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Removal of bicortical screws and other osteosynthesis material that caused symptoms after bilateral sagittal split osteotomy: a retrospective study of 251 patients, and review of published papers

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Abstract

Rigid fixation with either bicortical screws or miniplates is the current standard way to stabilise the mandibular segments after bilateral sagittal split osteotomy (BSSO). Both techniques are widely used and the superiority of one or other method is still debatable. One complication of rigid fixation is the need to remove the osteosynthesis material because of associated complaints. The main aim of this retrospective study was to analyse how often we needed to remove bicortical screws because they caused symptoms after BSSO in our clinic. Review of other published papers also enabled us to investigate the reported rates of removal of screws and miniplates at other centres. The mean (SD) duration of follow-up of 251 patients (502 sites) was 432 (172) days, and the number of bicortical screws removed in our clinic was 14/486 sites (3%). Other methods of fixation were used at 16 sites. We found no significant association between removal of bicortical screws and age, sex, presence of third molars, or bad splits. Published rates of removal of bicortical screws and miniplates are 3.1%–7.2% and 6.6%–22.2% per site, respectively. These findings show that fixation with bicortical screws after BSSO is associated with a low rate of removal of osteosynthesis material. Reported incidences imply a lower rate of removal for screws than for miniplates.

Keywords: Mandibular osteotomy; Screws; Plates; Fixation; Post-operative complication; Osteosynthesis

Introduction

Bilateral sagittal split osteotomy (BSSO), first described by Trauner and Obwegeser,[1] is a commonly-used technique in orthognathic surgery, and Dal Pont, Epker, and Hunsuck subsequently described popular modifications of the original technique.[2–4] Initially, the proximal and distal mandibular segments were fixed with a wire that was looped around the ramus, combined with immobilisation of the jaw and intermaxillary fixation (IMF).[1] In 1974, Spiessl introduced rigid fixation with lag screws to avoid having to use IMF.[5] A few years later, Lindorff advocated placement of positioning screws, without compression to prevent entrapment of the inferior alveolar nerve.[6] Rigid fixation with miniplates was popularised by Champy et al and has become another way to stabilise the mandibular segments after BSSO.[7]

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Although rigid fixation has many advantages over the earlier techniques, postoperative complications can be associated with the osteosynthesis material.[8–10] Sometimes it has to be removed because of related infection or irritation, or wound dehiscence. Although long-term consequences are rare, removal of the osteosynthesis material can cause morbidity, so its incidence should be minimised, particularly as orthognathic surgery is an elective procedure.

The aims of this retrospective study were to analyse our incidence of removal of bicortical screws after BSSO, and to compare it with reported rates of removal of bicortical screws and miniplates from other centres.

Materials and methods

The clinical records and radiographs of 259 consecutive patients who had been treated by either BSSO or bimaxillary osteotomy between January 2004 and December 2011, with or without genioplasty, were reviewed.

The same procedures and clinical care had been applied in all cases. Preoperatively, the patients had been given a single dose of antimicrobial prophylaxis (penicillin 1×10^6 units intravenously) and steroids (methylprednisolone 25 mg twice on day 1, 12.5 mg twice on day 2, and 12.5 mg once on day 3, given intravenously). Three senior staff surgeons operated in all cases, supervising a resident on the other side in most patients. BSSO was done with sagittal splitter and separators, without the use of chisels.[11,12] After the sagittal split, the mandible was placed in the new intermaxillary relation, and rigid fixation with 3 bicortical screws (Martin GmbH, Tuttlingen, Germany; 9, 11, or 13 mm long and 2.0 mm in diameter) was planned (Fig. 1). If fixation with bicortical screws was contraindicated, miniplates (Martin GmbH; 4- or 6-hole Champy miniplates) were used. The patients were discharged 2 days postoperatively and instructed to return to the clinic if there were any problems. Clinical and radiographic evaluations were planned at 1, 2, and 3 weeks and 3, 6, and 12 months postoperatively.

The patients' casenotes were reviewed for details of sex, age, preoperative diagnosis, condition of the mandibular third molars, other simultaneous procedures, method of fixation, and postoperative removal of bicortical screws. If the osteosynthesis material had been removed, the reason had been noted: infection at the site with inflamed tissue, granulation tissue, or intraoral fistula; wound dehiscence with visible osteosynthesis material; or loss of bone apparent around the material without symptoms. The osteosynthesis material was sometimes removed at the patient's request, usually because of irritation or tenderness at the site of osteosynthesis without infective symptoms.

Statistical analysis

Statistical evaluation was made with the help of IBM SPSS Statistics for Windows, version 20.0 (IBM Corporation, Armonk, NY, USA). Cross-tabulation, the chi square test, Fisher's exact test, and logistic regression were used as appropriate to assess the significance of differences among the variables. All statistical associations are reported with the odds ratio (OR) and 95% confidence interval (CI). Probabilities of less than 0.05 were accepted as significant.

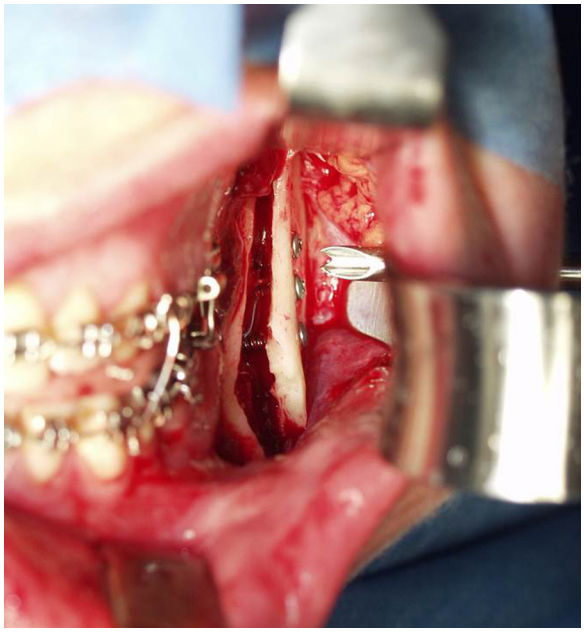

Figure 1. Intraoral view of the buccal cortex showing bicortical placement of screws after bilateral sagittal split osteotomy.

Results

Of the 259 patients enrolled in the study, the records of 8 patients were excluded because of incomplete data, so the final group comprised 251 (Table 1). The mean (SD) follow-up period was 432 (172) days. Twenty-one patients did not attend the clinical evaluation at 12 months and were contacted by telephone.

A sagittal split osteotomy was done at 502 sites, with fixation by screws in 246 patients (98.0%), bilaterally (n = 240) with fixation by miniplate on the other side, and unilaterally in 6. Miniplates were fixed on the right in 5 patients and combined with one bicortical screw on the left in the other 1. The reasons for unilateral fixation with miniplates were bad splits (n = 3), reduced volume of lingual cortical bone after extraction of third molars (n = 1), a small mandibular body with possible danger to the inferior alveolar nerve by bicortical fixation with screws because of its anatomical position (n = 1), and malfunction of the burr and fixation of the miniplate with other equipment (n = 1). Two patients (<1%) had bilateral fixation with miniplates because of a reduced volume of lingual cortical bone after extraction of third molars. Three patients had IMF because of bad splits.