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# Evaluation of Accuracy of Immediate Dental Implant Placement Using Stereolithographic Surgical Stent

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**Abstract:** ***Background: The success of implant therapy depends primarily on appropriate treatment planning and properly performed implant placement surgery, this can be achieved by means of surgical guidestents which are designed in conventional methods or by stereolithography. The aim of the study: Evaluation of the accuracy of immediate implant placement using stereolithographic surgical stent. Materials and methods: Ten implants were placed in patients having fresh extracted socket, implants were placed using stereolithographical design of surgical stent then measuring the deviation between the planned implant position before the surgery and the actual position of the placed implant after surgical procedure using cone beam computed tomography CBCT .Clinical assessment was done including implant primary stability , implant mobility, periimplant probing depth, sulcus bleeding index and bleeding on probing. Also radiographical evaluation was done to measure bone density and marginal bone height around implants.Assessment of implant distance to the maxillary sinus was also done by measuring the distance between implant planned and maxillary sinus by preoperative CBCT planning then measuring the actual placed implant distance to the maxillary sinus by postoperative CBCT. Results: Pain and edema decreased gradually throughout the follow up period.All implants showed both clinical and radiographical success. Stereolithographic stent shows minimal deviation between planned and actual placed implants. Conclusions: Immediate implant placement is a successful treatment option for restoring hopeless tooth, The guided surgery is a new modality for safe and easy implant insertion and using a stereolithographic stent for immediate implant placement is a good tool for that with an excellent outcomes.***

**Keywords:** Immediate implant, stereolithographic stent

## 1. Introduction

The development of dental and the implant supported oral restoration has become an increasingly used treatment option for partially edentulous and completely edentulous patients, even in patients with severe bone loss and in locations which were previously considered unsuitable for implant placement [1].

More than 30 years ago, Schulte and Heimke in 1976 initially described immediate placement of a dental implant in an extraction socket [2]. This treatment approach has many advantages such as reductions in the number of surgical interventions, a shorter treatment time, an ideal three dimensional implant positioning, the preservation of alveolar bone at the site of the tooth extraction and soft tissue aesthetics but on the other hand, the morphology of the side, the presence of periapical pathology, the absence of keratinized tissue, thin tissue biotype and lack of complete soft tissue closure over the extraction socket are disadvatanges for immediately placed implants[3].

The success of implant therapy depends primarily on appropriate treatment planning and properly performed implant placement surgery [4].

More than four decades ago,Branemark et al[5] in 1969 introduced the first dental implant. Since then, dental practitioners and researchers have been searching for various methods for improving the accuracy of the surgical placement of implants. Advances in dental imaging technology utilizing computed tomography (CT) has been proven especially useful when determining the installation sites of dental implants[6].

The success of the prosthesis and the achievement of the best functional and esthetical result require a high degree of accuracy in placement of implant. This can be achieved by means of a surgical guide which fits on to the existing dentition or on to the edentulous span[7].

Implants position, depth and angulations are three important factors to be considered during implant insertion. These factors are maintained by means of the surgical guide where it translates the diagnostic information from pre-surgical diagnostic wax up to direct implant placement [8].

Many conventional methods were used in fabrication of stents such as clear vacuum form and a hole, vacuum form with metal sleeves, self cure acrylic stent with guide channel, self cure acrylic stent with holes, acrylic with wire,self cure acrylic with metal sleeves [9].


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Recently, CAD/CAM techniques are used to fabricate the stereolithographic stents which are rapid prototyping technology allowing precise placement of the implants as they are preprogrammed with individual depth, angulations, mesio-distal and labiolingual positioning of the implant[10].

Thestereolithographic stentshave many advantages including minimal invasion, accuracy of implant placement, predictability, less post-surgical discomfort and reduced time required for definitive rehabilitation[11].

## 2. Patient and Methods

A clinical trial was conducted on ten adult patients having maxillary premolar tooth or remaining root indicated for extraction and for implant rehabilitation. The patients were selected from the out Patient clinic of theOral and Maxillofacial Surgery Department, Faculty of Dentistry, Alexandria University.

- The inclusion criteria of this study involved patients'ageranging from 20-50 years old havingmaxillary premolar tooth or remaining root indicated for extraction,sufficient bone volume and good oral hygiene.While the exclusion criteria excludedactive infection, inadequate interocclusal space, bruxism or clenching, systemic diseases such as uncontrolled diabetes and osteoporosis,patients receiving chemotherapy, heavy smokers,immunosuppressed patients (for example: following organ transplantation) and pregnant women were also excluded.
- In this study ten implants were placed using stereolithographic stent.
- The Dentium system implants(Dentiumsuperlinetaperd system, Yeoungtong-gu Suwon, South Korea) with different diameters (3.6,4,4.5,5,5.5,5.8)mm and lengths (7, 8, 10, 12, 14)mm were used in this study and Osstell ISQ was used for measurement of implant primary stability.
- Osstell ISQ (Osstell AB, stampgatan , Goteborg, Sweden) consists of Osstell ISQ instrument, probe, charger, USB cable and test peg.
- **The stereolithographic surgical stent system:** In2Guide™(**Cybermed Inc.**Korea) system was used in this study, components are:
  - Planning software: The treatment plane was powered by OnDemand3D™.(**OnDemand3D Technology Inc. U.S.A)** In2Guide utilizes OnDemand3D's powerful 3D engine to create a 3D volume from DICOM data for an intuitive way for planning the surgery. Then it turns virtual planning data into a real custom made surgical template with depth and angle control by ordering directly from In2Guide.
  - Surgical template: surgical template is a mouth guard shaped RPsculpture which controls the drilling location.

Surgical templates are made of certified bio-compatible resin, and are completely harmless to the human body. Manufactured under the ISO 13485 quality management system and certified by the FDA (US), the CE (Europe) and the KFDA (Korea)

- Surgical kit: In2Guide™ Universal Kit is a 44 piece surgery kit specifically designed for In2Guide surgical templates. Perform full sequence drilling with depth control for implant (Fig. 1, 2).

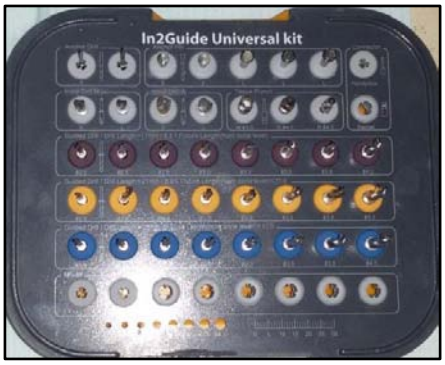


**Figure 1:** In2Guide Guided Drills.

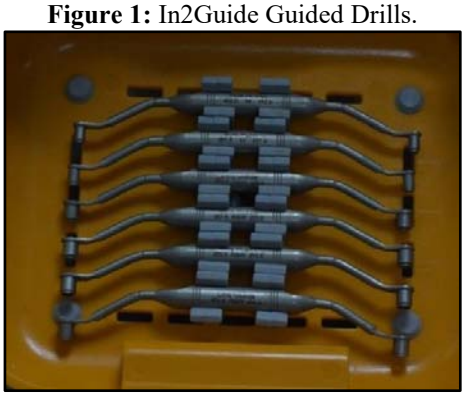

**Figure 2:** In2Guide Drill Guides

Drill length is determined by the implant fixture. In2Guide automatically adjusts the position of the sleeves and the guide is fabricated accordingly. Both the drill and sleeves are color-coded accordingly, allowing for depth control delivered through the surgical template.

**I- Pre surgical phase**

All patients underwent pre - operative clinical examination: Patients' data were collected; name, gender and age, medical and dental histories were taken.Also all patients underwent pre–operative Cone Beam Computer Guided Tomography (CBCT).

Guided implant surgery follows the following procedures:

- CBCT scan.
- Virtual treatment planning: To begin planning, the panoramic curve was labeled, maxillary sinus was identified, and implants were placed in the sagittal view. The placement was then evaluated in the sagital plane, horizontal plane, and the three dimensional rendering. Adjustments were made as needed to place the implants in their most ideal location and for preservation of maxillary sinus wall satisfying both the surgeon's desire for placement in bone and the prosthodontists' desire for an ideal access for restorations (Fig. 3).


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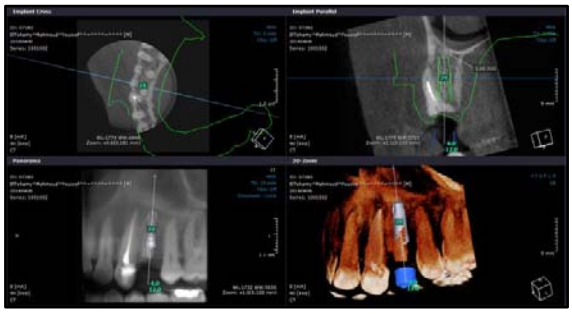

**Figure 3:** Virtual treatment planning

- Surgical guide construction: The DICOM format obtained from CBCT was sent to in2guide together with the diagnostic cast where optical scan was done to the cast(Fig. 4).The processing of the stereolithography interface (STL)-format data acquired from the optical scan overlapping the data obtained from the CT device in a DICOM format, which allowed simultaneous viewing of the axial, 3D, panoramic, and cross-sectional images on the computer monitor. Transferral of the virtual project to a 1:1 scale model with a rapid prototyping technique, and subsequent realization of a surgical stent obtained according to the CT scans and diagnostic cast by using the principle of stereolithography. Once the stereolithographic guides were returned from In2Guide, they were checked on the model, this for checking the stability and insure the appliance fit well before the surgeries were scheduled. After confirming the fit of the stereolithographic guides, patients were scheduled for surgery.

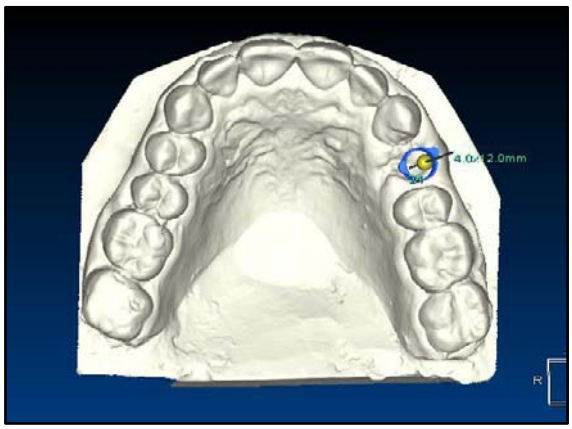

**Figure 4:** Optical scan of diagnostic cast

**II-Surgical phase**

Surgery was performed under local anesthesia (mepivacaine HCL with epinephrine 1:100,000).Atraumatic extraction of maxillary premolar remaining root or tooth after that Surgical guide stent was applied .Drilling was performed sequentially according to manufacturer instruction then dental implant was placed. Measurement of implant primary stability was done by Ostell™ after that cover screw was applied then suturing.(Fig. 5).

**Figure 5:** Stereolithographic stent in patient's mouth with sequential drilling

**III- Postsurgical phase**

Regarding Postsurgical phase**,**All patients were advised to apply cold packs extra orally intermittently every 10 minutes for 2 hours on the first day, chlorohexidine mouth wash was started on the 2nd post-operative day 3 times daily for 2 weeks and the sutures were removed after one weekpostsurgically. Antibiotic (Amoxicillin/clavulanic acid 1gm tab),was prescribed 2 times daily for 5 days in addition to non-steroidal anti-inflammatory drugs (ibuprofen 400mg, EIPICO, 10th of Ramadan city, Egypt), 3 times daily for 3 days were given.

**IV- Follow up phase**

**Clinical follow up**

All the patients were evaluated immediately after implant placement, after 1 week to detect the presence of any sign of infection, pain or swelling. Pain was evaluated on the second day, 7 days ,after 45 days and after 4 months through visual analogue scale(VAS) (Fig. 6) from 1 to10 ("1" is No pain and "10" is unbearable pain[12].

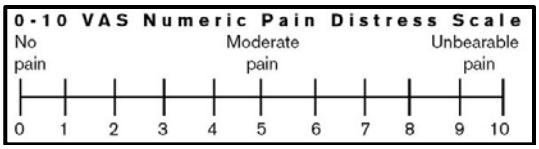


**Figure 6:** VAS numeric pain distress scale.

Edema was evaluated by its ability to pit[13]. The examiner finger is pressed into dependent area of the patient skin for 5 seconds .The finger will sink into the tissue and leave an impression when it is removed .The pitting is graded on a scale of +1to+4 as follows:

- +1 (trace) slight indentation rapid return to normal.
- +2 (mild) the indentation return to normal in few seconds.
- +3 (moderate) 6mm indentation rebounds in 10-20 Seconds.
- +4 (sever) 8mm indentation rebounds after> 30 seconds.

Delayed follow up was carried out at a period of 1, 3 and 6 months intervals post operativelyto test the Mobility of the implant according to Mickney and Koth[14] The clinical implant mobility scale is:

**Scale 0:** Absence of clinical mobility with 500 g in any direction.

**Scale 1:** Slight detectable horizontal movement.


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**Scale 2:** Moderate visible horizontal mobility up to 0.5 mm.
**Scale 3:** Severe horizontal movement greater than 0.5 mm.
**Scale 4:** Visible moderate to severe horizontal movement and any visible vertical movement.
Peri-implant probing depth[15], Bleeding on probing (BOP)[16]were also scored. Sulcus bleeding index(SBI)[17] was scored as follows :

- Score 0 – health looking papillary and marginal gingiva no bleeding on probing;
- Score 1 – healthy looking gingiva, bleeding on probing;
- Score 2 – bleeding on probing, change in color, no edema;
- Score 3 – bleeding on probing, change in color, slight edema;
- Score 4 –bleeding on probing, change in color, obvious edema;
- Score 5 –spontaneous bleeding, change in color, marked edema.

**Radiographic follow up:**
Direct digital standardized peri-apical radiograph or Computerized Dental Radiography (CDR) was done after 1,3 and 6 months to evaluate changes of bone density and marginal bone level around the dental implant using Image J software[18].

**Evaluation of accuracy: (Fig. 7)**
The preoperative and postoperative CBCT scans were then overlapped using a dedicated algorithm, which allowed the comparison of the virtually planned and the actual implant positions. Three deviation parameters between each planned and placed implant were measured. All measurements were performed using dedicated software (OnDemand3D™).

Coronal and apical differences were measured in mm, while the angular deviation was measured in degrees. Though several methods were used to describe the distance between the given points, the most common method was to measure the actual distance between the planned and actual point in the x, y, and z-axis, where x = bucco-lingual, y = mesio-distal, and z = apico-coronal deviation. The apico-coronal deviation was frequently expressed as a negative number if the implant was not inserted as deeply as planned (too coronal).

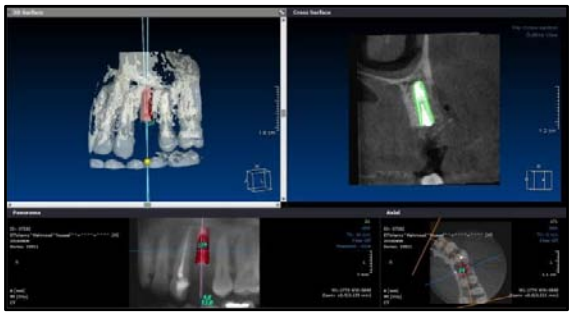

**Figure 7:** Measuring the accuracy

**Assessment of implant distance to the maxillary sinus**
By measuring the distance between implant planned and maxillary sinus by preoperative CBCT planning then measuring the actual placed implant distance the maxillary sinus by postoperative CBCT.

**V- Prosthetic phase**
Final restoration (porcelain fused to metal crown) was placed 3 months after surgery.

## 3. Results

The present study was conducted on 10 implants were placed in fresh extracted maxillary premolars socket by stereolithographic surgical stent. Patients were selected from the outpatient clinic of the Oral and Maxillofacial surgery department, Faculty of dentistry, Alexandria University. All patients were free from any systemic disease that can compromise implant success. The selected patients age ranged from 25-40 years old with mean of 32.5 years old and were of both sexes.

All patients were followed up and the result were resisted as regards both clinical and radiographic evaluations.

**I. Clinical evaluation**

1) Pain was evaluated on the second day, 7 days,after 45 days and after 4 months through visual analogue scale(VAS) from 1 to10 where pain intensity score scaled from 0 (No pain) to 10 (unbearable pain) according to Visual Analogue Scale[12]. After surgery, patients experienced slight to mild pain(1-3) at surgical site for 1-3 days duration.
2) Two patients suffered from mild edema subside totally by 2nd post -operative day.
3) Implant mobility:All over the evaluation period,none of implants showed any sign of mobility (i.e. mobility score was 0).
4) Peri-implant probing depth:Depth of the peri-implant sulcus was tested by applyinglight force to avoid undue tissue damage and over extension into the healthy tissueafter 1, 3 and 6 months postoperatively[15].(Table 1)

**Table 1:** Peri-implant probing depth

| | After one month | After 3 months | After 6 months |
|---|---|---|---|
| Min. - Max | 2.0 – 3.0 | 1.75 – 2.75 | 1.50 – 2.50 |
| Mean ± SD | 2.40 ± 0.39 | 2.10 ± 0.38 | 1.90 ± 0.34 |
| Median | 2.25 | 2.00 | 1.75 |
| P | | 0.001* | 0.001* |

p: p value for paired t-test for comparing between after one month with each other periods
*: Statistically significant at $p \leq 0.05$

5- Bleeding on probing (BOP): All the patients had negative bleeding on probing (BOP-) throughout the follow up periods.
6- Sulcus bleeding index(SBI): All the patients had score (O) of sulcus bleeding index throughout the follow up periods.
7- Measurment of implant primary stability by Ostell ™: The mean of implant primary stability was 65.60 ± 8.82 with minimum value of 50.0 and maximum value of 78.0.

**II. Radiographic evaluation**

**1-Accuracy of immediate implant placement**
For all ten implants,angular deviation,coronal deviation and apical deviation,were determined .Data collected were statistically analysed. (Table 2)


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**Evaluation of angular deviation**

The mean of angular difference in implant with stereolithographic stent were 2.05 ± 1.47 with minimum value of 0.37 and maximum value of 4.49.

**Evaluation of coronal deviation**

Coronal and apical differences were measured and analysed for total distances and also for 3 axises (x,y,z) positions where :

Dx is the differencein a bucco-lingual position.
Dy is the difference in a mesio-distal position.
Dz is the difference in aapico-coronal position.

**Table 2:** Statistical analysis of the studied cases according to total accuracy

| Total accuracy | Min. – Max. | Mean ± SD. | Median |
|---|---|---|---|
| Degree diff | 0.37 – 4.49 | 2.05 ± 1.47 | 2.07 |
| Coronal diff sum | 0.43 – 2.51 | 1.31 ± 0.81 | 1.13 |
| Coronal diff DX | 0.23 – 2.24 | 0.82 ± 0.72 | 0.57 |
| Coronal diff DY | 0.05 – 1.37 | 0.55 ± 0.45 | 0.38 |
| Coronal diff DZ | 0.12 – 1.85 | 0.54 ± 0.64 | 0.30 |
| Apical diff sum | 1.01 – 2.50 | 1.68 ± 0.65 | 1.29 |
| Apical diff DX | 0.28 – 2.38 | 1.04 ± 0.70 | 0.93 |
| Apical diff DY | 0.37 – 1.47 | 0.82 ± 0.34 | 0.74 |
| Apical diff DZ | 0.10 – 2.15 | 0.66 ± 0.76 | 0.33 |

**2- Assessment of bone density around the implants**

Data were collected regarding mean peri-implant bone density values and standard deviation at the first month post-operative, at 3 months and 6 months.(Table 3,Fig. 8)

**Table 3:** Comparison between different periods according to bone density

| | 1st (n=10) | 3rd (n=10) | 6th (n=10) |
|---|---|---|---|
| **Bone density** | | | |
| Min. – Max | 90.53 – 127.89 | 99.01 – 136.93 | 110.36 – 145.2 |
| Mean ± SD. | 104.14 ± 11.26 | 114.75 ± 11.26 | 124.92 ± 9.72 |
| Median | 101.81 | 114.73 | 125.47 |
| **Sig.bet. periods** | $p_1<0.001^*$,$p_2<0.001^*$,$p_3<0.001^*$ | | |

Sig. bet. periods was done using Post Hoc Test (LSD) for ANOVA with repeated measures
p1: p value for comparing between 1st and 3rd
p2: p value for comparing between 1st and 6th
p3: p value for comparing between 3rd t and 6th
*: Statistically significant at p ≤ 0.05

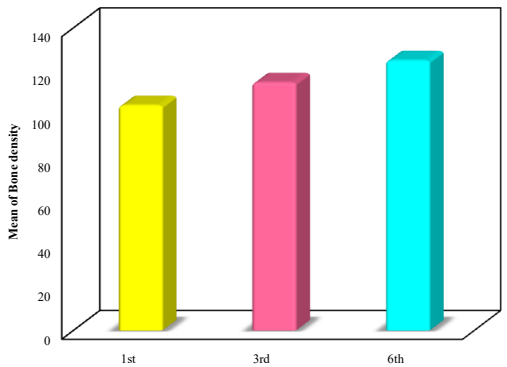


**Figure 8:** Comparison between different periods according to bone density.

**3-Assessment of marginal bone height**

Data were collected regarding the marginal bone height at the mesial and distal aspects of all implants. The mean marginal bone level values and standard deviation at one month, 3 months and 6 months post-operative are shown in table 4, Fig. 9.

**Table 4:** Comparison between different periods according to marginal bone height

| | 1st (n=10) | 3rd (n=10) | 6th (n=10) |
|---|---|---|---|
| **Marginal bone level** | | | |
| Min. – Max | 1.02 – 3.52 | 0.77 – 3.31 | 0.55 – 3.11 |
| Mean ± SD. | 2.04 ± 0.80 | 1.81 ± 0.78 | 1.61 ± 0.78 |
| Median | 1.82 | 1.71 | 1.47 |
| **Sig.bet. periods** | $p_1<0.001^*$,$p_2<0.001^*$,$p_3<0.001^*$ | | |

Sig. bet. periods was done using Wilcoxon signed ranks test
p1: p value for comparing between 1st and 3rd
p2: p value for comparing between 1st and 6th
p3: p value for comparing between 3rd t and 6th
*: Statistically significant at p ≤ 0.05

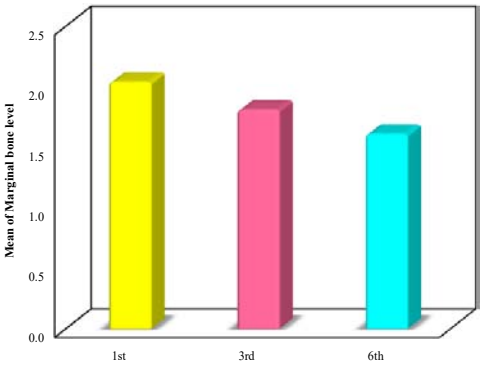


**Figure 9:** Comparison between different periods according to marginal bone height

**4- Assessment of implant distance to the maxillary sinus**

The mean of the distances between the planned implants preoperatively to the maxillary sinus was 3.70 ± 2.09 mm with minimum value of 1.17 mm and maximum value of 6.60mm.

The mean of the distances between the placed implants to the maxillary sinus were 3.15 ± 1.96 mm with minimum value of 0.30 mm and maximum value of 6.36mm (Table 5).

**Table 5:** Statistical analysis of the studied cases according assessment of implant distance to the maxillary sinus

| | Planned implants | Placed implants | Z | p |
|---|---|---|---|---|
| Min. – Max | 1.17 – 6.60 | 0.30 – 6.36 | | |
| Mean ± SD. | 3.70 ± 2.09 | 3.15 ± 1.96 | $1.988^*$ | $0.047^*$ |
| Median | 2.97 | 2.92 | | |

Z: Z for Wilcoxon signed ranks test
*: Statistically significant at p ≤ 0.05

## 4. Discussion

Immediate implant placement following tooth extraction has been found to be a viable and predictable solution to tooth loss. Minimally invasive surgical technique, ease of procedure and shorter time involved together with minimum postextraction complications are the important advantages of


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this method.Besides, proper case selection and postoperative care are essentials for success[19].

Accuracy of CAD/CAM technology in dental implant planning and predictable transfer of the presurgical plan to the surgical site has been documented[20-28]. However, various complications [29] related to inaccurate planning, radiographic stent error, intrinsic errors during scanning, software planning, the rapid prototyping of the guide stent, and the transfer of the prosthetics restoration were reported.

This study evaluated the accuracy of immediate implant placement using stereolithograpraphic surgical stents among ten implants. Ten patients each had a non restorable maxillary premolar tooth.They were selected from the outpatient clinic of the Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Alexandria University. Their ages ranged between 25 and 40 years with mean age of 32.5,free from systemic diseases and parafunctional habits such as bruxism and clenching because these may affect the implants badly.

In this study, the patients experienced slight to mild pain at the surgical site which disappeared completely after the 2nd and 3rdpost operative days, and mild to moderate edema which completely resolved after 3 days. This is in contrast with the studies done by Garber et al. 2001,[30]Saadoun (2002),[31]Gapski et al (2003),[32]who drilled into healed site and resulted in more heat generation, edema and postoperative pain because more amount of bone is being prepared.

Regarding the gingival condition around the implants, all cases showed a sulcus bleeding index score of (0)and negative bleeding on probing (BOP -) throughout the evaluation period indicating absence of peri-implant mucositis.

Regarding the mean peri-implant probing depth in the present study there wasn't any increase throughout the evaluation period, which indicate periodontally successful implants.

Intraoral digital periapical films were taken for each patient at 1st, 3rd and 6 months post-operative to measure detect the changes in bone density surrounding dental implants and the marginal bone level. Comparison was done at the three different periods showing an increase in peri-implant bone density starting from the first month to the end of the 6 months of the evaluation period indicating osseointegration of all implants.

The expected marginal bone loss was evident on the radiographs which settled at the implant crestal module at the end of the 6th monthwhich is consistent withNadal et al (2014)[33].

Regarding implant primary stability, ostell device was used for assessment of each implant .The mean of implant stability quotient (ISQ) was 65.60 ± 8.82 ISQ. That was in agreement with Shiigai (2007)[34] andAnitha K et al(2014)[35] who mentioned that the primary stability of immediate implant with ISQ more than 62 considered to be suitable.

Regarding implant relation to the maxillary sinus, the stereolithographic stent was beneficial in two issues: firstly, there was a small difference in values regarding the distance between implant planned and the maxillary sinus and that between the actually placed ones and the maxillary sinus (p=0.047) which indicated proper placement of implant by sterolithographic stent.

Secondly, in cases where planned implants were near the maxillary sinus, maxillary sinus lifting was avoided by proper planning and our stent.

Evaluation of the accuracy of placement was done by measuring the overall deviations between virtually planned and surgically placed dental implants based on a comparison of preoperative and postoperative CBCT images.

The mean of angular difference in implant with stereolithographic stent were 2.05 ± 1.47.

The Mean of total coronal differences in stereolithographic guided implant were (1.31 mm ± 0.81mm).

Mean of total apical differences in stereolithographic guided implant were (1.68 ± 0.65 mm).

Results of this study were similar to previous studies measuring the accuracy of CAD/CAM surgical guides in implant placement [23,36-39]. A summary of these results appears in (Table 6).

**Table 6:** Summary of previous studies measuring the accuracy of CAD/CAM surgical guides

| *Author* | *year* | *Angulation* | *Coronal* | *Apical* |
|---|---|---|---|---|
| Di Giacomo | 2005 | 7.25 ± 2.67° | 1.45 ± 1.42 mm | 2.99 ± 1.77 mm |
| Van Assche | 2007 | 2 ± 0.8° | 1.1 ± 0.7 mm | 2.0 ± 0.7 mm |
| Ersoy | 2008 | 4.9 ± 2.36° | 1.22 ± 0.85 mm | 1.51 ± 1 mm |
| Ozan | 2009 | 4.1 ± 2.3° | 1.11 ± 0.7 mm | 1.41 ± 0.9 mm |
| Valente | 2009 | 7.9° | 1.4 mm | 1.6 mm |
| Schneider | 2009 | 5.73° | 1.16 mm | 1.96 mm |
| Pettersson | 2010 | 2.64° | 1.06 mm | 1.25 mm |
| Widmann | 2010 | 2.8°±2.21° | 1.2±0.7 mm | 1.1±0.6 mm |
| D'haese | 2012 | 3.54° | 1.04 mm | 1.64 mm |
| Farley | 2013 | 3.39° ± 2.35° | 1.43 ± 0.67 mm | 1.72 ± 0.61 mm |
| Current study | 2016 | 2.05° ± 1.47° | 1.31mm± 0.81mm | 1.68 ± 0.65 mm |

The final results of accuracy is affected by several factors that cause errors, but it is difficult to pinpoint a certain factor that is particularly significant to the final outcome. However, it is possible to minimize some of the errors if the surgeon consider these sources of variation and carefully follow the instructions of the protocol. For example, patient movements during CBCT scan, fitting and placement of the surgical template which influence the final implant positions. The surgeon should remember, that even the patient selection, the first step in the treatment, will affect the accuracy of implant placement.


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## 5. Conclusion

Immediate implant placement is a successful treatment option for restoring hopeless tooth. The guided implant surgery is a new modality for safe and easy implant insertion and using a stereolithographic stent for immediate implant placement is a good tool for that with an excellent outcomes.

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