

Review article



MANAGEMENT OF MANDIBULAR THIRD MOLAR SURGERY TO PRESERVE PERIODONTAL HEALTH OF SECOND MOLAR

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ABSTRACT

Background: Extraction of impacted third molar violates surrounding soft and bony tissues. Various surgical approaches and surgical technics have an important impact on the periodontal health of the adjacent second molar.

Purpose: The aim of this review is to analyse the causes that can affect postoperative periodontal outcomes for the mandibular second molars (LM2) adjacent to the impacted/ semi impacted mandibular third molars (LM3).

Material and Methods: Electronic searches were conducted through the MEDLINE (PubMed), Scopus, etc. databases to screen all relevant articles published from inception to April 2017.

Results: Different flap techniques had no significant impact on the probing depth reduction or on the clinical attachment level of LM2. Szmyd and paramarginal flap designs may be the most effective in reducing the probing depth after third molar surgery, and the envelope flap may be the least effective. Use of bone substitutes and guided tissue regeneration therapy has been proposed, to eliminate or prevent these periodontal defects, but there is still no consensus on their predictability or clinical benefit. Higher costs and the risk of postoperative inflammatory complications should also be taken into proper account, as with any surgical procedure. "Orthodontic extraction" is indicated for that impacted M3 that present a high risk of postoperative periodontal defects at the distal aspect of adjacent M2.

Conclusion: Risk factors associated with bone loss following lower third molar extraction includes age, the direction of the eruption, preoperative bone defects, and resorption of the LM2 root surface. Prevention of such periodontal defects continues to challenge clinicians.

Keywords: third molar surgery, periodontal defect, complication, healing process

Introduction

Dentists and oral surgeons have long held the consensus that symptomatic or pathological impacted third molars should be extracted. In the case of asymptomatic impacted third molars, there is still some debate about the need for removal. Some authors suggest a timely, prophylactic

extraction to prevent possible future pathological changes around the impactions or adjacent second molars. [1, 2] This argument was recently supported by Nunn et al. [2], who reported a significantly increased risk of a second molar pathology of 4.88-fold with soft tissue impaction of the adjacent third molar and 2.16-fold with bony impaction of the adjacent third molar. Since the impacted third molars might ultimately be extracted, any associated adverse effects would become a disconcerting, troublesome issue for both dentists and patients. Periodontal defect formation often causes plaque accumulation and further local inflammatory disease. Therefore, consideration should be given to minimising tissue damage around the surgical area. That can be accomplished through the intervention technique like flap design, suture, or additional periodontal regenerative therapy) and the perioperative management chosen by the surgeon during the operation. Over the past few decades, investigations into periodontal outcomes in regards to third molar extraction, as well as perioperative hard and soft tissue management techniques have been reported extensively in the published literature in efforts to improve periodontal outcomes.

This systematic review is based on database in electronic searches through the MEDLINE (PubMed), and Scopus, Science direct databases to screen all relevant articles published from inception to April 2017.

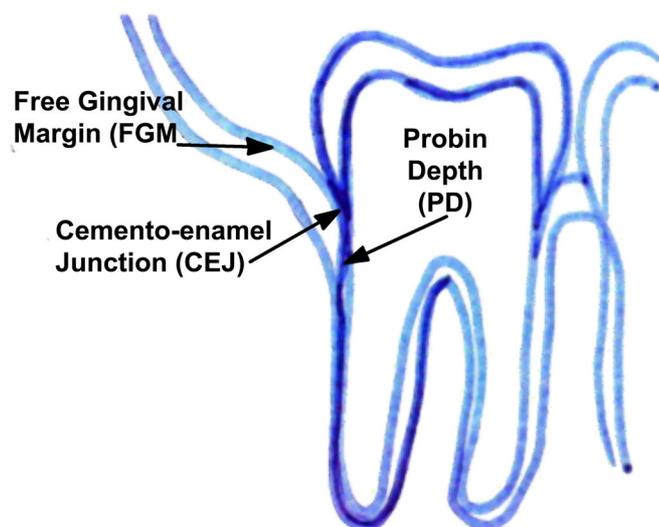
A further search was performed in the following journals: Journal of Oral and Maxillofacial Surgery, International Journal of Oral and Maxillofacial Surgery, British Journal of Oral and Maxillofacial Surgery, Journal of Cranio-Maxillofacial Surgery, International Journal of Oral Surgery, and Journal of Oral Surgery. The reference lists of selected articles were screened to identify additional articles that might fit the selection criteria.

Two of the important reasons for removing impacted third molars is to preserve periodontal health or, in some situations, to treat a periodontitis that already exists [1]. A relative contraindication to the removal of impacted third molars is a situation in which there is good periodontal health and a complete bony impaction in an older patient. Removal is contraindicated because the healing response in older patients would likely result in a large persistent postsurgical defect. [1]

After third molar surgery, the bone height distal to the second molar usually remains at the preoperative level [2, 3, 4], although some studies have indicated a net gain in bone level after surgery [5]. If the bone level on the distal aspect of the mandibular second molar is compromised by the presence of the third molar, it usually remains at that level following the healing of the bone. There is universal agreement that bone healing is better if surgery is done before the third molar resorbs the bone on the distal aspect of the second molar and while the patient is young. [6, 7, 8] The greatest bony defect occurs in situations in which the third molar has resorbed extensive amounts of bone from the second molar in an older patient, which compromises bony repair and bone healing.

The other periodontal parameter of importance is attachment level or, less accurately, sulcus or pocket depth. (fig.1) As with bone levels, if the preoperative pocket depth is great, the postoperative pocket depth is likely to be similar. In most studies, the attachment level has been found to be at essentially the same level as it is preoperative [2, 5, 6] In older patients with complete bony impactions, pocket depth and attachment levels may be significantly lower than preoperative levels. In patients younger than age 19 years, removal of complete bony impactions results in no compromise in attachment level or pocket depth. Initial healing after third molar surgery usually results in a reduction in pocket depth in young patients. [7, 8] The long-term healing in this group continues for up to 4 years after surgery, with continuing reduction in probable pocket depths [7]. Long-term follow-up of older patients clearly demonstrates that this long-term healing does not occur. [5, 7] Usually, the surgeon makes an attempt to mechanically débride the distal aspect of the second molar root area with a curette to encourage improved bone regeneration following third molar extraction. [1]

Fig. 1. Clinical assessment of periodontal health of the second molar after LM3 surgery



Periodontal healing following third molar surgery is clearly best when the impacted tooth is removed before it becomes exposed in the mouth, before it resorbs bone on the distal aspect of the second molar, and when the patient is as young as possible. [2, 3, 4, 5, 7, 9, 10] If the third molar is partially impacted and is partially exposed in the mouth, it should be removed. The reason for this is that there is already a deep and potentially destructive periodontal lesion that is difficult for the patient to maintain hygienically. Even if the patient is asymptomatic, the impacted tooth should be removed to allow the best periodontal healing after surgery as possible. In these situations, the periodontal healing is compromised because there was already a destructive lesion caused by the presence of the partially impacted third molar. [1]

The completely impacted third molar in a patient older than age 35 years should be left undisturbed unless some pathology develops. Removal of asymptomatic completely impacted third molars in these older patients results in pocket depths that are significant and the potential loss of alveolar bone on the posterior aspect of the second molar [1].

Some authors reported that early removal of impacted lower third molars with a large angulation and a close positional relationship to the adjacent second molar proved to have a beneficial effect on the periodontal health of M2 [7]. (fig.1)

The 'orthodontic extraction' technique was introduced in 1996 for the management of impacted M3 in a close anatomical relationship with the mandibular canal. As the roots of M3 are pulled away from the mandibular canal because of orthodontic movement, the risk of neurological damage is greatly reduced, making subsequent extraction easier, quicker, and safer [11, 12]. The orthodontic extrusive movement produces tensional forces on the periodontal fibres of M3, thereby resulting in new bone apposition along the path of tooth eruption. So far, the hypothesis that this can limit postoperative periodontal involvement at the distal aspect of the adjacent M2 has been supported only by case reports and series. [11, 12, 13]

According to Chen et al. [9] the different flap techniques had no significant impact on the reduction of probing depth (WDPDR 0.14 mm, 95% confidence interval 0.44 to 0.17), or on the clinical attachment level gain (WDCAG 0.05 mm, 95% confidence interval 0.84 to 0.94). A subgroup analysis revealed that the Szmyd and paramarginal flap designs may be the most effective in reducing the probing depth in impacted LM3 extraction, and the envelope flap may be the least effective. (fig.2). The amount of bone loss and destruction of the periodontium perioperatively are primarily related to the surgeon's attempt to access, elevate, and luxate the tooth successfully. Since a mucoperiosteal flap is designed for adequate visual accessibility and manipulation of the surgical area by release of the soft tissue, it is intuitively thought to be related to soft tissue sequel. Many studies have examined the effects of various mucoperiosteal flap designs, including the Szmyd flap, envelope flap, trian-

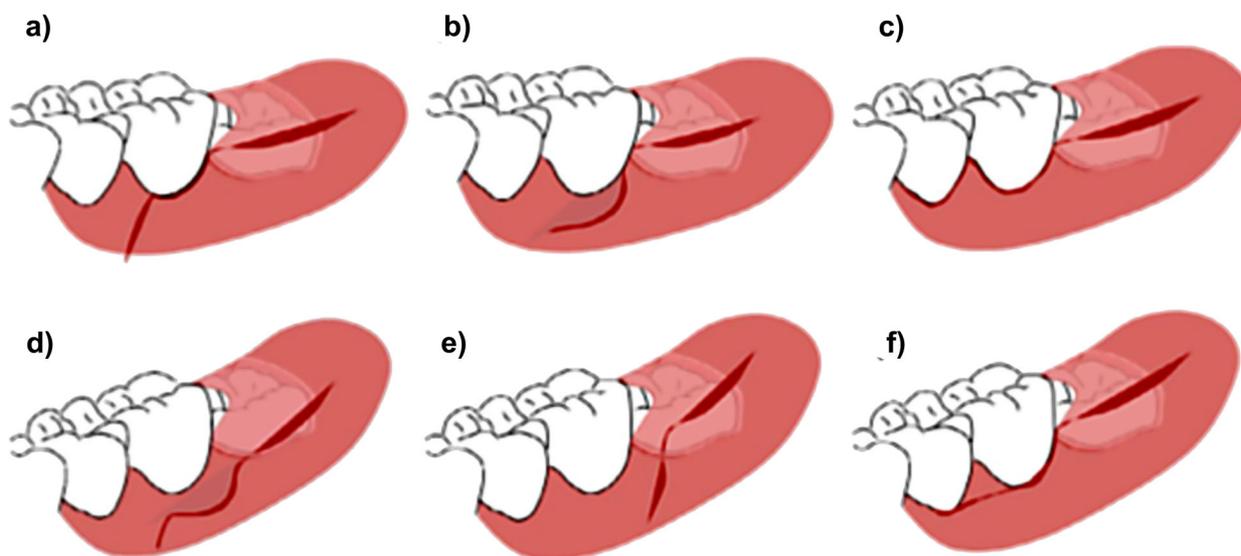
gular (or three-cornered) flap, and modified versions of these flaps. [9] (fig.2) For impacted mandibular third molars (LM3), envelope and triangular flaps are possibly two of the most commonly used flaps by oral surgeons. While both envelope and Szmyd flaps consist of a single horizontal incision and flap elevation by undermining the periosteum, triangular flaps utilize an additional vertical buccal releasing incision. The main advantages of the envelope and Szmyd flaps are the minimal disruption of the vascular supply to the elevated tissue and the ease of wound closure. On the other hand, the triangular flap allows extended reflection of the flap for better visibility and accessibility during osteotomy. Also, the relaxing vertical incision decreases flap tension, and thus the triangular flap is also believed to promote rapid wound healing. [9]

Therefore, it is important for clinicians to continuously evaluate PD for at least 3 months to determine the real postoperative PD change after flap surgery for LM3 extraction. [14]

The results from the subgroup analysis showed a possible benefit of leaving a whole gingival collar around the adjacent molar, which is done with the paramarginal modification of the Szmyd or triangular flap. The result showing that the Szmyd flap had a larger (although not significant) PD reduction also somewhat supports the original intention in the design of the Szmyd flap, which was meant to preserve a partial band of keratinized gingiva around LM2 to minimise the impact of surgery

on periodontal health. However, it is worth noting that a 14.8% incidence of postoperative short-term wound dehiscence was found by Suarez- Cunqueiro et al. with their modified triangular flaps. [15] This problem might be attributed to the surgical incision made at the paragingival margin, resulting in greater tension on the sides of the flap. Nevertheless, this was considered to be a transient complication that ultimately healed. In this review; the envelope flap showed the least favourable PD reduction among all the flap types. In contrast to envelope flaps, the Szmyd and triangular flaps use either a horizontal releasing incision or a vertical incision, which provides a larger reflected flap without tension. [16] These might also allow better accessibility for meticulous debridement after impacted tooth removal, as well as the possibility of adapted healing on a repositioned site. Further clinical studies are needed to corroborate this connection. From the viewpoint of the current study, the surgical extraction of impacted LM3 with different flap designs seems to have no significant impact on the periodontal condition of LM2. However, it is possible that making a releasing incision and a paramarginal incision around the adjacent molar favours better PD reduction postoperatively. It would also be reasonable to assume that other intraoperative factors, such as suture technique or osteotomy methods, might influence periodontal health. Further RCTs with large sample sizes should be conducted to examine these factors. [17, 18]

Fig. 2. Illustration of the flap designs used in impacted mandibular third molar extraction: (a) standard triangular flap, (b) Szmyd flap, (c) envelope flap, (d) - (f) modification flaps.



Use of bone substitutes and guided tissue regeneration therapy has been proposed to eliminate or prevent these periodontal defects, but there is still no consensus on their predictability or clinical benefit. Higher costs and the risk of postoperative inflammatory complications should also be taken into proper account, as with any surgical procedure. [18, 19]

CONCLUSION

Best periodontal healing (soft tissue and bone tissue healing process) will occur if the surgery to remove impacted third molars is done as early as possible. By age 17 years, if the diagnosis of inadequate room for functional eruption can be made, then the asymptomatic third molar should be removed. Even though the tooth may be

completely covered with soft and hard tissue, removing the third molar at that age will eliminate the future pathologic potential and maximise the periodontal health of the second molar; these are important goals of the oral and maxillofacial surgeon. Completely impacted third molar in a patient older than age 35 years should be left undisturbed unless some pathology develops. Removal of asymptomatic completely impacted third molars in these older patients results in pocket depths that are significant and the potential loss of alveolar bone on the posterior aspect of the second molar.

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