

# An alternative surgical flap design for impacted third molars: A comparison of two different surgical techniques

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## ABSTRACT

**Introduction:** A major concern of patients who need surgery for impacted third molars is the occurrence of pain and swelling. The damage done during the incision and retraction of soft tissue to expose the impacted teeth, contribute to the above-mentioned.

**Aims and objectives:** The study was done to prove a hypothesis that an alternative surgical flap (ASF) is effective in limiting pain and swelling when compared to the standard reverse L-flap (RLF).

**Method:** A prospective randomized cross-over study was done, which included 33 healthy patients. Patients with mirror-image impacted mandibular third molars were selected. Evaluation of pain and swelling was done by Visual Analogue Scale (VAS), implemented for the first seven days after surgery.

**Results:** The results indicated on average that patients experience less pain with the ASF, although this was not statistically significant. The patients also indicated that they experienced a significant reduction ( $p < 0.05$ ) in swelling for days one through three, compared to the RLF.

**Conclusions:** The hypothesis that the ASF will result in less swelling, has been proven. It is therefore recommended that surgeons use this flap method for removal of impacted third molars to enhance post-operative patient comfort.

## INTRODUCTION

The most common operation in oral surgery is the surgical removal of impacted third molars. A critical review of the literature about risks and benefits of the removal of impacted third molar teeth<sup>1-9</sup> reflected that absolute indications and contra-indications for the removal of asymptomatic third molar teeth cannot be established.

Pain<sup>10-15</sup> is the most severe complication experienced by patients following the removal of impacted teeth. This is followed closely by swelling<sup>10-15</sup>. Minimizing soft tissue damage will limit post-operative pain and swelling. The principle of surgical flap design is to provide access with the least possible ensuing soft tissue damage. Incisions should be designed so as to: provide good and adequate blood supply (broad base), good access to allow adequate vision and space for instrumentation, protect the soft tissue in terms of inflicting minimal trauma and permitting anatomical repositioning



Figure 1: Mandibular 3<sup>rd</sup> molar impactions – mirror image.

and reattachment of the flap. The incisions must permit elevation and retraction of the soft tissue without damaging the adjacent structures and it must be a full thickness flap (overlying gingiva, mucosa, submucosa and periosteum). A number of different flap designs have been tried and tested with the removal of impacted mandibular third molars<sup>11,14,16,17,18-22</sup>. The alternative surgical flap design comply with the above requirements as it provides good and adequate blood supply, inflicts minimal trauma to the soft tissue and permits anatomical repositioning and reattachment of the flap. It also permits elevation and retraction of the soft tissue without damaging the adjacent structures.

In a clinical trial, a smaller reverse-L incision<sup>23</sup> was compared to the classical envelope flap method. The results showed that significantly less swelling and pain is associated with the smaller incision. Operating time was also reduced. This prospective randomized cross-over study compares an alternative surgical flap (ASF) technique, as a straight line incision, to the standard technique of the reverse-L flap (RLF)<sup>23</sup> in terms of the difference in the amount of pain and swelling experienced by patients between these two surgical incisions. The amount of pain and swelling was evaluated using VAS. The duration and difficulty per procedure was also evaluated and compared.

## MATERIALS AND METHODS

Thirty-six patients complied with the inclusion criteria. The following inclusion criteria applied: patients must have no pre-existing medical conditions or medication use which would influence

their ability to undergo surgery, on a panoramic radiograph the impactions must present as symmetrical, bilateral, impacted, mandibular third molars that should still be fully covered by mucosa (mirror image) (Figure 1). There must be no discernable active pathology associated with the impactions. Patients were informed about the nature of the study and that the maxillary impactions would not be included in the trial. Patients were required to give consent and sign an undertaking to attend the follow up as well as complete the evaluation form (VAS).

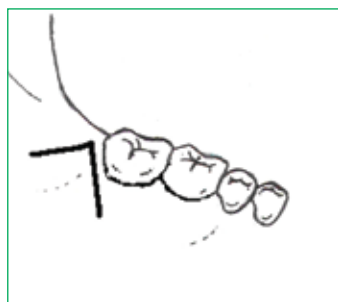


Figure 2: Reverse-L flap method.

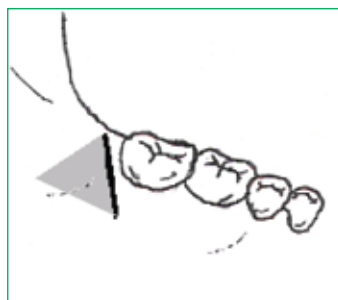


Figure 3: Alternative surgical flap method, a straight line incision (Schematic, Shaded area = area of retraction).

All surgical procedures were performed by one surgeon. On the day of the procedure, the side for the ASF and the side for the control (RLF) were randomly selected by the cast of a die. All procedures were done under general anaesthesia. The oral cavity was cleaned with 2% chlorhexidine solution and each patient received one gram Kefzol® intra-operatively IV, apart from two patients that were allergic to penicillin and therefore received 600mg of Clindamycin. In order to obtain vasoconstriction, an inferior alveolar block and infiltration of the buccal area of the impacted teeth was done with 2% Xylotox with vasoconstrictor. The duration of each procedure per side was recorded from the start of the incision up to the time that the last suture was placed.

The RLF on the control side consisted of an incision extending disto-buccally from the distal aspect of the second molar with the length of the incision approximately the width of the crown of the impacted molar and extending anteriorly to include the distal third of the buccal mucosa of the second molar (Figure 2). The ASF consisted of only a straight incision, ± 15mm long, beginning 5mm distal of the second molar and running mesio-buccally towards the sulcus adjacent to the second molar (Figure 3,4,5). Al-



Figure 4: Alternative surgical flap method, a straight line incision

Gender		Age (years)			ASF	
Male	Female	Min	Max	Average	48 area	38 area
10	26	15	29	19	17	19

Day	1	2	3	4	5	6	7
ASF	6.4	6.1	5.3	4.4	3.6	2.9	2.4
RLF	7.2	6.6	5.9	5.0	4.0	3.2	2.6

Day	1	2	3	4	5	6	7
ASF	6.9	7.1	5.7	4.6	3.5	2.5	1.7
RLF	8.0	8.1	6.7	5.3	3.9	3.0	1.9

veolar bone was removed with a 703 surgical straight fissure drill bit and the impacted tooth was resected with the same drill and removed through the opening created, using Warwick-James elevators. The surgical site was rinsed with saline and closed with two 3-0 Vicryl® (Ethicon – Johnston & Johnston) sutures (Figure 6). All patients received a standard post-operative prescription for pain control (paracetamol) for five days and an oral rinse (Andolex C®) for the same period.

Each participant was required to complete a questionnaire which consisted of the visual analogue scale (VAS)<sup>24</sup> for pain and swelling for both sides. The questionnaire was to be completed every morning for seven days starting with the day following surgery as day one. The scale ranges between 1-10, where 1 represents no swelling/pain and 10 represents most swelling/pain<sup>24</sup>. The clinical follow up examination was scheduled for day three post-operative. Results were analysed using Microsoft Excel and the t-test. The comparison between the two methods is presented in the accompanying tables and graphs.

**RESULTS**

Thirty-six patients were included in the study. Their ages ranged between 15 and 29 years of age, the average being 19 years. Female patients numbering 26 were more than double the number of male patients (10). On the basis of random selection, the alternative surgical flap was applied in the area of tooth 38 in 19 patients and in the area of tooth 48 in 17 cases (Table 1). All patients



Figure 5: Alternative surgical flap method, area of retraction

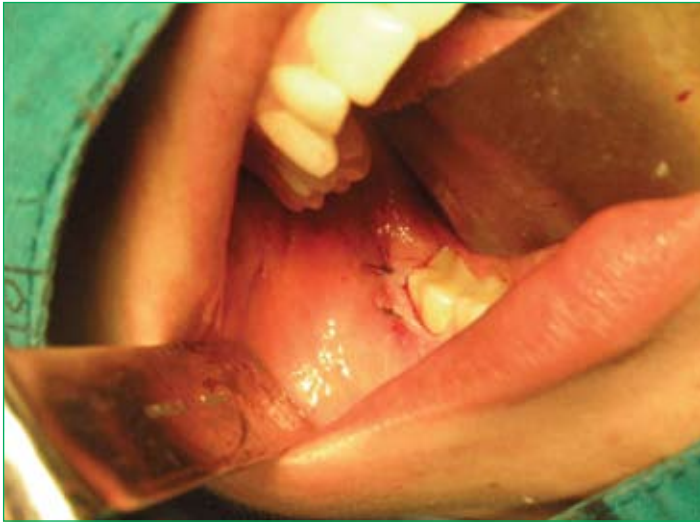


Figure 6: Closure of incision with two sutures

Table 4: Infection		
Infection	ASF	RLF
Number	1	3
Smoking	0	2

Table 5: Duration of procedure			
Flap	38 area	48 area	Average
ASF	8 min 12 sec	7 min 52 sec	8 min 02 sec
RLF	9 min 15 sec	8 min 12 sec	8 min 43 sec

when compared to the RLF (Table 2, Figure 7). At day two the difference was down to 0.5, however this increased again to 0.6 at day three and four. There after a steady decrease in difference was indicated for days five through to seven respectively (0.4, 0.3 and 0.2). Although the overall indication was that patients experienced less pain on the side of the ASF, the outcome was not statistically significant ( $p > 0.05$ ).

On average, the indication at day one was that the patients experienced 1.1 out of 10 less swelling with the ASF when compared to the RLF (Table 3, Figure 8). At day two and three the difference was 1.0 and at day four it was down to 0.7. For days five through to seven it was respectively 0.4, 0.5 and 0.2. The difference in amount of swelling between the two sides was statistically significant when analyzed with the t-test ( $p < 0.05$ ) for days one through to three, but not for days four through to seven. Four patients developed post-operative infection; of these, two indicated that they are smokers (Table 4). On average the execution of the ASF procedure was marginally faster (Table 5) than that of the RLF procedure. The difference was, however, not statistically significant ( $p < 0.05$ ).

**DISCUSSION**

The most common problems encountered by patients after third molar surgery are pain and swelling<sup>11-13,15</sup>. This is as a result of the inflammatory response following surgical trauma<sup>25,26</sup>. With specific reference to the above, many researchers have developed and tried different designs in the search for a surgical flap method that will lead to the least post-operative pain and swelling<sup>11,14,18-22</sup>. This research project compares an alternative surgical flap (ASF), which in design complies to inflicting minimal trauma to the soft tissue, permitting anatomical repositioning and reattachment of the flap and permits elevation and retraction of the soft tissue without damaging the adjacent structures, to the proven reverse-L-flap (RLF)<sup>23</sup>.

Berge<sup>24</sup> evaluated the correlation between the VAS assessment and metric measurements of pain and swelling in two different studies. A significantly positive correlation was found in these projects. Therefore the VAS assessment method was selected to be employed as the evaluation system in this study due to the fact that it can easily be completed by a lay individual. It is therefore well-suited to exploring patients' post-operative experience.

The majority of patients in this project experienced less pain on the side of the ASF (Figure 9). Five out of the 33 patients whose questionnaires were received and analysed experienced marginally more pain on the side where the ASF was used and eight experienced the same amount of pain on both sides at day one. With one of the five patients who experienced more pain on the side of the ASF, a problem was experienced with the cool-

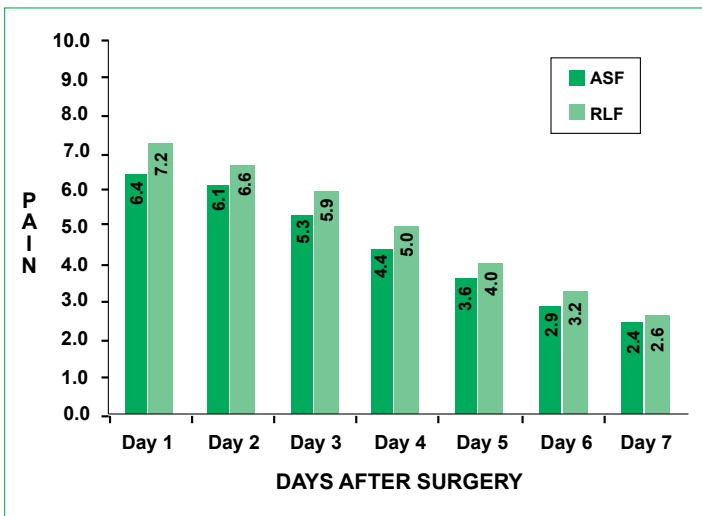


Figure 7: Average Pain intensity of different techniques

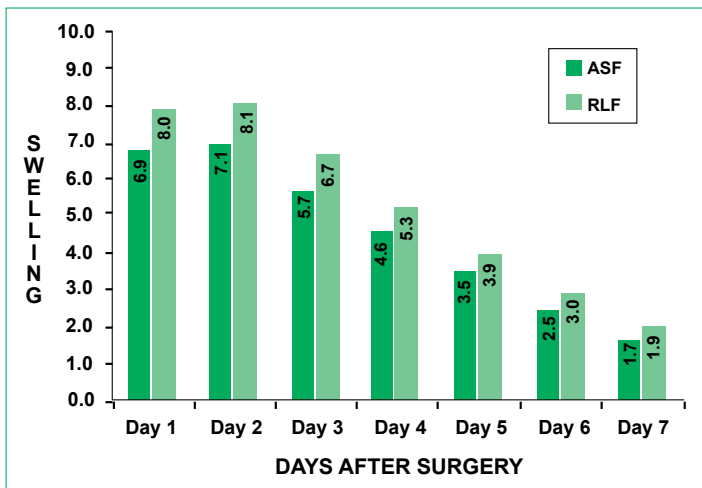


Figure 8: Average Swelling intensity of different techniques

attended the follow up on day three. Post-operative symptoms were discussed with each patient. Results for the evaluation of pain and swelling are based on 33 questionnaires as three out of the 36 patients treated did not return the questionnaires.

The majority of patients experienced less pain on the side where the ASF was used. On average, the indication at day one was that the patients experienced 0.8 out of 10 less pain with the ASF than



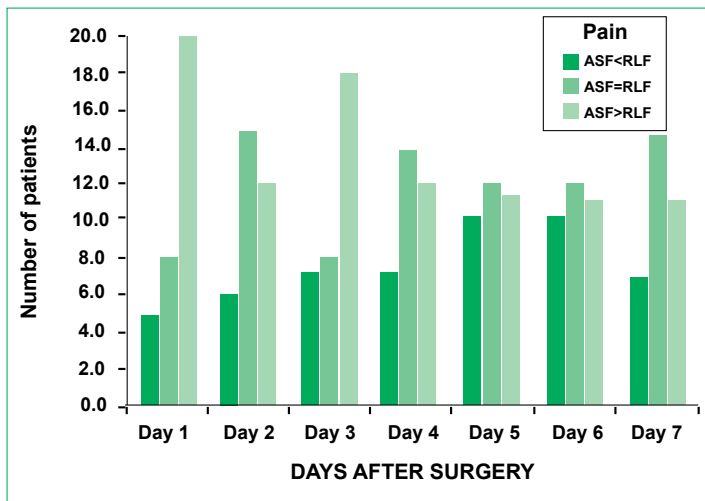


Figure 9: Comparison of pain experienced by patients between different techniques

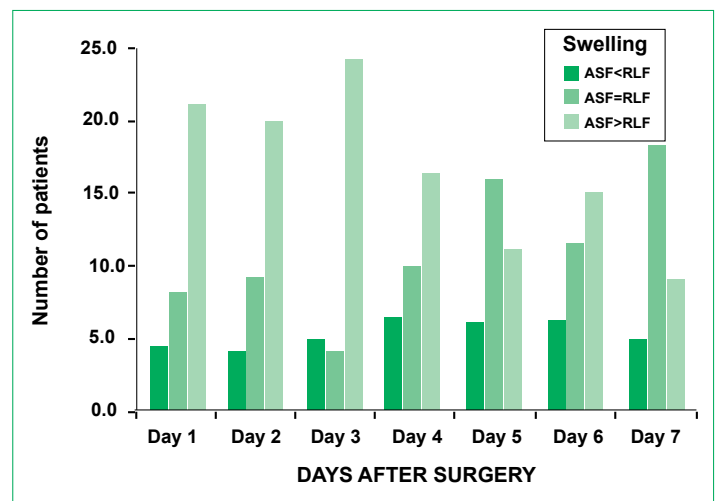


Figure 11: Comparison of swelling experienced by patients between different techniques

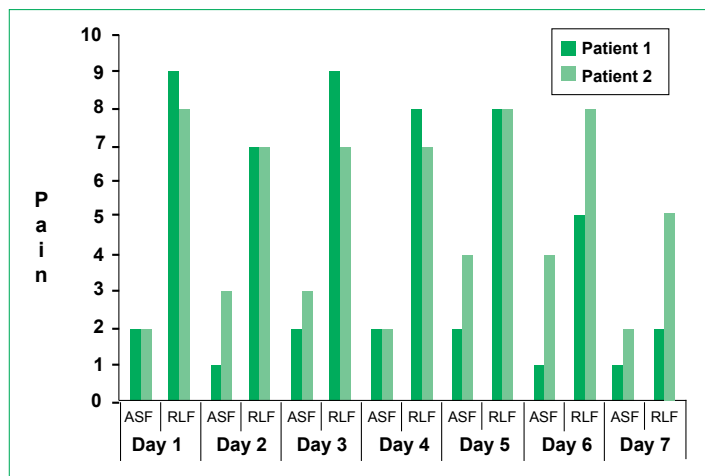


Figure 10: Largest difference in pain experienced by two patients

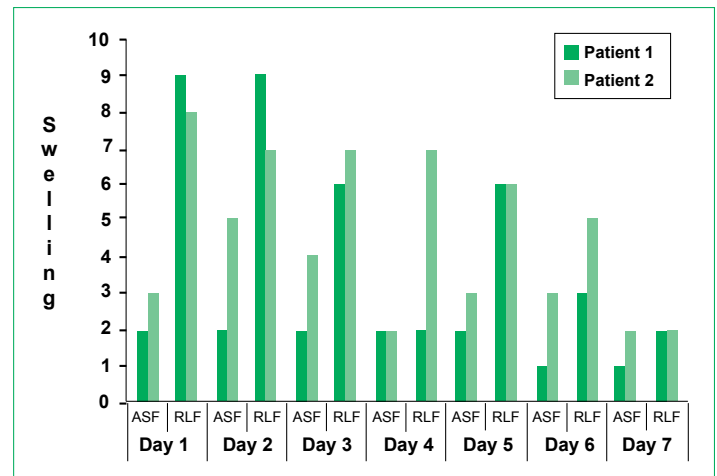


Figure 12: Largest difference in swelling experienced by two patients

ing system during the surgical procedure and it is suspected that this may have negatively influenced not only the duration of the procedure but also the amount of pain and swelling experienced post-operatively. This specific patient as well as another patient indicated less pain on the side of the ASF from day two onwards. At day seven, seven patients indicated that they had slightly more pain on the side of the ASF, fifteen experienced no difference between the two sides and eleven of the patients indicated less pain on the side of the ASF. Two patients (Figure 10) indicated that they had respectively six and seven out of 10 less pain on the side where the ASF was applied for days one through to three, after which the difference between the two sides steadily decreased. Both these patients indicated that they experienced the ASF very positively. In summary the ASF produced less pain overall when compared to the RLF although the difference between the two methods was less than initially expected and not statistically significant ( $p > 0.05$ ).

The results indicate that most patients experienced significantly less swelling with the ASF when compared to the RLF (Figure 11). Three of the five patients who experienced more pain on the side of the ASF, also experienced more swelling on the same side. There were eight patients who indicated the same amount of swelling on both sides. Of these eight, four correlated with the patients who experienced the same level of pain on both sides and one of the seven experienced more pain on the side of the ASF. Two patients

indicated more swelling on the side of the ASF although they had less pain on the same side when compared to the RLF. The following question arises: What role does sleep position play in pooling of the swelling, as these patients slept on the side where the ASF was applied. The same two patients that experienced the large difference in pain between the two sides also indicated a similar variation for swelling (Figure 12). In summary the ASF produced overall significantly less swelling for days one to three when compared to the RLF and this contributes to the post-operative well-being of the patient.

One patient developed an infection on the side where the ASF was used and received treatment on day six. Three patients developed infection on the side where the RLF was used. Two of these indicated that they are smokers. One of the two patients who are smokers developed sepsis and trismus within the week of evaluation and the other patient only after three weeks. The third patient presented with infection four weeks after the surgery. All of these patients received antimicrobial and anti-inflammatory treatments. No further complications were noted at the follow-up visits. In summary there was no difference between the ASF and the RLF, in terms of post-operative infection complications.

The results indicate that on average the ASF was marginally faster surgically executed than the RLF (Table 5). It was noted that the surgery for both flap methods were done in less time on the 48

tooth area when compared to the 38 tooth area. The ASF is certainly not an easier surgical method to access an impacted mandibular third molar area. The results for this study have partially supported the hypothesis that the ASF procedure produces less pain and swelling. Although the amount of pain experienced by patients was less with the ASF, the difference was not statistically significant. The advantage of the ASF is that this surgical procedure caused significantly less swelling. Therefore this flap design is recommended for the removal of a fully covered impacted mandibular third molar.

## ACKNOWLEDGEMENTS

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