

Is Plate Removal after Orthognathic Surgery Mandatory?

Dinesh Ram Raja^{1*}, Madhulaxmi. M², P.U. Abdul Wahab², James Solomon Jesudasan²

¹Intern, Saveetha Dental College, Chennai

²Department of Oral and Maxillo facial surgery, Saveetha Dental College, Chennai

*Corresponding author: avdineshramraja@gmail.com

Received November 09, 2013; Revised November 26, 2013; Accepted December 13, 2013

Abstract Rigid internal fixation was propagated for use in the oral and maxillofacial region in the late 1970s. Since that time, a number of systems have been developed for orthognathic surgery, craniofacial surgery and facial fracture reconstruction [1,2]. The advantages of such internal fixation include a stable intra operative maxillary position, the avoidance or reduced time of maxillomandibular fixation, and the suggestion within the current literature that long term stability is improved [3,4,5,6]. In most maxillofacial units it is routine policy not to remove plates and screws following bony union, unless when clinically indicated [7,8,9]. Many studies have investigated the removal of miniplates in trauma cases but relatively few studies have focused exclusively on orthognathic surgery operations. This review of literature was done to investigate if there is a need and necessity to remove plates and screws after orthognathic surgery.

Keywords: miniplates, orthognathic surgery, infection

Cite This Article: Dinesh Ram Raja, Madhulaxmi. M, P.U. Abdul Wahab, and James Solomon Jesudasan, "Is Plate Removal after Orthognathic Surgery Mandatory?" *International Journal of Dental Sciences and Research* 1, no. 3 (2013): 60-62. doi: 10.12691/ijdsr-1-3-5.

done. An independent search of the internet was also done for relevant articles.

1. Introduction

Miniplates have been widely used in the osteosynthesis of the mandible and maxilla in maxillofacial surgery, be it for trauma or orthognathic surgery. In 1991, the Strasbourg Osteosynthesis Research Group recommended that "the removal of a non-functional plate is desirable provided that the procedure does not cause undue risk to the patient" [10]. For most patients there is less risk in leaving symptomless plates in situ than in removing them. There is as yet no consensus among surgeons on the need for routine removal of maxillofacial plates [11]. It is routine policy in most units not to remove miniplates following bony union, but to remove them only when clinically indicated [7,8,9]. There have been a number of studies looking at small groups of patients who have had miniplate osteosynthesis in cross section and most report relatively low rates of removal [12-19].

2. Objective

This review was done to evaluate whether removal of plates and screws after orthognathic surgery is mandatory or not.

3. Search Methodology

In JULY 2013 search for relevant trials in The Cochrane Library, MEDLINE, PUBMED(MESH) was

4. Selection Criteria

No specific criteria was used except that the relevant articles should be on human subjects and in English.

After thorough scrutiny four articles were selected as appropriate and evaluated.

5. Results

According to the study conducted by Brian L. Schmidt et al [2], a total of 738 plates were placed in 190 patients out of which 21 of the 190 patients (11.1%) had at least a portion of the hardware removed because they either requested removal or required removal secondary to complication related to the plate or screw. This represented 70 of 738 plates (9.5%). The reasons for removal included pain, palpation by the patient, sinusitis, temperature sensitivity, infection, and patient request.

Similarly in study conducted by Vyomesh Bhatt et al [11] a total of 308 plates were inserted into 153 patients in which 32 plates were removed from 21 patients (10.4%) over 4 years; 27 plates were removed from 16 patients for purely plate-related symptoms, with infection being the most common cause accounting for 16 plates (50%) in 9 patients. Symptoms necessitating plate removal occurred within 52 weeks after insertion in 16 patients, accounting for 23 of the plates removed (72%).

T. Theodossy et al [20] in their study suggested infection was the sole reason for plate removal. A removal rate of 15.6% was noted. Age and duration of operation were the only two statistically significant factors to affect plate removal while some of the other factors showed increased odds ratios but were not statistically significant.

Bart Falter et al [21] in their study of 570 orthognathic patients, hardware was removed in 157 patients (27.5%). 78 patients (13.7%) needed removal because of plate-related infection; 66 (11.6%) because of clinical irritation; 5 (0.9%) for dental implant placement; and 8 (1.4%) for other reasons. Average time between operation and removal was 9.9 months. More women (31.7%) than men (20.3%) had plates removed, but age was not a factor except with infection.

6. Discussion

Various complications can arise after miniplate and screw fixation, such as infection, miniplate fracture, nonunion and nerve paralysis or dysesthesia [7]. Plate removal after orthognathic surgery varies between 1.0% and 18.6% of patients [17,20,22,23,24].

Some German centers advocate routine removal of plates and screws after treatment [25]. In general, there is no significant correlation between age and the risk for plate removal, in line with what has been reported by Kuhlefeldt et al [23]. The role of antibiotics in intraoral orthognathic surgery remains controversial and has been questioned by the result of specific studies [26,27]. But yet there is no harmony among maxillofacial surgeons regarding the long-term management of miniplates.

Some authors recommend removal [1], while others recommend retention unless clinically indicated [7,8,9]. Greater than 11% of patients undergoing Le Fort I osteotomy with internal fixation will ultimately have the hardware removed. Complications from the plates or screws necessitating removal were observed in 10.6% of patients [2]. It is important to note that plate removal is not synonymous with failure of treatment as all patients had their infected plates removed after a healing period that allowed bony union. As for duration of operation, it was interesting to note that if the procedure took longer than 190 minutes, the odds of having a plate removed were significantly greater than if the operation took 190 minutes or less. Procedures that lasted within the mean of 180 minutes did not seem to show any statistical significance. This might be due to the increased length of time that the open wound/osteotomy site is exposed to the oral environment [20]. Although the standard removal of all osteosynthesis material is no longer promoted in the literature, controversy remains about the long-term effect of titanium miniplates, primarily in young adults [16,28,29,30].

Another possible explanation for the high removal rates is that the patients are not placed in intermaxillary fixation (IMF) postoperatively. Although the double-plating method gives a strong fixation that excludes the need for IMF, it is possible that this practice results in micromotions at the fracture site that provoke a reaction near the surgical wound [21]. There is evidence in the literature of the excellent tissue compatibility and high corrosion resistance of titanium and its alloys and the lack

of support for the routine removal of titanium miniplates [31].

Those who advocate the routine removal of osteosynthesis devices do so on the basis that once bony union has occurred and the implant has accomplished its particular purpose it becomes a useless foreign body with the potential to cause problems, and that removing it might be considered preventative [11].

Our current practice is to only remove miniplates when they are symptomatic, when they are encountered at further surgery, or on request from the patient, which is in keeping with the views of the consultants in the West Midlands region of the United Kingdom [7] and other studies [8,9]. Ultimately, the problem of plate palpation could be solved completely by use of absorbable plates if their profile is not too large immediately after placement. The question is whether the incidence of plate palpation is great enough to justify the increased expense of absorbable plates [2].

7. Conclusion

Although age and gender are not controllable, duration of operation, smoking habits and wisdom tooth removal at the time of surgery can be controlled to try and minimize the risk of infection and thus plate removal. Only a minority of patients are likely to require removal of any plates or screws after orthognathic surgery and to remove them all routinely is to subject a large number of patients to uncomfortable, sometimes difficult and even occasionally hazardous procedures unnecessarily [2].

Newer plating systems such as resorbable plates and screws that can fix these osteotomies in a stable and reliable manner, with the material not being too bulky, always fully resorbed and not costing more than present metal materials must also be studied in detail to add value to this debate.

References

- [1] Champy M, Lodde JP, Schmidt R, et al: Mandibular osteosynthesis by miniature screwed plates via a buccal approach. *J Maxillofac Surg* 6: 14, 1978.
- [2] Brian L. Schmidt, David H. Perrott, Dennis Mahan and Gerard Kearns: The Removal of Plates and Screws after Le Fort I Osteotomy. *J Oral Maxillofac Surg* 56:184-188, 1998.
- [3] Horster W: Experience with functionally stable plate osteosynthesis after forward displacement of the upper jaw. *J Maxillofac Surg* 8: 176, 1980.
- [4] Rittersma J, van der Veld RGM, van Gool AV, et al: Stable fragment fixation in orthognathic surgery: Review of 30 cases. *J Oral Surg* 39:671, 1981.
- [5] Steinhauser EW: Bone screws and plates in orthognathic surgery. *Int J Oral Surg* 11:209, 1982.
- [6] Egbert M, Hepworth B, Myall R, et al: Stability of Le Fort I osteotomy with maxillary advancement: A comparison of combined wire fixation and rigid fixation. *J Oral Maxillofac Surg* 53:243, 1995.
- [7] Matthew IR, Frame JW: Policy of consultant oral & maxillofacial surgeons towards removal of miniplate components after jaw fracture fixation—A pilot study. *Br J Oral Maxillofac Surg* 37: 110, 1999.
- [8] Brown JS, Trotter M, Cliffe J, et al: The fate of miniplates in facial trauma and orthognathic surgery: A retrospective study. *Br J Oral Maxillofac Surg* 27:306, 1989.

- [9] Haug RH: Retention of asymptomatic bone plates used for orthognathic surgery and facial fractures. *J Oral Maxillofac Surg* 54:611, 1996.
- [10] Ward Booth P: Discussion: Risk factors contributing to symptomatic plate removal in orthognathic surgery patients. *J Oral Maxillofac Surg* 57:682, 1999.
- [11] Vyomesh Bhatt, Purnima Chhabra, M.S. Dover: Removal of Miniplates in Maxillofacial Surgery: A Follow-Up Study. American Association of Oral and Maxillofacial Surgeons *J Oral Maxillofac Surg* 63:756-760, 2005.
- [12] Persson G, Hellem S, Nord PG: Bone plates for stabilising Le Fort I osteotomies. *J Maxillofac Surg* 14:69, 1986.
- [13] Punnia-Moorthy A, Rix L, Stevenson L: An analysis of 80 cases of mandibular fractures treated with miniplate osteosynthesis. *Int J Oral Maxillofac Surg* 20:337, 1991 BHATT, CHHABRA, AND DOVER 759.
- [14] Francel TJ, Birely BC, Ringelmann PR, et al: The fate of plates and screws after facial fracture reconstruction. *Plast Reconstr Surg* 90:568, 1992
- [15] Nakamura S, Oka M, Takenoshita Y: Complications of miniplate osteosynthesis for mandibular fractures. *J Oral Maxillofac Surg* 52:233, 1994.
- [16] Alpert B, Seligson D. Removal of asymptomatic bone plates used for orthognathic surgery and facial fractures. *J Oral Maxillofac Surg* 1996; 54:618-21.
- [17] Schmidt BL, Perrott DH, Mahan D, et al: The removal of plates and screws after Le Fort I osteotomy. *J Oral Maxillofac Surg* 56:184, 1998.
- [18] Manor Y, Chaushu G, Taicher S: Risk factors contributing to symptomatic plate removal in orthognathic surgery. *J Oral Maxillofac Surg* 57:679, 1999.
- [19] Bhatt V, Langford RJ: Removal of miniplates in maxillofacial surgery: University Hospital Birmingham experience. *J Oral Maxillofac Surg* 61:553, 2003.
- [20] T. Theodossy, O. Jackson, A. Petrie, T. Lloyd: Risk factors contributing to symptomatic plate removal following sagittal split osteotomy. *Int. J. Oral Maxillofac. Surg.* 2006; 35: 598-601.
- [21] Bart Falter, Serge Schepers, Luc Vrielinck, Ivo Lambrechts and Constantinus Politis: Plate removal following orthognathic surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;112:737-743.
- [22] Alpha C, O'Ryan F, Silva A, Poor D. The incidence of postoperative wound healing problems following sagittal ramus osteotomies stabilized with miniplates and monocortical screws. *J Oral Maxillofac Surg* 2006; 64:659-68.
- [23] Kuhlefelt M, Laine P, Suonimen-Taipale L, Ingman T, Lindqvist C, Thorén H. Risk factors contributing to symptomatic miniplate removal: a retrospective study of 153 bilateral sagittal split osteotomy patients. *Int J Oral Maxillofac Surg* 2010; 39:430-5.
- [24] Beals SP, Munro IR. The use of miniplates in craniomaxillofacial surgery. *Plast Reconstr Surg* 1987; 79:33-8.
- [25] Mueller CK, Bader RD, Schultze-Mosgau S. Oral and maxillofacial injuries. Current concepts of treatment. *Trauma Berufskrankh* 2010; 12:208-14.
- [26] Baqain ZH, Hyde N, Patrikidou A, Harris M. Antibiotic prophylaxis for orthognathic surgery: a prospective randomised clinical trial. *Br J Oral Maxillofac Surg* 2004; 42: 506-510.
- [27] Ruggles JE, Hann JR. Antibiotic prophylaxis in intraoral orthognathic surgery. *J Oral Maxillofac Surg* 1984; 42: 797-801.
- [28] Haug RH. Retention of asymptomatic bone plates used for orthognathic surgery and facial fractures. *J Oral Maxillofac Surg* 1996; 54:611-7.
- [29] Rubio J, Garcia-Alonso M, Alonso C, Alobera M, Clemente C, Munuera L, et al. Determination of metallic traces in kidneys, livers, lungs and spleens of rats with metallic implants after a long implantation time. *J Mater Sci Mater Med* 2008; 19:369-75.
- [30] Sarmiento-González A, Encinar J, Marchante-Gayón J, Sanz-Mendel A. Titanium levels in the organs and blood of rats with a titanium implant, in the absence of wear, as determined by double-focusing ICP-MS. *Anal Bioanal Chem* 2009;393:335-43.
- [31] Langford RJ, Frame JW: Surface analysis of titanium maxillofacial plates and screws retrieved from patients. *Int J Oral Maxillofac Surg* 31:511, 2002.