Modified Flap Design for Lower Third Molar Surgery: A Short Patient-based Outcome Comparative Study

Sulaimani Dental Journal

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Received: *August, 2014*
Accepted: *October, 2014*
Published: *December, 2015*

Abstract

Objectives: to compare the influence of a newly suggest modified flap design on pain and swelling with the traditional two sided flap.

Materials and Methods: Patients were divided into two groups: conventional approach (control) group (n=42) and modified approach (experimental) group (n=41). Pain and swelling were evaluated for the first three postoperative days using 10 cm visual analogue scales. Presence of dry socket was documented in the 7th postoperative day.

Results: There was statistically significant difference on the third postoperative day ($p < 0.05$) in the mean pain score between the two surgical groups. The mean score of swelling in conventional group was slightly higher than the modified approach ($p<0.05$) in the first and the third post operative days. The incidence of dry socket in the modified approach was significantly less than conventional approach group ($p < 0.001$).

Conclusions: The modified flap design has a relative advantage over the conventional two sided buccal approach in terms of postoperative pain, swelling and dry socket incidence.

Keywords: *modified approach, lower third molar surgery, pain, swelling, dry socket.*

Cite this article as: Alhamdani FY. Modified Flap Design for Lower Third Molar Surgery: A Short Patient-based Outcome Comparative Study. Sulaimani Dent J. 2015;2(2):121-128.

Introduction:

High incidence of impacted lower third molar[1] made its surgical removal the most common procedure in oral and maxillofacial surgery. It is performed in general practice, hospitals and private dental practice[2,3].

Surgical extraction of impacted lower third molar involves soft tissue incision, raising a mucoperiosteal flap and bone removal[1]. Despite being commonly performed procedure, still has high percentage rate of complication; such as pain, swelling, trismus, nerve damage and more frequent incidence of dry socket[2,4].

Postoperative complications of surgical removal lower third molar are common. There are plethora of studies about theses complications, both during and post-surgery. Some of which are more common than others. The most common complications include: dry socket, oedmea and pain[5,6].

To reduce the incidence of postoperative complications, different modifications have been suggested. These modifications focused on the surgical flap designs[7]. However, the conventional two sided buccal (triangular) flap remains the most commonly used approach[8].

The aim of this study was to compare the influence of a newly suggest modified flap design on postoperative pain and swelling with the traditional two sided (triangular) flap.

Materials and Methods:

This study was approved by the Scientific Committee, College of Dentistry- Al-Mustansiriyah University. Patients were informed about the surgery and agreed to participate in the study. Patients were divided into two groups: conventional approach (control) group (n=42) and modified approach (experimental) group (n=41). All the patients, including the conventional approach. Categorisation of impaction angulation and depth were assessed on OPGs taken using Planmeca machine (PM 2002 CC Proline Pan/Ceph). Angulation was determined using Winter's classification[9], whereas the depth of impaction was considered according to Pell and Gregory's classification[10].

Included patients attended Oral Surgery Department were complaining from partially or completely impacted lower third molars, with no medical history of systemic diseases that interfere with the outcome of the study., All surgical operations were performed in Al-Karamah Secondary Dental Care Centre, Baghdad. Surgical procedures were completed under local anaesthesia using 1.8 ml lidocaine with 1:100000

epinephrine (Septodont, France). Two experienced oral surgeons (A.R. and B.K.) did the surgical operations. The author who developed the flap design was not involved in the surgical procedures to eliminate any judgement bias. However, the surgeons who performed the procedures came with the suggestion of swinging the resultant flap over the socket to achieve primary closure. The surgical procedure in the conventional group followed the commonly used two sided buccal flap technique[11]. The suggested modified approach (Figure 1 and 2) starts as the conventional approach. The buccal incision, however, is straight and joined by another horizontal incision above the mucobuccal fold extending from the distal third of lower second molar, going backward over the mesial third of the third molar.

After exposing the surgical site, bone removal was carried out by ditching around the impacted third molar until reaching the cementoenamel junction using surgical round bur. Tooth sectioning was done when necessary. The closure technique of the modified design flap was performed by swinging the anterior U shaped part of the flap over the extracted tooth socket and closed with one suture (3.0 black silk). The duration of surgery was considered from the time of incision until the final suture placement (Tables 1 and 2). The patients were given Paracetamol 500 mg for postoperative pain control and Chlorohexidine Digluconate 0.2% as antiseptic mouthwash. No antibiotics were prescribed for both surgical groups.

Pain and swelling were evaluated by the patient on a daily basis for the first three postoperative days[12,13] using 10 cm visual analogue scales (VAS)[7,14,15]. The reason for choosing pain and swelling among other complications is that pain and swelling are the most common and important postoperative complications from the patients' perspective[16]. A questionnaire form answered by the patients were received on the 7th postoperative day, as sutures were removed and presence of dry socket was documented.

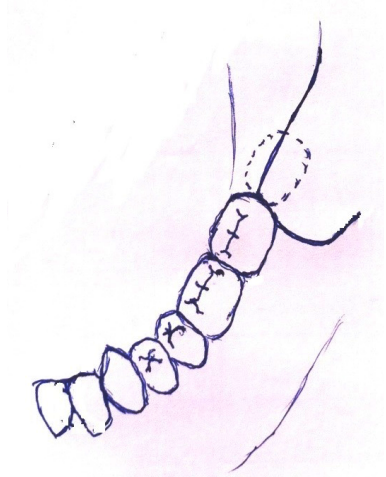

Figure 1: A simplified drawing for the suggested flap design.

Statistical Package for Social Studies (SPSS) ver. 20 was employed for data analysis. Chi-Square Test, Mann Whitney Test, and Kruskat-Wallis Test were applied. P value <0.05 used to define the level of statistical significance.

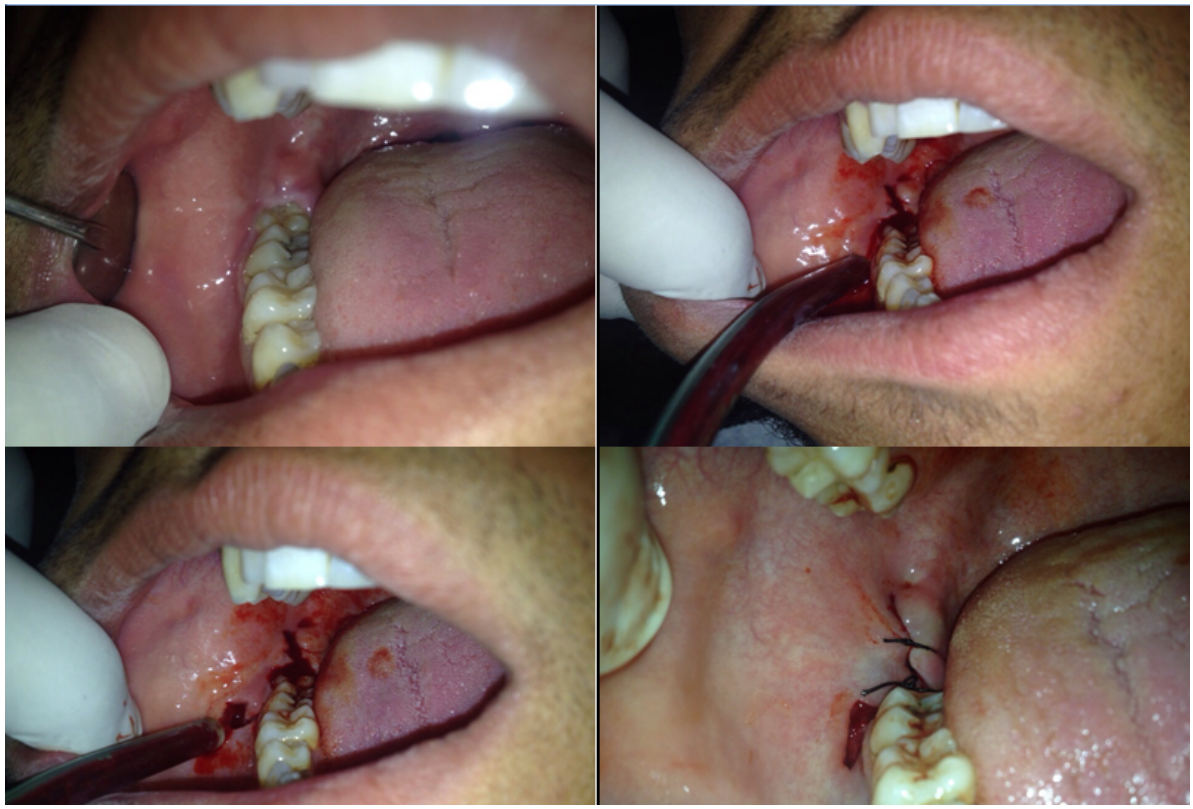

Figure 2: Steps of performing the modified flap incision and suturing. Upper right: before surgery. Upper left: performing horizontal and vertical buccal incision. Lower left: the complete flap design. Lower right: swinging of the flap to cover the socket.

Results:

Eighty three patients participated in this study, 44 (53%) were males and 39 (47%) were females. The age range of the study participants was 18-49. Kruskat-Wallis Test showed no statistical significant difference ($p > 0.05$) in age between two management groups.

Table 1 and table 2 provide descriptive statistics for the conventional approach and suggested approach groups respectively. Despite Chi-Square Test showed no statistical significant difference ($p > 0.05$, $df=1$) in gender between two surgical approach groups, the number of males in the modified flap group (n=18) is less than females (n=23) compared to the conventional flap group (males n=26, females n=16).

The mean operative time for both management groups were comparable. Mann-Whitney Test showed no statistically significant difference between the two groups in operation time ($p > 0.05$).

Figure 3 shows the percentages of cases according to the angulation type of impaction in both groups. The percentages are comparable in all angulation groups. This has been statistically confirmed ($p>0.05$). Cases with horizontal impaction were the highest in number, followed by mesio-angular impaction. Disto-angular impaction cases were the least among other angulation categories.

Furthermore, figure 4 shows comparable percentages in the depth of impaction for both treatment groups, which has been statistically confirmed ($p>0.05$). In both groups level B impaction reported the highest number of cases, followed by level A.

The line of mean pain score demonstrated in figure 5, as reported by the patients' VAS, separates as the time moves away from the operation. The closest the mean pain score levels in both treatment groups appear at the time of operation. Mann Whitney U test showed no statistical significant difference between pain experienced in both surgical approach groups at the time of operation, Day 1 and Day 2 postoperatively. However, at day 3 the separation between the pain lines becomes more apparent, with the pain in the conventional approach group is higher. This has been statistically confirmed ($p <0.05$).

Table 1: Descriptive statistics for the conventional approach group (no=42).

Variables	Minimum	Maximum	Mean	Std- Deviation
Age	20	49	25.88	5.632
Operating time	10	50	24.02	12.162
Pain score during operation	1	5	2.86	1.523
Pain score in the first day	2	10	5.83	2.262
Pain score 2nd day	1	10	4.69	2.484
Pain score 3rd day	1	9	3.62	2.326
Swelling score 1st day	1	9	4.07	1.892
Swelling score 2nd day	1	10	5.17	2.388
Swelling score 3rd day	1	9	4.33	2.534

Table 2: Descriptive statistics for the new approach group (no=41).

Variables	Minimum	Maximum	Mean	Std. Deviation
Age	18	32	24.88	3.393
Operating time	10	75	26.9	13.987
Pain score during operation	0	6	2.68	1.312
Pain score in the first day	1	10	5.29	2.462
Pain score 2nd day	1	10	4.15	2.632
Pain score 3rd day	0	10	2.66	2.198
Swelling score 1st day	0	9	3.22	2.275
Swelling score 2nd day	0	10	4.2	2.667
Swelling score 3rd day	0	9	3.29	2.421

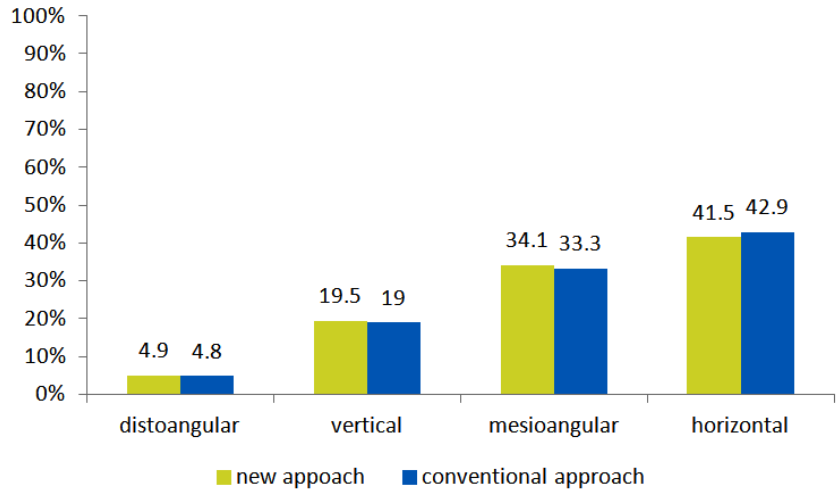

Figure 3: Angulation of impaction in both surgical groups.

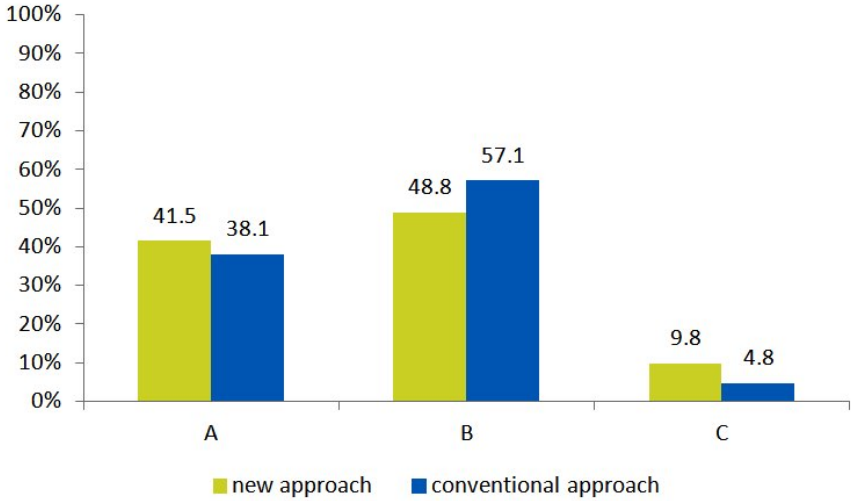

Figure 4: Depth of impaction in both surgical groups.

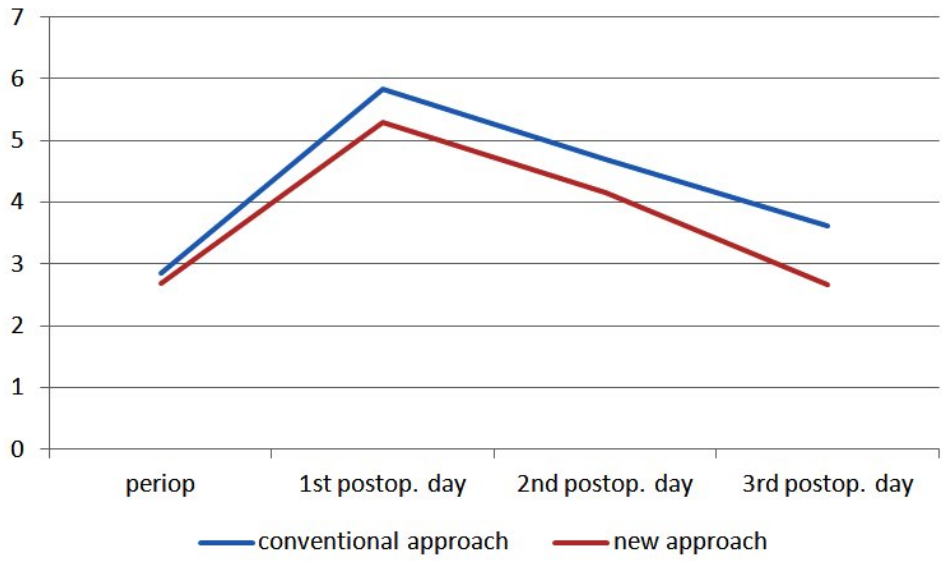

Figure 5: Pain mean score level for the first 3 postoperative days in both surgical groups.

As shown in figure 6 the mean score of swelling in conventional group is slightly higher than the suggested approach. This has been statistically confirmed ($p<0.05$) in the first and the third post operative day. However, Mann Whitney U test did not show as statistical significant difference between the two approaches in the second post operative day.

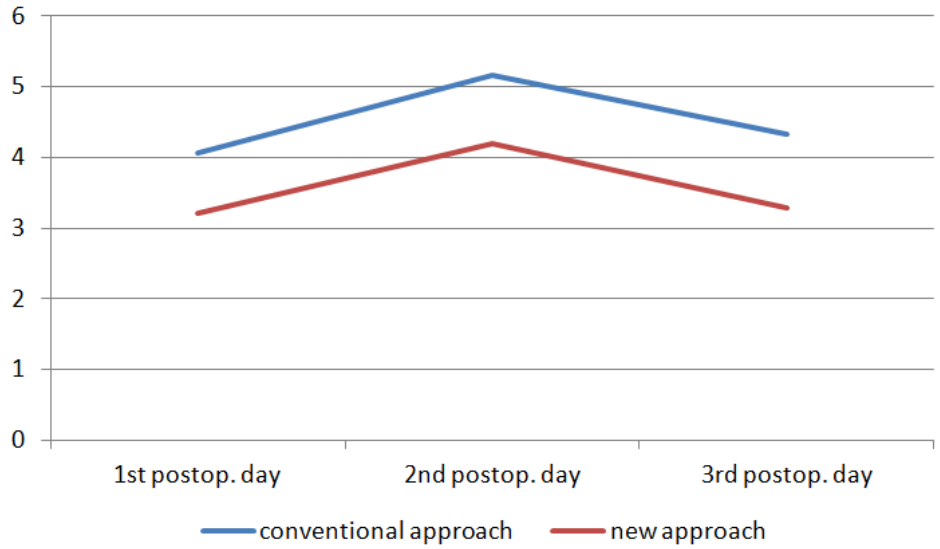

Figure 6: swelling mean score level for the first postoperative days in both surgical groups.

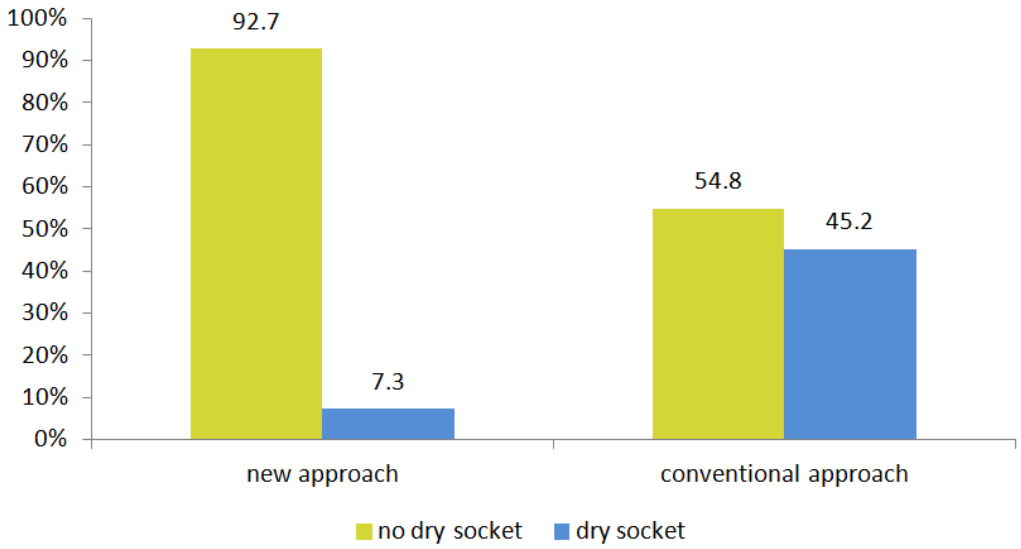

Figure 7: incidence of dry socket in both surgical groups.

Out of 83 patients 22 (26.5%) had dry socket. The incidence of dry socket, however, in the new suggested approach, as shown in Figure 7, which is considerably less (3 out of 41 patients) than conventional approach group (19 out of 42). This has been statistically (Chi-Square Test) confirmed ($p < 0.001$, $df=4$). 21 patients (25.3%) from all study participants were smokers. The number of smokers in conventional approach group was 14 (33.3%), which is higher than modified approach group 7 (17.1%). Chi-Square Test showed a significant relationship ($p<0.05$ $df=1$) between smoking and incidence of dry socket.

Discussion:

Despite being a very common, surgical removal of impacted wisdom tooth still represents a challenging procedure in many instances(17). The factors that influence the difficulty of the procedure are patient, procedure and surgical skills' related factors[18-20]. Adequate accessibility and tooth position, however, remain the most important[20,21]. These factors greatly determine the extension of incision, periosteal elevation and duration of surgical procedure[21-23]. This in turn play an important role in postoperative inflammatory (pain and swelling) complications development. Pain and swelling remain the most important factors as far as quality of patient's life is concerned at the early postoperative period[24].

So far, conducted research on the influence of surgical approach on complications of lower third molar surgery went in two directions. The first direction studied the influence of currently used flap designs over postoperative complications. These studies provide conflicting evidence about the

influence of flap design over postoperative complications. Baqain et al in a split mouth study compared between the envelope and triangular buccal flaps. They found that triangular flap produces more postoperative swelling. However, they reported no difference in pain level between two flap designs[25]. Erdogan et al found that envelope flap was superior to triangular buccal flap in terms of postoperative pain and swelling[26]. Sandhu et al, however, disagree with the previous studies. They found triangular flap better than envelop flap in terms of postoperative pain and wound dehiscence development[7]. On the other hand, other studies found that traditionally used flap designs are not clearly different in their influence on different postoperative complications[23,27,28],

The second direction suggested new surgical approaches to improve surgical outcome. Over the last decade there were different suggested designs and modifications for surgical removal of impacted lower third molar[4,16,28-30]. Despite these several attempts, pain and swelling remain problematic complications[31].

The suggested modifications compared between straight one sided and two sided flaps. The aim seems to provide small flap designs minimising surgical trauma. Roode and Butow compared between two suggested small flap designs (inverted L shaped and straight incision). They concluded that the straight incision design is superior in terms of post surgical patient comfort[16]. Another suggested approach introduced by Koyuncu and Cetingul, using a modified triangular flap. They compared it to the traditional envelop flap. They found a significant difference in postoperative pain and swelling, but with higher incidence of dry socket, although not statistically significant[4]. Goldsmith et al found that their modification using an inferiorly based pedicle buccal flap design has better outcome in term of postoperative pain and swelling over the envelope flap. They also found that the incidence of dry socket was less in their suggested flap design[29].

Surgical removal of lower third molar should balance between small incision, delicate tissue handling and minimum bone removal on one hand, and providing adequate surgical access and minimum intervention time on the other hand[16,23] acknowledging the particular nature of lower third position at the angle of the mouth and related accessibility.

In Iraq, the usual surgical practice adapts two sided (triangular) buccal flap approach. According to the authors' clinical experience, it has been noticed that even this approach, despite it provides adequate surgical access, still has some traumatic effect on the muco-periosteal flap tissue. The experienced pain and discomfort partly results from flap retraction, particularly, at the lower proximal end of the flap. Flap retraction is one of the contributing factors in development of postoperative inflammatory complications in lower third molar surgery[16]. This might justify the suggested modification. In addition, the swinging technique of the resultant flap provide adequate closure of the wound without pressure on the buccal mucosal flap.

The additional horizontal buccal incision did not significantly influence the operative time, which works as advantage for the suggested flap design. Operative time increases the likely incidence of postoperative morbidity[21]. The duration of surgery as reported in this study is comparable to what has been reported in other studies[21,32].

This study data showed that the use of the modified flap design resulted in relatively better outcome in both pain and swelling. Larger incision with better exposure to the surgical site could decrease the tension applied on the flap during retraction and provide better maneuverability throughout the surgical procedure.

Pain level in both treatment groups was the highest at the first postoperative day. Swelling score, on the other hand, was higher in second postoperative day in both treatment groups. The evident difference between both approaches in pain level appears in the third postoperative day. The difference between two groups in swelling is more statistically evident. These findings might reflect less flap tissue trauma in the modified approach group during the procedure.

The incidence of dry socket, as shown in this study, is relatively higher than what is generally reported in the literature[33]. Despite incidence of dry socket was not the major focus of the current study, it seems that the new design showed lower dry socket incidence. Decrease incidence of dry socket might be explained by the fact that comfortable access could influence surgical manipulation and possibly decrease bony trauma. There is another possibility, which is the swinging technique used for wound closure, which decreases the possibility of wound dehiscence and clot dislodgment. However, there is no conclusive evidence in the literature demonstrates the influence closure technique on postoperative complications in general[24]. It worth mentioning, however, that increase incidence of dry socket in conventional group is partly related to the higher number of smokers in this group. Smoking and surgical trauma has been linked to the incidence of dry socket after tooth extraction[34-36].

Having comparable percentages in the patients' age, type of angulation and depth of impaction in both surgical groups gives the comparison more value. However, the authors think that modified approach might be of particular advantage in deep and horizontal impaction cases. The authors, also, think the incision might become easier to perform when the vertical incision is extended to the mesial side of second molar. This might be considered in future studies.

This study has limitations. First is the absence of postoperative follow up time, which was governed by patient's cooperation. Second limitation is the sample size adopted in this study. Larger sample size provides more robust conclusion and better chance to compare the outcome in each impaction category. Further studies with larger sample and longer follow up period are required.

Conclusions:

The modified flap design has a relative advantage over the conventional two sided buccal approach in terms of postoperative pain and swelling. There are no financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other) in relation to this manuscript.

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