburn et al. [9] reported screw fracture in 3 out of 122 patients (2.4%). The reason for screw breakage might be the forceful tightening of the screw. The screw loosening occurred in 30% of patients in the present study, which was equal in both maxilla and mandible. Coletti et al. [10] also reported the almost similar percentage (29%) of screw loosening as in the present study. The pressure exerted by facial musculature was responsible for loosening of the

screws; that is why long term MMF with screws was questionable. The rate of infection was 5% which was managed by antibiotic therapy.

Teeth damage was seen in 10% (8 teeth out of 80 teeth in 20 cases) of cases on postoperative radiograph. All injured teeth were asymptomatic after one-month follow-up period. Farr and Whear [3] reported 41.9% of tooth damage in their study. Rai et al. [2] reported 5.81% of injury to the roots of the teeth. Glove perforation and trauma to the operator's finger were seen in one patient in Group I. Avery et al. [11] in a study showed that the incidence of glove perforation was significantly high with wiring techniques.

To our knowledge, no prospective study has compared these two modalities of achieving MMF, which makes the present study unique. The small sample size and limited follow-up could be considered as the limitation of the study.

In conclusion, the use of bondable buttons for MMF is a quick and easy method that reduces the operating time. Oral hygiene maintenance is better in patients with bondable buttons than with MMF screws.

Compliance with Ethical Standards

Conflicts of interest The authors declare that there are no conflicts of interest regarding the publication of this paper.

Ethical approval Ethical clearance is taken from institutional ethics committee.

Informed Consent No patient identifying photographs are included.

References

1. Arthus G, Berardo N (1989) A simplified technique of maxillo-mandibular fixation. J Oral Maxillofac Surg 47:1234
2. Rai A, Datarkar A, Borle RM (2011) A better option in achieving IMF. J Oral Maxillofac Surg 69:3015–3018
3. Farr DR, Whear NM (2002) Intermaxillary fixation screws and tooth damage. Br J Oral Maxillofac Surg 40:84–87
4. Burke JL, Mitchell DA (2000) Buttons and elastics for the conservative treatment of fractured mandible. J Orthod 27:341–342
5. Gibbons AJ, Hodder SC (2003) A self-drilling intermaxillary fixation screw. Br J Oral Maxillofac Surg 41:48
6. Tursky S, Gilmore G (1970) Reduced plaque formation by chloromethyl analogue of Victamine C. J Periodontol 41:41–44
7. Busch RF (1999) Re: Jones. Intermaxillary fixation using intraoral cortical bone screws. Br J Oral Maxillofac Surg 37:422–423
8. Rai A et al (2012) Comparative assessment between eyelet wiring and direct interdental wiring for achieving intermaxillary fixation: a prospective randomized clinical study. J Oral Maxillofac Surg 70:1914–1917
9. Coburn DG, Kennedy DWG, Hodder SC (2002) Complications with intermaxillary fixation screws in the management of fractured mandibles. Br J Oral Maxillofac Surg 40:241–244
10. Coletti DP, Salama A, Caccamese JF Jr (2007) Application of intermaxillary fixation screws in 208 maxillofacial trauma. J Oral Maxillofac Surg 65:1746–1750
11. Avery CME, Johnson PA (1992) Surgical glove perforation and maxillofacial trauma: to plate or wire? Br J Oral Maxillofac Surg 30:31