

# Comparison Between Flapped and Flapless Implant Techniques by Measuring Crestal Bone Level: A Prospective Radiographical Trial

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## ABSTRACT

**Background:** Previously, the flapped dental implant surgery was the most common implant placement procedure. With the development of different implantation techniques, the flapless surgery is now available for implant placement. The aim of this study was to evaluate the effect of the flapless surgical technique for implant placement on bone level compared with the flapped surgery technique with the aid of panoramic imaging.

**Materials and methods:** The study comprised 10 patients, 20 dental implants investigated, two implants placed for each patient (one implant placed with a flapped procedure and the other with a flapless surgical technique). Utilizing panoramic view pre- and post-surgical treatment, the crestal bone level at different intervals (1 week, 4 weeks and 12 week) has been compared.

**Results:** When comparing flapped and flapless implant surgical procedures at different time intervals, the flapless surgical technique showed less bone level reduction, on the other hand no significant results obtained when comparing the surgical techniques in the maxillary and mandibular arches.

**Conclusion:** Flapless implant placement provides less bone level reduction compared with the flapped technique.

## KEYWORDS:

flapless surgical technique, crestal bone level, bone level loss

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## مقارنة طريقتين جراحتين لزراعة الاسنان من ناحية مستوى العظم المحيط بالزرعة بواسطة أشعة الوجه والفكين

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## المستخلص

سابقا كانت زراعة الاسنان تجرى فقط بواسطة فتح شق باللثة ومن ثم وضع الزرعة اما الان بعد التطور الحاصل بزراعة الاسنان فقد تم استحداث طريقة لزراعة الاسنان بواسطة عمل ثقب بمقدار حجم الزرعة ووضع الزرعة بشكل مبسط وسهل بدون تعريض المريض للعمليات الجراحية المؤلمة وخياط اللثة. تم في هذه الدراسة مقارنة الطريقتين من ناحية تأثيرهما على سوفان العظم المحيط بالزرعة بواسطة أشعة الوجه والفكين حيث تمت المقارنة على ثلاث فترات: اسبوع وأربعة أسابيع واثنا عشر أسبوعا واتضح من النتائج ان طريقة ثقب اللثة ووضع الزرعة هي أفضل من الطريقة الاخرى من ناحية الحفاظ على مستوى العظم حول الزرعة.

## INTRODUCTION:

A dental implant is a surgical device which replaces the lost roots of tooth to which an artificial tooth or complete denture can be attached<sup>1</sup>. The success of dental implant treatment depends on careful preoperative planning and professional surgical handling<sup>2</sup>. Implant treatment is a highly suitable option. Successful implant treatment means less bone level loss, implant stability, better esthetic outcome<sup>3</sup>,

and no or low postoperative complications<sup>4</sup>.

There is a well-known evidence correlation between the flapped technique and bone level loss resulted in the introduction of a minimally invasive or flapless technique. This approach is gaining popularity in dental implant surgery<sup>5, 6, 7</sup>.

A soft tissue puncture or flapless technique means an immediate placement of the dental implant without elevation of a flap to ensure more patient acceptance,

comfort, soft tissue circulation and architecture<sup>8</sup>, and it has been widely used in recent years<sup>9</sup>.

To ensure less trauma during surgical placements of dental implants, and less surgical time, a flapless technique can be used with the aid of a surgical stent but it requires a good bone quality<sup>10</sup>. It is regarded as a blind procedure and the operator cannot evaluate the alveolar bone quality<sup>4</sup>; therefore, it needs an advanced clinical experience and surgical judgment<sup>8, 11, 12</sup>.

The disadvantages of the flapless surgical technique include inability to visualize anatomical landmarks, thermal damage due to reduction of coolant irrigation during preparing the socket, and mal-posed angle of dental implants<sup>8, 11, 12</sup>. The advantages of the flapped surgical procedure are: it provides good access to the implant site, allows good visualization to anatomical landmarks, and allows bone graft placement, when required<sup>8,11,12</sup>.

For initial healing and osseointegration, a healing phase from three to six months is required; however, another idea supported by recent research, says that directly loading implants following fixture placement provides equal levels of osseointegration; moreover, it may stimulate osseointegration and resist osteolysis<sup>13, 14</sup>.

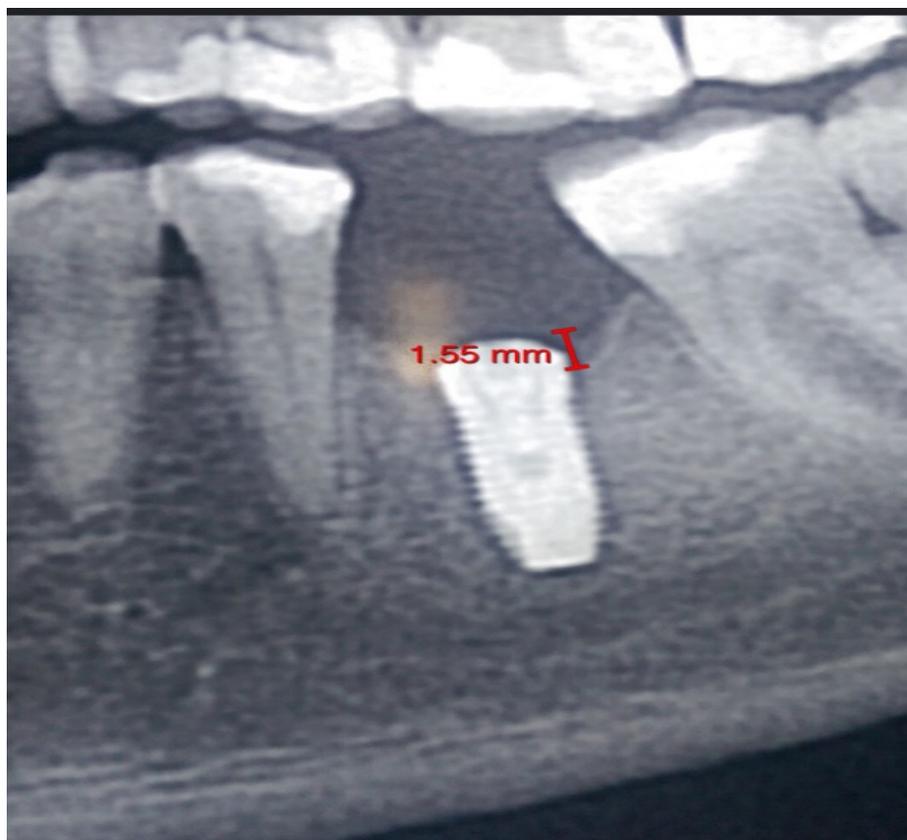
This study was designed to evaluate the amount of crestal bone loss level between using the flapped and flapless dental implant surgical procedures at different time intervals.

## MATERIALS AND METHODS

Ten patients aged 4 – 45 with good oral hygiene and no previous medical problems were selected and they underwent full arch treatment. The size of the implants ranged from 3.8 to 4.2 mm according to the bone width and the length was from 10 to 12 mm according to the bone height. Dentium implants (Dentium Company, Korea) were used. The level of crestal bone around the dental implants were measured using iron panoramic image. Twenty implants were investigated; ten implants were inserted by the flapped technique surgery and ten by the flapless technique.

The implants were placed in the 1<sup>st</sup> premolar and 1<sup>st</sup> molar areas in both jaws, due to the preferable width of the bone (in anterior area knife-edge bone founded in most of cases so that it was excluded).

The bone level was measured by using Autodesk AutoCAD 2014 program; a line was drawn from the top surface of the implant to the point of implant fixture's surface contact with the bone. The line was parallel to the long axis of the implant and perpendicular to the alveolar bone as shown in Fig. 1.



**Fig. 1. Measurement of bone level at the area of 1<sup>st</sup> molar after 1 week of implant insertion**

The crestal bone level was measured at 1, 4, and 12 weekly intervals after implant insertion, and a comparative analysis was made between the flapped and flapless techniques by using two-independent

variable statistical analysis.

**RESULTS**

Table 1 shows descriptive statistics for the crestal bone level measurements at different time intervals. The crestal bone level mean of the flapped surgery technique at first week after surgery was 1.28 mm with SD ±0.25, after 4 weeks it was 2.75 mm with SD ±0.53, and after 12 weeks, it was 1.85 mm with SD ±0.27.

The mean of the crestal bone level of the flapless surgery technique at first week after surgery was 1.35 mm with SD ±0.21, after 4 weeks, it was 1.80 mm with SD ±0.28, and after 12 weeks, it was 1.03mm with SD ±0.08.

The measurement of the crestal bone level of the flapless technique at first week was 1.38 mm with SD±0.19 in the maxilla, and 1.25 with SD± 0.35 in the mandible, while after 4 weeks it was 1.84 mm with SD±0.23 in the maxilla, and 1.63 with SD± 0.53

As compared between the flapped and flapless technique, the P-value at the first week was non-significant, after 4 and 12 weeks it was highly significant, as shown in Table 2.

The results of the comparison between maxilla and mandible in both techniques are shown in Table 3. The measurement of the crestal bone level of the flapped technique at first week was 1.28 mm with SD±0.25 in the maxilla, and 1.25 with SD± 0.35 in the mandible, while after 4 weeks it was 2.84 mm with SD±0.55 in the maxilla, and 2.38 with SD± 0.18 in the mandible and after 12 weeks it was 1.91 mm with SD±0.27 in the maxilla, and 1.63 with SD± 0.18 in mandible.

in the mandible and after 12 weeks, it was 1.03 mm with SD±0.09 in the maxilla, and 1.00 with SD± 0.00 in the mandible With non-significant P-value between maxilla and mandible as shown in Table 4.

**Table 1: Descriptive statistics of crestal bone measurements between flapped and flapless techniques at different time intervals**

| Technique | Time intervals | Number | Mean | ±SD  |
|-----------|----------------|--------|------|------|
| Flapped   | 1 week         | 10     | 1.28 | 0.25 |
|           | 4 weeks        | 10     | 2.75 | 0.53 |
|           | 12 weeks       | 10     | 1.85 | 0.27 |
| Flapless  | 1week          | 10     | 1.35 | 0.21 |
|           | 4 weeks        | 10     | 1.80 | 0.28 |
|           | 12 weeks       | 10     | 1.03 | 0.08 |

**Table 2: Statistical analysis of crestal bone measurements between flapped and flapless techniques at different time intervals**

|          |                |       |
|----------|----------------|-------|
| 1 week   | Mann-Whitney U | 42.00 |
|          | Wilcoxon W     | 97.00 |
|          | Z              | -0.67 |
|          | P-value        | 0.50  |
| 4 weeks  | Mann-Whitney U | 3.00  |
|          | Wilcoxon W     | 58.00 |
|          | Z              | -3.64 |
|          | P-value        | 0.00  |
| 12 weeks | Mann-Whitney U | 0.00  |
|          | Wilcoxon W     | 55.00 |
|          | Z              | -4.03 |
|          | P-value        | 0.00  |

**Table 3 Descriptive statistics of crestal bone measurements between flapped and flapless techniques in the maxilla and the mandible at different time intervals**

| Technique            | Time intervals | Jaw      | N | Mean | ±SD  |
|----------------------|----------------|----------|---|------|------|
| Flapped<br>(Control) | 1 week         | Maxilla  | 5 | 1.28 | 0.25 |
|                      |                | Mandible | 5 | 1.25 | 0.35 |
|                      | 4 weeks        | Maxilla  | 5 | 2.84 | 0.55 |
|                      |                | Mandible | 5 | 2.38 | 0.18 |
|                      | 12 weeks       | Maxilla  | 5 | 1.91 | 0.27 |
|                      |                | Mandible | 5 | 1.63 | 0.18 |
| Flapless<br>(Study)  | 1 week         | Maxilla  | 5 | 1.38 | 0.19 |
|                      |                | Mandible | 5 | 1.25 | 0.35 |
|                      | 4 weeks        | Maxilla  | 5 | 1.84 | 0.23 |
|                      |                | Mandible | 5 | 1.63 | 0.53 |
|                      | 12 weeks       | Maxilla  | 5 | 1.03 | 0.09 |
|                      |                | Mandible | 5 | 1.00 | 0.00 |

**Table 4 Statistics test of crestal bone measurements between flapped and flapless techniques in the maxilla and the mandible at different time intervals**

| Technique | Statistics        | 1 week | 4 weeks | 12 weeks |
|-----------|-------------------|--------|---------|----------|
| Flapped   | Mann-Whitney U    | 7.500  | 4.000   | 3.000    |
|           | Wilcoxon W        | 10.500 | 7.000   | 6.000    |
|           | Z                 | -0.144 | -1.067  | -1.412   |
|           | P-value           | 0.885  | 0.286   | 0.158    |
|           | Fisher exact test | 0.889  | 0.400   | 0.267    |
| Flapless  | Mann-Whitney U    | 6.000  | 5.500   | 7.000    |
|           | Wilcoxon W        | 9.000  | 8.500   | 10.000   |
|           | Z                 | -0.593 | -0.738  | -0.500   |
|           | P-value           | 0.553  | 0.460   | 0.617    |
|           | Fisher exact test | 0.711  | 0.533   | 0.889    |

## DISCUSSION

Previous studies have revealed that flap reflection is the direct reason for bone resorption around natural teeth<sup>7</sup>. To reduce the possibility of postoperative peri-implant tissue loss, the concept of the flapless implant surgery has been advocated for patients with sufficient available bone volume in the implant recipient site. The flapless technique is accepted as an alternative way for placing dental implants with less time and trauma<sup>15,16</sup>.

The present study null hypothesis assumed that the crestal bone level of the flapped dental implant surgery was significantly less compared with the flapless surgical technique, so from the results in table 1 and 2; the null hypothesis accepted since the flapless dental implant technique shows less level of bone resorption within time.

Comparison of the flapped and flapless techniques shows there were no significant differences at the 1<sup>st</sup> weeks; this result is in agreement with Mijiritsky et

al in 2011, who proved that there was no significant changes between the two techniques at 1<sup>st</sup> weeks<sup>4</sup>, but when comparing the flapped and flapless techniques at the 4<sup>th</sup> and 12<sup>th</sup> weeks, there were significant differences between them. This study showed less crestal bone resorption using the flapless surgery was, which is in agreement with Tsoukaki et al in 2013, who proved that there was greater crestal bone resorption at 6 – 12 weeks using the flapped surgery and no bone resorption using the flapless technique<sup>17</sup>. Shibu et al in 2008 also proved low bone resorption using the flapless technique during 3 months post-surgical period<sup>18</sup>, while, Bayounis et al in 2011 proved better peri-implants healing using the flapless than that using the flapped technique<sup>19</sup>. The possible explanation is that the flapless surgery has also been reported to preserve the circulation of the peri-implant tissues and accelerate healing at the surgical site, thereby allowing the patient to resume regular oral hygiene maintenance immediately after

implant placement<sup>20</sup>. In addition, the flapless surgical procedures are typically performed trans-mucosally without elevating the soft tissue covering the alveolar bone. The main benefit of this technique is the reduction in the level of trauma to the tissue, as the periosteum layer remains intact. Not disturbing the periosteum layer allows greater chance to preserve alveolar bone levels, improve blood supply to the implant site, and reduce patient discomfort<sup>20</sup>.

## CONCLUSION

Within the limits of the present prospective study, placement of implants by the flapless approach has a potential to decrease crestal bone level loss, and minimize surgical time which is more comfortable to the patient.

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