AJP Chaves
LR Nascimento
MEG Costa
M Franz-Montan
PA Oliveira-Júnior
FC Groppo

Effects of surgical removal of mandibular third molar on the periodontium of the second molar

Authors' affiliations:
Antônio J.P. Chaves, Paulo A. Oliveira-Júnior, Department of Maxillofacial Surgery, EAP, APCD, Piracicaba, SP, Brazil
Lorena R. Nascimento, Maria E.G. Costa, Dental School of Federal University of Pará, Belém, PA, Brazil
Michelle Franz-Montan, Francisco C. Groppo, Department of Physiological Sciences, Piracicaba Dental School, UNICAMP, Piracicaba, SP, Brazil

Correspondence to:
Francisco Carlos Groppo
Av. Limeira
901, Areião
13414-903 Piracicaba,
SP Brazil
Tel.: +55 19 2106 5310
Fax: +55 19 2106 5310
E-mail: fcgroppo@fop.unicamp.br

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Chaves AJP, Nascimento LR, Costa MEG, Franz-Montan M, Oliveira-Júnior PA, Groppo FC. Effects of surgical removal of mandibular third molar on the periodontium of the second molar.

Abstract: *Objective:* The effects on periodontal tissues of adjacent second molars after semi-impacted mandibular third molar surgery were evaluated. The influence of flap design was studied. *Methods:* Twenty volunteers randomly underwent the three-cornered flap technique (group A) or the distal wedge flap technique (group B). The periodontal probing depth was measured by using a 'Williams'-type probe just prior to surgery and three months post-operatively. Six sites, mesio-buccal, buccal, disto-buccal, disto-lingual, lingual and mesio-lingual, around the second molar were selected for measurement. Kruskal–Wallis test and Dunn test (*post hoc*) were used. Significance level was set at 5%. *Results:* There were no complications (oedema, alveolitis, etc.) in any of the patients of the study. The results showed that both methods caused shallow pocket depth ($P > 0.05$) and there were no statistically significant differences between the flap techniques ($P > 0.05$). Flap design was not an important factor affecting the periodontal status of the second molar. *Conclusion:* The decision to use any of the various flap designs for access to mandibular third molars should be based on operator preference rather than on the assumption that periodontal health of the adjacent second molar will be improved.

Key words: distal wedge flap; flap design; periodontal pocket depth; third molar surgery; three-cornered flap

Introduction

Recent research demonstrated that erupted third molars have a negative impact on periodontal health in young adults and especially in the later stages of life. Periodontal pocket and gingival bleeding on second molars were associated with adjacent third molars (1, 2).

Surgical extraction of mandibular third molars usually demands a gingival flap and ostectomy, which could lead to gingival changes, loss of bone, development of periodontal pockets and exposure of cementum on the second molars distal aspect (3–6). However, other authors demonstrated improvement in attachment level and probing depths after third molar removal (7–10).

Few studies compared the influence of flap designs used in the surgical removal of impacted third molars in the periodontal conditions of the adjacent second molar (5, 6).

It is still not very clear if the periodontal condition of the adjacent second molars after the removal of third molars becomes healthier or this kind of extraction may lead to greater periodontal breakdown. Moreover, there are questions if the flap design has some or does not have any influence on periodontal condition of the adjacent second molars after the surgery.

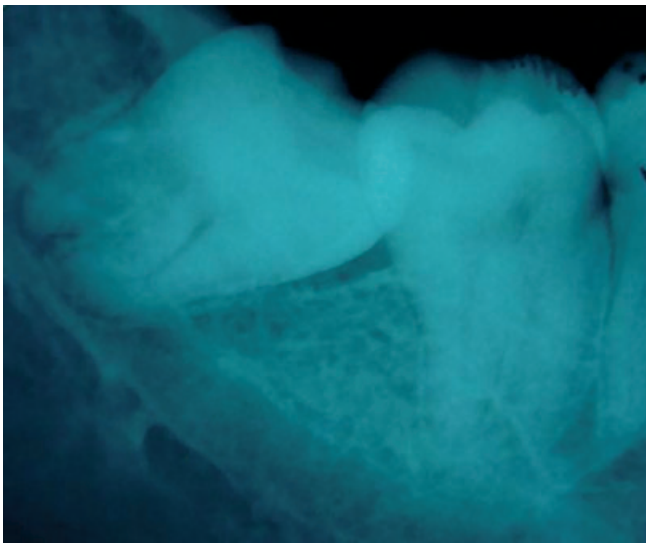

Fig. 1. Periapical radiograph of the third molar illustrating the degree of impaction of the third molars.

Material and methods

The purpose of this study was to evaluate the periodontal conditions of the second molar after the removal of partially impacted mandibular third molars using two different flap designs in Brazilian volunteers.

Twenty healthy volunteers (13 females and seven males) aged 18–27 years (21.75 ± 2.5 years) who had been scheduled for surgical removal of their mandibular third molars at the Dental Clinics of the Federal University of Pará were selected. Each volunteer was assessed radiographically (including panoramic and periapical radiography) and clinically. The main criteria to select volunteers were absence of any kind of systemic involvement, not smokers, good oral heath and with no gingival inflammation and the presence of bilateral semi-impacted mandibular third molars, which were indicated for extraction. The level of impaction for the third molars was classified according to Pell and Gregory's classification, being the highest portion of the tooth on a level with or above the occlusal plane (11) (Fig. 1).

The subjects did not use any other medication than the ones provided by the researchers. All subjects signed an informed consent form prior to their participation in the study. The Ethical Committee of the Federal University of Pará, Brazil, approved the study.

Experimental design

Volunteers were randomly assigned to either group A or B. Ten subjects of group A underwent the three-cornered flap technique. The distal wedge flap technique was used in 10 volunteers in group B. Surgical extractions were carried out by the same surgeon and all periodontal measurements were performed by the same periodontist. Neither the examiner nor the patient was aware as to which group the patient had been allocated.

The probing depth was measured just prior to surgery and 3 months post-operatively. Six sites, mesio-buccal, buccal, disto-buccal, disto-lingual, lingual and mesio-lingual, around the second molar were selected for measurement. The probing depth was measured using a 'Williams'-type probe (PQWBR, Hu-Friedy do Brasil, Rio de Janeiro, RJ, 0.5 mm of tip diameter). It was inserted into the gingival sulcus parallel to the axis of the tooth until a slight resistance was observed. All measurements were made to the nearest millimetre.

Surgery

All subjects were administered a single dose of 2 g of amoxicillin, 1 h before the surgical procedure. In addition, all subjects received 50 mg of sodium diclofenac 1 h before the surgical procedure and 50 mg q.i.d. for three days.

All patients were given 0.12% chlorexidine and an extraoral antisepsis with 1% topical povidine as mouthwash for 1 min. Regional blockade of inferior alveolar and lingual nerves was performed by using two cartridges (3.6 ml) of 2% mepivacaine/1:100 000 epinephrine.

After elevation of the designed flaps, bone removal and tooth sectioning were achieved using a high-speed surgical bur with copious irrigation. After curettage and careful irrigation, the flap was repositioned, the incision was closed using a 4.0 plain gut, interrupted sutures. All patients received instructions on oral hygiene measures and were examined 1 week post-operatively by the surgeon to ensure proper surgical healing.

Surgical flap designs

Group A flap was an envelope incision with a releasing incision anterior to the second molar (three-cornered flap) performed according to a previously described technique by Rosa *et al.* (6). The incision was performed along the post-molar triangle, starting well up on the ramus and keeping nearer the buccal side than the lingual. The horizontal incision was brought into contact with the distal surface of the second molar. The incision continued sulcularly to the mesio-buccal line-angle of the second molar with a releasing incision anterior to the second molar (Fig. 2).

Group B mucoperiosteal access flap used was the technique described by Szmyd (12): a distal wedge technique was carried out and the incision continued sulculary to the mesial of the first molar (buccal side). Mucoperiosteal flaps were reflected on buccal aspects (Fig. 3). Figure 4 shows a line diagram of both incision lines used in groups A and B.

Fig. 2. Envelope incision with a releasing incision anterior to the second molar (three-cornered flap) described by Rosa *et al.* (6).

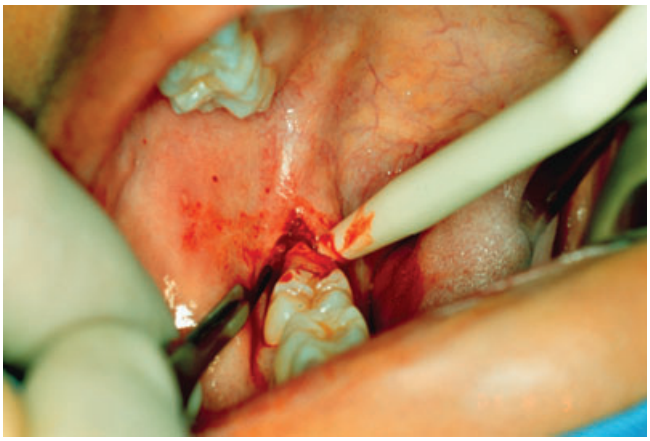

Fig. 3. Mucoperiosteal access flap described by Szmyd (12).

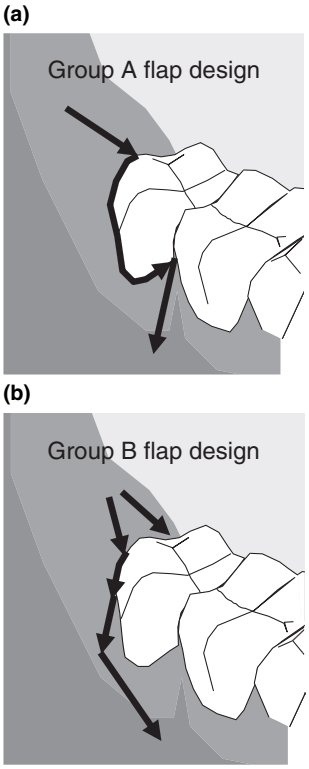

Fig. 4. Line diagram of flap designs used for groups A and B. The black arrows indicate the incision directions.

Post-surgery procedures

After 90 days of surgery, all volunteers were invited to perform a new evaluation. The following parameters were observed: gingivitis, scars on incision zone, colour alteration or gingival recession.

Data analysis

Kruskal–Wallis test and Dunn test (*post hoc*) were used to observe the effect of both methods in every aspect of the

second molar before and after the surgical procedure. Significance level was set at 5%.

Results

There were no complications (oedema, alveolitis, etc.) in any of the patients of the study. All of them completed the study without any systemic complication. Table 1 shows the parameters observed at the post-surgical visit, according to the surgical flap designs.

Table 2 shows the mean (±SD) of pocket depth before and after the surgical procedures in each aspect measured. Statistical analyses showed that there are no differences ($P < 0.05$) considering each aspect.

To observe the effect of both methods, a comparison between periods of both groups (Fig. 5) was performed. This comparison showed that both methods caused shallow pocket depth ($P > 0.05$). In addition, the comparison between the pocket depth conditions before the surgical procedure of both groups showed no differences. The results of both surgical methods also did not show statistically significant differences ($P > 0.05$).

Table 1. **Percentage of volunteers presenting local complications according to the surgical flap designs**

	Group A	Group B
Gingivitis	20	40
Scars on incision zone	0	0
Colour alteration	0	0
Gingival recession	40	20

Table 2. **Mean (±SD) of pocket depth (in mm) before and after the surgical procedures considering each aspect**

		Pocket depth	
Aspect	Period	Method A	Method B
Disto-buccal	Before	3.3 (±1.89)	3.8 (±0.92)
	After	2.3 (±0.63)	2.25 (±1.14)
Buccal	Before	2.25 (±1.32)	2.3 (±1.34)
	After	1.5 (±0.47)	1.9 (±0.88)
Mesio-buccal	Before	2.2 (±0.79)	2.9 (±1.37)
	After	1.85 (±0.75)	2.15 (±0.67)
Disto-lingual	Before	3.55 (±1.74)	3.8 (±1.55)
	After	2.55 (±1.21)	2.55 (±1.01)
Lingual	Before	2.1 (±1.22)	2.5 (±1.58)
	After	1.9 (±0.88)	2.3 (±1.06)
Mesio-lingual	Before	2.5 (±0.82)	2.5 (±1.18)
	After	2.1 (±0.97)	2.3 (±0.82)

There are no differences (Kruskal–Wallis, $P < 0.05$) considering each aspect.

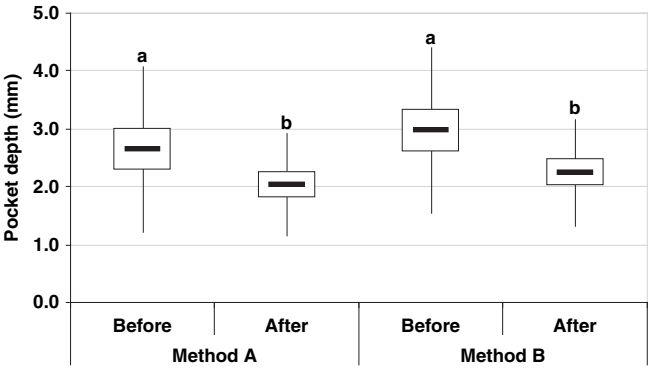

Fig. 5. Box–Whisker plot for comparison among groups considering pocket depth (central line: mean; box: ±95% CI; Whisker: ±SD; $n = 10$). Different letters mean statistically significant differences between groups (Kruskal–Wallis test and Dunn test (*post hoc*), $P < 0.05$).

Discussion

It is important to preserve the integrity and periodontal health of the adjacent second molar during the surgical removal of impacted third molar, and it is also essential to select a surgical technique considering anatomic structures and sound physiological principles (7). The surgical techniques chosen at the present study considered these characteristics.

This study evaluated the periodontal conditions after the removal of partially impacted third molars around the adjacent second molar using two different flap designs in young Brazilian volunteers. The age and other physical characteristics of the patients were similar to that of previous studies evaluating periodontal healing after third molar surgery (5–7, 10).

In this study, the absence of high probing depths and good oral health of all individuals may have a positive influence on the post-operative healing, as young patients have better healing than older patients (3). The degree of impaction classified according to Pell and Gregory's classification was similar in all subjects of the present study and also similar to subjects of others studies (7, 10, 11).

Two different flap designs were performed to evaluate their influence on the post-operative healing. The first technique performed was the classical envelop flap used by previous authors (4, 6, 13). The second technique used was the mucoperiosteal flap designed by Szymd (12), which was also used by Stephens *et al.* (10), Kugelberg *et al.* (9) and Rosa *et al.* (6).

In this study, none of the patients had complications such as oedema, gingival inflammation or colour alteration at the surgery site after surgical procedure. In addition, the periodontal conditions of the adjacent second molars improved after the surgery. It was demonstrated that both methods caused a

shallow pocket depth independent of the flap design used for the removal of partially impacted mandibular third molars.

Other authors have discussed distal periodontal healing as well potential injuries to the mandibular second molars after the removal of mandibular third molars (7). The findings of this study agree with those observed by Stephens *et al.* (10), Kugelberg *et al.* (9), Chang *et al.* (7) and Dodson (8). Other studies also demonstrated post-operative reduction in pocket depth of adjacent teeth (12, 14, 15).

Stephens *et al.* (10) observed that none of the volunteers had more than mild inflammation 12 weeks after the mandibular third molar surgery. In addition, soft tissue and gingival sulcus around the inferior second molar were generally healthier than they were at the preoperative time.

The oral hygiene prior to the surgical procedure of the subjects was considered satisfactory in this study (data not show). Kugelberg *et al.* (9) observed that the oral hygiene had a very strong influence on the post-operative improvement in probing depth after impacted lower third molar surgery.

Dodson (8) measured the efficacy of demineralized bone powder or guided-tissue regeneration therapy in preventing periodontal defects on the distal aspect of the second molar following extraction. The author concluded that those therapies did not offer the expected benefit over the treatment and, as observed at this study, the extraction itself led to improvement in attachment levels and probing depths.

However, other studies observed greater periodontal breakdown, such as loss of attachment, higher incidence of plaque, gingivitis and periodontal pockets in the adjacent second molar after the surgery (3–6).

One of the best explanations of these contradictory results is the influence of aging over the healing function. Usually, young people heal faster than older people (4, 9). It was proposed that age decreases the cellular immunity against dental plaque. A low immune response could be associated with different periodontal responses between younger and older subjects, and physiological changes in periodontium increase with age (3, 4). Thus, the suggestion to remove third molars in the early stages of life is common and might have beneficial effects on the periodontal health of the adjacent second molar.

The prophylactic extraction of impacted third molars has been recommended at an early age due to three reasons: influence of age on periodontal status, operative risks that also increases with age; and increased post-operative morbidity with age (5).

In a 4-year prospective evaluation on the periodontal healing after the impacted mandibular third molar surgery, fewer intrabone defects were observed in younger patients, but nearly two-thirds of older subjects had poor responses (4).

Peng *et al.* (3) found a periodontal breakdown on the distal surface of the adjacent second molar induced by the surgical removal of impacted mandibular third molar. However, they selected adults who were diagnosed with moderate-to-severe chronic periodontitis in their study. These subjects may have a tendency for greater attachment loss due to the nature of the disease. In this study, there were no periodontal patients enrolled but healthy volunteers.

Besides age, other several factors may have significant biological influence upon the potential for periodontal healing. Preoperative intrabone defects or probing depths, the size of the contact region between second and third molars and root resorption were pointed out as important factors. The first two factors occur most frequently and were most severe when the third molar's crown is close to the second molar's root. The rate of tissue breakdown accelerates after 30 years of age when periodontal disease is present (9).

In addition, factors that could affect periodontal status, such as poor cultural level, non-regular dental visits and smoking could also be associated with periodontitis after third molar removal. Smoking could double the risk of having probe depth of 5 mm or more in a second molar (1). In this study, all subjects had similar cultural level and none of them were smokers.

Flap design was not an important factor affecting the periodontal status of the second molar according to Woolf *et al.* (16), Stephens *et al.* (10), Quee *et al.* (5) and Rosa *et al.* (6). Therefore, based on the findings of these previous studies and this study, it is up to the operator to choose the flap design for mandibular third molar surgery because flap design has no influence upon periodontal healing post-operatively.

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