

Comparison of 2 Flap Designs in the Periodontal Healing of Second Molars After Fully Impacted Mandibular Third Molar Extractions

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Purpose: This investigation compared the effects of different flap designs on the periodontal health status of the mandibular second molar after the extraction of the adjacent impacted third molar.

Patients and Methods: Eighteen patients aged 16 to 32 years who required removal of bilateral impacted mandibular third molars were included in this study. The periodontal health of the second molar was evaluated preoperatively and at 1 week, 2 weeks, 4 weeks, and 12 months postoperatively. The third molars were removed by using the 3-cornered flap on the left side of the jaw and modified Szmyd flap on the right side.

Results: The mean probing depth (PD) at distal and buccal sites was significantly different between the flaps at 1 week, 2 weeks, and 4 weeks postoperatively ($P < .05$). There were no significant differences in preoperative and 1 year postoperative mean PD between the 2 flaps ($P > .05$). There was no significant difference in mean clinical attachment level between the flap sites at 1 year ($P > .05$).

Conclusion: The modified Szmyd flap, which leaves intact gingiva around the second molar, has better primary periodontal healing than the 3-cornered flap after surgical removal of the fully impacted mandibular third molar.

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J Oral Maxillofac Surg 65:2206-2210, 2007

Surgical removal of impacted third molars is the operation carried out most commonly by oral surgeons. The optimal management of the surgical extraction of the impacted third molar is a highly relevant issue to maintaining the periodontal health of the adjacent second molar. Dehiscence can take place distal to the second molar during primary wound healing after extraction of the impacted third molar and this area may heal secondarily. Secondary wound healing can cause loss of attachment and gingival defects distal to

the second molar.¹ The effect of impacted third molar extraction and different flap techniques on periodontal health distal to the adjacent second molar has been investigated with conflicting results in several studies.¹⁻⁹ To increase understanding of this issue, this investigation compared the effect of different flap designs on periodontal health status of the mandibu-

Received from the Faculty of Dentistry, University of Ondokuz Mayıs, Samsun, Turkey.

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0278-2391/07/6511-0012\$32.00/0

doi:10.1016/j.joms.2006.11.029

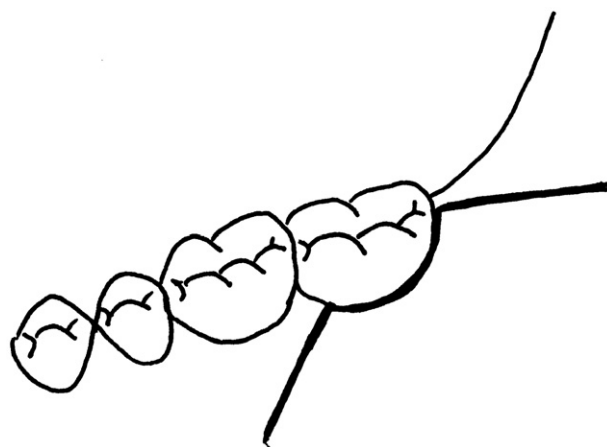


FIGURE 1. An illustration of the incision for the 3-cornered flap.

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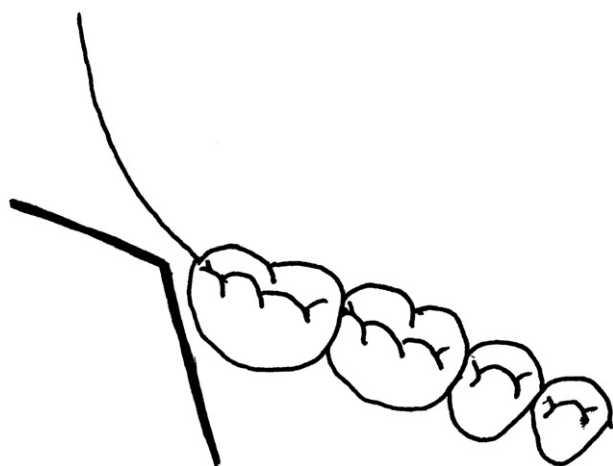


FIGURE 2. An illustration of the incision for the modified Szmyd flap.

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lar second molar after the adjacent impacted third molar extraction.

Patients and Methods

The study population comprised 18 patients (12 females, 6 males) who had been scheduled for bilateral surgical removal of their mandibular third molars at the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Ondokuz Mayıs University in Samsun, Turkey. Their ages ranged from 16 to 32 years, with a mean of 20.8 years. All patients were in good general health and were not using any medication that would influence wound healing after surgery. Indication of impacted third molar removal resulted from prophylactic or orthodontic considerations. The preoperative examination consisted of intraoral examination and panoramic radiographs. An alginate impression of the lower arch was also taken at this time for fabrication of an acrylic stent.

The participants were selected according to the following criteria: 1) presence of bilateral and fully impacted mandibular third molars; and 2) similarly positioned impacted mandibular third molars with

vertical (<26°) or mesioangular (26° to 75°) classification.

CLINICAL EXAMINATION

Clinical measurements were carried out on each patient preoperatively and at 1 week, 2 weeks, 4 weeks, and 12 months postoperatively. The plaque index (PI)¹⁰ and the gingival index (GI)¹¹ were evaluated on the buccal, distal, and lingual surfaces of the adjacent second molar. The pocket depth (PD) and clinical attachment loss (CAL) were evaluated on the distobuccal, mid distal, distolingual, lingual, and buccal surfaces of the second molar. Acrylic stents were constructed for use as probing guides preoperatively and postoperatively. All measurements were carried out by the same examiner using William's periodontal probe (Hu-Friedy, Chicago, IL) to eliminate interexaminer variability. The PD was defined as the distance in millimeters (mm) from the free gingival margin to the bottom of the pocket. The CAL was defined as the distance in mm from the cemento-enamel junction to the bottom of the pocket.

SURGICAL TECHNIQUES

All surgical procedures were carried out by the same surgeon. For each patient, bilateral mandibular third molars were removed during the same operation. The patients were treated under aseptic conditions using local anesthesia. The local anesthetic was articaine solution with 1:100,000 epinephrine (Ultracaine DS; Aventis, Istanbul, Turkey).

Technique I

The 3-cornered flap was used on the left side of the jaw. It consisted of a horizontal incision in the mandibular ramus and a sulcular incision starting near the mesiobuccal edge of the second molar and extending to its distal surface. A relieving incision was made in the mesial region without cutting the interdental papilla. The horizontal incision was terminated at the distal surface of the distobuccal cusp of the mandibular second molar (Fig 1).

Technique II

The Szmyd flap was modified and used on the right side of the jaw. An incision was made along the post

Table 1. PLAQUE INDEX ON THE DISTAL SURFACE OF THE SECOND MOLAR PREOPERATIVELY AND POSTOPERATIVELY

Flap Technique	Preoperative	1 Week	2 Weeks	4 Weeks	1 Year
Technique II	0.56 ± 0.12	1.72 ± 0.11	0.94 ± 0.21	0.56 ± 0.17	0.56 ± 0.17
Technique I	0.61 ± 0.12	1.72 ± 0.11	1.00 ± 0.21	0.61 ± 0.18	0.56 ± 0.17
P value	NS	NS	NS	NS	NS

Abbreviation: NS, not significant.

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Table 2. GINGIVAL INDEX ON THE DISTAL SURFACE OF THE SECOND MOLAR PREOPERATIVELY AND POSTOPERATIVELY

Flap Technique	Preoperative	1 Week	2 Weeks	4 Weeks	1 Year
Technique II	0.61 ± 0.50	1.78 ± 0.43	1.11 ± 0.58	0.56 ± 0.62	0.60 ± 0.52
Technique I	0.67 ± 0.49	1.89 ± 0.32	1.33 ± 0.59	0.83 ± 0.62	0.63 ± 0.51
<i>P</i> value	NS	NS	NS	NS	NS

Abbreviation: NS, not significant.

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molar triangle, starting on the ramus and terminating 2 mm behind the second molar. From this point it was extended down the buccal side (Fig 2).

Ostectomy was carried out with a rotary instrument under constant irrigation with sterile saline. After removal of the tooth, the extraction socket was cleansed carefully, including removal of follicular remnants. The wound was closed with 2 single 3-0 silk sutures, which were removed at a second visit 7 days after the extraction. After the surgical procedure, all the patients were treated for 7 days with amoxicillin (Largopen, 1,000 mg 3 × 1; Bilim, Istanbul, Turkey), flurbiprofen (Majezik, 100 mg 2 × 1; Sanovel, Istanbul, Turkey) and 0.2% chlorhexidine gluconate (Klorhex, 2 × 1; Drogosan, Istanbul, Turkey).

The Wilcoxon test was used for statistical analyses. A *P* value of less than .05 was considered statistically significant.

Results

PLAQUE INDEX

The mean plaque index for distal surfaces for the technique I and technique II flaps is presented in Table 1. There were no significant differences in plaque scores between the 2 flaps preoperatively and postoperatively. However, a significant increase was observed in plaque at 1 week at both flap sites (*P* < .05) but they decreased after the first week.

GINGIVAL INDEX

Table 2 shows the mean gingival index on the distal surfaces of the second molar with both types of flaps. No significant differences between the 2 types of flaps

were found for the gingival index. There were significant differences, however, in gingival index scores among the preoperative, first and second week postoperative measurements in both types of flaps.

PROBING DEPTH

Tables 3 and 4 show the mean PD for the distal and buccal surfaces of the second molar. The mean PD at the distal and buccal sites was significantly different between the 2 types of flap at 1 week, 2 weeks, and 4 weeks postoperatively (*P* < .05). There were no significant differences in preoperative and 1 year postoperative mean PD between 2 types of flaps (*P* > .05). Values for the 3-cornered flap showed significant increases in distal and buccal probing depth at 1 week, 2 weeks, and 4 weeks after surgery (*P* < .05). There was also a significant difference on the distal surface of the second molar at 1 week and 2 weeks after surgery for modified Szmyd flap site (*P* < .05) and on the buccal surface of the second molar at 1 week after surgery at modified Szmyd flap sites (*P* < .05). There were no significant differences on the lingual surface of the second molar between the 2 groups in terms of probing depth preoperatively and postoperatively (*P* > .05).

Although there was a significant difference between preoperative and 1 year postoperative measurements of attachment level in 3-cornered flap group (*P* < .05), there was no significant difference in the modified Szmyd flap group (*P* > .05). There was also no significant difference in mean clinical attachment level between modified Szmyd flap sites (0.56 ± 1.15 mm) and 3-cornered flap sites (1.39 ± 1.72 mm) at 1 year (*P* > .05) (Table 5).

Table 3. POCKET DEPTHS ON THE DISTAL SURFACE OF THE SECOND MOLAR PREOPERATIVELY AND POSTOPERATIVELY

Flap Technique	Preoperative	1 Week	2 Weeks	4 Weeks	1 Year
Technique II	2.78 ± 0.65	4.61 ± 2.30	3.72 ± 1.81	3.22 ± 1.52	2.56 ± 0.70
Technique I	2.89 ± 0.58	6.22 ± 2.44	5.28 ± 2.35	4.44 ± 1.95	3.00 ± 0.69
<i>P</i> value	.559	.036*	.018*	.036*	.075

*Significant difference at *P* < .05.

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Table 4. POCKET DEPTHS ON THE BUCCAL SURFACE OF THE SECOND MOLAR PREOPERATIVELY AND POSTOPERATIVELY

Flap Technique	Preoperative	1 week	2 weeks	4 weeks	1 year
Technique II	1.33 ± 0.49	1.89 ± 0.76	1.50 ± 0.51	1.50 ± 0.51	1.53 ± 0.50
Technique I	1.56 ± 0.70	2.89 ± 0.83	2.28 ± 0.67	2.06 ± 0.73	1.92 ± 0.69
P value	.376	.001*	.001*	.019*	.077

*Significant difference at $P < .05$.

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Discussion

The periodontal status of the adjacent mandibular second molars after the surgical removal of the impacted lower third molars has been investigated in several studies.^{8,12-15} The effects of flap design on the postoperative periodontal health status of second molars were investigated with different flap designs. Although some authors^{1,8} suggested that flap design influenced primary wound healing, others^{3,4} suggested that flap design did not influence periodontal health.

Cunqueiro et al⁸ reported that the paramarginal flap has less buccal and distal probing depth of the second molar than the marginal flap at 5 and 10 days after surgery. However, there was no significant difference between the 2 flaps at 3 months. In the present study, flap design influenced the probing depth of the distal and buccal surfaces of the second molar at 1 week, 2 weeks, and 4 weeks after surgery, but did not influence it at 12 months. These differences between the 2 flap designs in the early stages could be related to the incision that left intact gingiva around the second molar and the sulcular incision that did not leave intact gingiva around the second molar. It is obvious that buccal probing sites were less affected in the early phases of healing with the modified Szyd flap because no flap was reflected on the buccal of second molars. After impacted third molar surgery, the remaining amount of periodontal ligament and gingival fibers of the second molar is an important factor in periodontal healing.^{1,4,16} The differences in pocket depth at the distal and buccal

surfaces at 1, 2, and 4 weeks were not attributable to a difference in plaque accumulation because of the similar plaque and gingival indices in both groups.

Jakse et al¹ reported that a flap design leaving gingiva intact on the distal and buccal aspect of the second molar, except at the distofacial edge, influenced primary wound healing. Quee et al⁴ reported that flap design that left intact gingival collar on the distal aspect of the second molar did not prevent loss of attachment. In our study, the 3-cornered flap group had higher attachment loss than the modified Szyd group, but there was no significant difference between the 2 types of flaps at 1 year postoperatively.

In the study by Stephens et al,⁵ postoperative periodontal health status at 12 weeks was better than preoperative periodontal status. They found decreased mean probing depth around the second molars and no significant difference between flap designs on postoperative periodontal health at 12 weeks. However, Rosa et al¹⁴ and Quee et al⁴ reported postoperative periodontal status at 6 months was worse than preoperative status. In our study, there was no significant difference between preoperative and postoperative periodontal health status at 12 months for both techniques.

Patient age might have an effect on second molar periodontal health after impacted third molar surgery.^{2,6,17} According to several authors, early removal of impacted lower third molars might have a beneficial effect on the periodontal health of the adjacent second molar.^{6,7} Removal of the impacted lower third molar affected the periodontal healing of the second molar in the older age group (≥ 30 years old). However, even lower preoperative periodontal health did not affect the healing process in the younger age (≤ 20 years old).⁶

In the present study, the age range was 16 to 32 years (median, 20.8 years) and patients had no periodontal disease before surgery. The youth of the study population did not affect the comparison of the 2 types of flaps. In addition, no significant differences between preoperative and 1 year postoperative probing depth and attachment loss in both groups were attributable to younger individuals.

Table 5. CAL ON THE DISTAL SURFACE OF THE SECOND MOLAR PREOPERATIVELY AND POSTOPERATIVELY

Flap Technique	Preoperative	1 Year
Technique II	—	0.56 ± 1.15
Technique I	—	1.39 ± 1.72
P value	—	.082

Abbreviation: CAL, clinical attachment loss.

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In conclusion, careful surgical extraction with minimal trauma was important in the early phases of healing. The modified Szmyd flap, which left intact gingiva around the second molar, resulted in better primary periodontal healing than the 3-cornered flap after surgical removal of the fully impacted vertically and mesioangularly inclined third molar.

Acknowledgment

The authors thank Gregory T. Sullivan of Ondokuz Mayıs University in Samsun, Turkey for his proofreading.

References

1. Jakse N, Bankaoglu V, Wimmer G, et al: Primary wound healing after lower third molar surgery: Evaluation of 2 different flap designs. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 93:7, 2002
2. Ash MM, Costich ER, Hayward JR: A study of periodontal hazards of third molars. *J Periodontol* 33:209, 1962
3. Schofield ID, Kogon SL, Donner A: Long-term comparison of two surgical flap designs for third molar surgery on the health of the periodontal tissue of the second molar tooth. *J Can Dent Assoc* 54:689, 1988
4. Quee TA, Gosselin D, Millar EP, et al: Surgical removal of the fully impacted mandibular third molar. The influence of flap design and alveolar bone height on the periodontal status of the second molar. *J Periodontol* 56:625, 1985
5. Stephens RJ, App GR, Foreman DW: Periodontal evaluation of two mucoperiosteal flaps used in removing impacted mandibular third molars. *J Oral Maxillofac Surg* 41:719, 1983
6. Kugelberg CF, Ahlstrom U, Ericson S, et al: Periodontal healing after impacted lower third molar surgery in adolescents and adults. A prospective study. *Int J Oral Maxillofac Surg* 20:18, 1991
7. Kugelberg CF, Ahlstrom U, Ericson S, et al: Periodontal healing after impacted lower third molar surgery. A retrospective study. *Int J Oral Surg* 14:29, 1985
8. Suarez-Cunquero MM, Gutwald R, Reichman J, et al: Marginal flap versus paramarginal flap in impacted third molar surgery: A prospective study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 95:403, 2003
9. Krausz AA, Machtei EE, Peled M: Effects of lower third molar extraction on attachment level and alveolar bone height of the adjacent second molar. *Int J Oral Maxillofac Surg* 34:756, 2005
10. Silness J, Loe H: Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand* 22:121, 1964
11. Loe H, Silness J: Periodontal disease in pregnancy. I. Prevalence and severity. *Acta Odontol Scand* 21:533, 1963
12. Richardson DT, Dodson TB: Risk of periodontal defects after third molar surgery: An exercise in evidence-based clinical decision-making. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 100:133, 2005
13. Kan KW, Liu JKS, Lo ECM, et al: Residual periodontal defects distal to the mandibular second molar 6-36 months after impacted third molar extraction. A retrospective cross-sectional study of young adults. *J Clin Periodontol* 29:1004, 2002
14. Rosa AL, Carneiro MG, Lavrador MA, et al: Influence of flap design on periodontal healing of second molars after extraction of impacted mandibular third molars. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 93:404, 2002
15. Peng KY, Tseng YC, Shen EC, et al: Mandibular second molar periodontal status after third molar extraction. *J Periodontol* 72:1647, 2001
16. Karapataki S, Hugoson A, Kugelberg CF: Healing following GTR treatment of bone defects distal to mandibular 2nd molars after surgical removal of impacted 3rd molars. *J Clin Periodontol* 27:325, 2000
17. Yamaoka M, Tambo A, Furusawa K: Incidence of inflammation in completely impacted lower third molars. *Aust Dent J* 42:153, 2000