IMMEDIATE IMPLANT PLACEMENT IN MANDIBULAR MOLAR USING ROOT-GUIDED VS COMPUTER-GUIDED TECHNIQUES

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ABSTRACT

INTRODUCTION: Because of minimal trauma and shorter treatment durations, immediate implant has becoming prevalent. Immediate implant placement after teeth extraction is an efficient technique for preserving bone while, also restoring function and aesthetics. To provide enough proper implant-bone contact and stability of the immediate implant, the inter-radicular bone must be preserved during extraction. This will prevent the implants from sliding into the empty sockets. Our study's goal was to evaluate the accuracy of root guided and computer guided techniques.

OBJECTIVES: Investigation of accuracy and stability of immediate implant placement utilizing two techniques (Root-Guided versus Computer-Guided Techniques).

MATERIALS AND METHODS: this study was a randomized control clinical trial (RCT). Twenty-four patients were randomly allocated into two groups: group I twelve immediate implants were placed by (Root-Guided Technique) and group II twelve immediate implants were placed by (Computer-Guided Technique). Osstell was used to determine the primary stability intra-operative. After 3 months the secondary stability was assessed again by Osstell. Post-operative Cone Beam Computer Tomography was done immediately after surgery for both groups evaluating the implant accuracy.

RESULTS: Throughout the study, 24 implants were effectively operating, in both groups. The accuracy of implant placement was significantly higher in (group II) in comparison with (group I). Three months postoperative ISQ values for all implants increased with (group II) having significantly higher increase.

CONCLUSION: The computer-guided technique showed more accuracy and stability when compared with root-guided technique.

KEYWORDS: Immediate implant placement, Root-guided technique, Computer-guided technique.

RUNNING TITLE: Different techniques of posterior mandibular immediate implants.

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INTRODUCTION

Recently, a significant advancement in the development of dental restorative materials, techniques, and procedures that are predictably efficient for the long-term management of missing teeth. Scientifically verified procedures have developed to provide dental patients with excellent tooth replacement options that are both aesthetically pleasing and functioning well. Patients who are partially edentulous can now have a single tooth or numerous missed teeth replaced with implant-retained crowns that have the same function and appearance as their original teeth (1).

As implant therapy progresses, new obstacles emerged due to increase functional and aesthetic expectations. During the late 1970s, the conventional procedures were developed. Implants were only placed after complete healing of extraction sockets. It was recommended that implants would be placed after a minimum of 6 to 12 months after tooth extraction (2).

Continuous researches have led to the development of more advanced techniques. Time required for immediate implant placement have been shortened as a result of improved implant design and surface technology. Techniques for implant placement have been introduced recently (Immediate, early, and late implant placement techniques), despite the definitions being different for each of them. Four scenarios were developed for implant insertion. Immediate implant placement after teeth extraction is referred to Type I. Type II implant is inserted after one to two months to ensure perfect soft tissues healing, type III implant is placed after three to four months to ensure completely bone healing and filling, and type IV implant is inserted in healthy sites (3).

Immediate implant placement in newly extracted socket has been developed in 1976 by “Schulte” (4). The treatment outcomes of that kind of procedure have already been reviewed and documented, revealing that it's a perfect and valuable procedure for replacing hopeless teeth (5,6). The number of surgeries and the duration of procedures were minimized when implants were placed immediately after teeth extraction. Furthermore, in comparison to the conventional protocol, it secures best 3D implant positioning, preserves the bone at the place of tooth extraction and the aesthetic of the soft tissues, and seems to have identical overall survival (7,8). Immediate implants were typically used to replace the single rooted teeth as well as premolars. There are numerous challenges in the immediate implant placement of molar teeth, including occlusion, site anatomy, and biomechanical concerns (9).Immediate implant placement also has several disadvantages including increased risk of implant failure, unpredictability of future levels of both hard and soft tissue, difficulties achieving implant stability due to presence of a gap between the extraction socket and fixture, and the inability to cover the fixture with soft tissue, leading to increased risk of infection and implant loss. (10).

Because of the anatomical features of the site, immediate implant placement in the posterior molar region has many difficult issues. The presence of inter-radicular bone can help or guide the drilling direction (11). Taking all of these factors into consideration, a good pre-operative planning is essential for successful implant placing in these circumstances, and different 3D imaging techniques, such as CBCT images, enable clinicians to gather the information required for the suggested objectives (12).

The plan utilized to correctly guide the placement of the implants in appropriate 3D positions can now be created digitally, placing the implants in the ideal aesthetically and functional positions. The first step in the planning process is to create the best functional restorations over these implants regarding to the potential implants location. Digitally positioned Implants can be placed in the most perfect and ideal locations (13). The plans can also aid in identifying the possibility of difficulties like, damaging to critical areas or the necessity for further grafting. To ensure correct implant placement in the planned areas, computer-guided implants therapy with digitalized surgical templates have now been recommended (14). On the other hand, another surgical approach known as Root-Guided Technique that uses the morphology of the root's trunk to direct the implant placement in the inter-radicular bone. This will help in obtaining enough implant stability in an ideal location, regardless of the morphology surrounding the extracted sockets (15). In regions with multi-rooted teeth, the root-guided procedure is an easy, useful and ideal method to facilitate implant insertion. The inter-radicular bony septum is engaged during this implant placement technique using the form and morphology of the roots of molar teeth that will be restored. This enables the placement of implants in a desirable and correct position from an anatomic and biomechanics standpoint (16).

This study's main goal was to compare the accuracy of immediate implant placement in mandibular molar region by two different techniques (Root-guided technique and Computer guided technique). While the secondary aim was to investigate the stability of the immediate implant using the two techniques.

MATERIALS AND METHODS

Informed consent

The research ethics of committee of the Faculty of Dentistry at Alexandria University gave its approval for this study before it began. Before being included in this study, all patients were informed about the procedure that was performed and each participant signed a written consent. Each participants was informed that he or she had the ability to withdraw from this study at any point with no repercussions.

Sample size

The minimal sample size is calculated based on a previous study aimed to assess the accuracy of implant placement using the remaining roots of multi-radicular mandibular molars, evaluate bone density around implants and implant stability in fresh extracted site (17). Abdelazim et al. (2021) (17) concluded that tooth guided immediate implant placement at molar region is a novel technique for easy and safe implant insertion. Based on their results, adopting a power of 80% to detect a standardized effect size (non-inferiority margin, d) of 0.10 in accuracy rate (primary outcome), and level of significance 95% (α=0.05), the minimum required sample size was found to be 12 patients per group (number of groups=2) (Total sample size=24 patients) (18,19). Any withdrawal for any reason will be compensated by replacement to control for attrition (withdrawal) bias (20).

Patients

Our study involved 24 participants that fulfilled the inclusion criteria and had severely damaged lower molar teeth that needed to be replaced immediately by implants. It was a RCT. Participants were chosen from the Oral and MaxilloFacial Surgical Department of the Dentistry Faculty at Alexandria University's outpatient clinics.

Inclusion criteria

Patients who have good dental hygiene, Class I and II patients according to American Society of Anesthesiologists classification (ASA I and II), have severely damaged lower molars with no furcation involvement and the socket has four remaining osseous walls (21) type A and B extracted sockets (22) and have enough keratinized mucosa and enough ridge dimensions (7mm or more in diameter and 10 mm or more in length).

Exclusion criteria

Patients have disease states reported to influence the health and healing of the periodontium, such as uncontrolled diabetic ketoacidosis, osteoporosis, heavy smokers, and ankylosed roots. Also, those who have para-functional habits.

Materials

Implant system

Vitronex implant system (V-line, Italy) with different diameters (5, 5.5) mm and lengths (10, 11.5, and 13) mm.

The v- line implants are characterized by 0.6 mm machined collar (more secure peri-implant tissue), tapered implant body, double threads for better primary stability, apical self-tapping, self-drilling power and accuracy of the conical connection 10 microns.

Osstell^{TM} device (Osstell ABStampgatn 14-SE 411 01 Goteborg, Sweden).

The Osstell device used to evaluate implant stability by the resonance frequency analysis (RFA)

Surgical guided kit for implant placement in group II. (B&B surgical guided kit, Italy)

SmartPeg (Vitronex, Italy)

SmartPegs are high precision small metal bars, which are screwed into the implant to measure the stability of the implant with the Osstell device.

Desktop scanner (Autoscan-DS-EX, Shinning, China). Used to scan the model of the patients for the fabrication of the surgical guide.

Resin (Anycubic resin, Anycubic, China).

LCD 3D printer (Photon S, Anycubic, China).

Used to print the surgical guide

Surgical bur (H33LSU bur, Komet, USA).

Used to separate the roots for both groups.

Methods

Pre-operative stage

Clinical assessment

I. Pre-operative procedure

Personal data and clinical evaluation:

Pre-operative clinical evaluations were performed on all patients. Personal data, including names, ages, sex, and medical and dental conditions, were documented. Scaling was done with instructions for maintaining good oral hygiene.

Investigations needed:

Lab investigations (INR, HBA1C and CBC) were performed. Then preoperative CBCT (PaX-i3D Green, Vatech, USA) was done for implant planning and to investigate the inter-radicular bone, pathological lesions around the apex and approximation to the inferior alveolar canal.

Guide fabrication

An alginate impression which represent the soft tissue was obtained, poured, scanned by desktop scanner and superimposed over the pre-operative CBCT which represent the hard tissue (bone) to fabricate the tooth supported surgical guide using a computer software (Bluesky Plan, BlueskyBio, USA). Then, replacing the missing molar tooth with a virtual crown selected from the software (tooth list panel) to ensure that implant procedure is prosthetic driven (reverse treatment plan). Then, implant dimensions (diameters and lengths) were selected for both groups according to socket dimensions so that at least 1:1.5 mm of bone were present around the implant after placement and 2:3 mm of bone apical to the socket was engaged during insertion to achieve adequate primary stability and 2 mm away from inferior alveolar nerve. Then specifications for the guide tube (offset, height and diameter) were inserted according to the surgical guided kit instructions and the tooth supported guide outline was drawn. Then the tooth-supported surgical guide was designed on computer software (Bluesky plan, BlueskyBio) and Steriolithographic file (STL) was exported and 3d printed by LCD 3D printer. (Figure 1)

II. Surgical stage

All patients received local anesthetic throughout the procedure. Articaine Hydrochloride and Adrenaline (Alexadricaine, Alexandria Pharmatheutical Company, Egypt) were utilized.

For group I: separation of the two roots was done using a surgical bur. Then, drilling through the roots in the inter-radicular bone septum was done till the final drill according to implant system before the extraction of the two roots. Atraumatic extraction was performed. Saline was used to remove any debris after dental extraction was carried out. Then, the implant was inserted (implant dimension was selected according to socket dimensions so that at least 1:1.5 mm of bone were present around the implant after placement and 2:3 mm of bone apical to the socket was engaged during insertion to achieve adequate primary stability and 2 mm away from inferior alveolar canal) in the osteotomy site (inter-radicular bone) following the

manufacturer protocol. After that, the primary stability was measured intra-operative using Osstell. Then a customized healing abutment was screwed. (Figure 2)
For group II: separation of the roots was done using a surgical bur. Then atraumatic extraction of roots were performed. Saline was utilized to remove any debris after dental extraction was carried out. After that, Insertion of tooth-support surgical guide through which the drilling for the osteotomy into the inter-radicular bone was done following the sequence of the guided kit. Insertion of the implant in the prepared site. Then, the primary stability was measured intra-operative after implant insertion using Osstell. Then a customized healing abutment was screwed. (Figure 3)

III. Postsurgical stage

For the first day, it was recommended to all patients to use extra-oral cold packs lasting 15 minutes each hour, Postoperative medications were prescribed including oral antibiotic Cefixime 400 mg (Suprax: manufactured by Hikma Pharma, Egypt); 1 capsule once daily for five days. In addition to, NSAIDs Diclofenac Sodium 75 mg (DICLAC: manufactured by Mina Pharm, Novartis), one tablet every twelve hours after meals for 72 hours. Patients were instructed to practice strict oral hygiene measures and regularly rinse with Chlorhexidine 0.2% mouthwash (Chlorhexidine Antibacterial mouthwash, Paxton, Healthpoint LTD) throughout 2 weeks.

Follow-up phase

A. Clinical evaluation

Measurement of implants stability

Primary stability of implants was measured for both groups after implant insertion immediately using Resonance Frequency Analyzer device (Osstell TM device) and SmartPeg. After 3 months, Secondary stability was measured using Resonance Frequency Analyzer device (RFA) (osstell TM device) after removal of the customized healing abutment and screwing of the SmartPeg over the implants.

B. Radiographical assessment

Immediate Post-operative CBCT was performed following the surgical procedures with the same apparatus and settings as the pre-operative CBCT. For the assessment of the accuracy of implant placement (the planned implant position on the pre-operative CBCT was compared with the actual implant position on the immediate post-operative CBCT).

Assessment of accuracy

CBCT had been performed twice on the same quadrant: pre-operatively to create virtual implants using software and immediately post-operatively to evaluate the simulated expected implant's position to the actual implant's position. Then both CBCTs were superimposed on each other (virtual planned implants and actual implants). Three deviation parameters (coronal, apical and angular deviations) were calculated between the planned and the actual implants using software application Mimics innovation suite 21 software (Materialise Mimics 3D Medical Imaging, Belgium). (Figure 4)

Statistical analysis:

With the aid of the IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). Data were loaded into the computer and evaluated. The normality of the distribution was examined using the Shapiro-Wilk test. The range (minimum and maximum), mean, standard deviation, median, and interquartile range (IQR) were used to illustrate quantitative data. At the 5% level, significance of the results was verified.

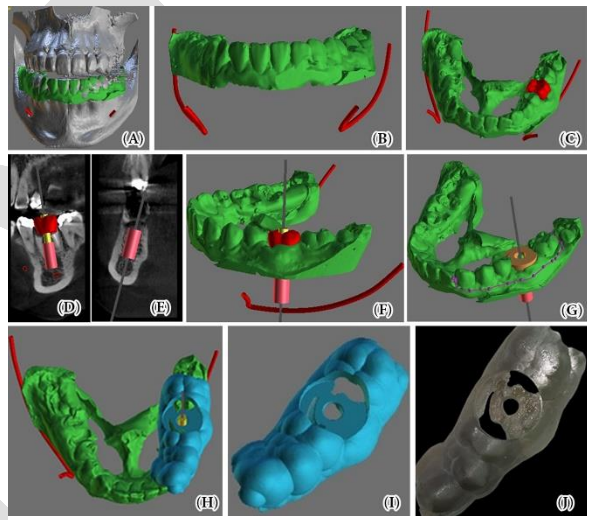

Figure (1): Fabrication of the surgical guide for Group II. (A), a photograph showing the superimposition of the cast of the patient (green color) which represent soft tissue on the CBCT 3D image (gray color) which represent the bone. (B), a photograph showing tracing of the inferior alveolar nerve (red color) before virtual implant placement. (C), a photograph showing replacement of the missing molar tooth with a virtual crown selected from the software (tooth list panel) to ensure that implant procedure is prosthetic driven. (D), (E) photographs showing the selection of the virtual implant form the software (implant list panel) according to the socket dimensions. (F), a photograph showing the virtual abutment in the center of the virtual crown and the virtual implant placed 2mm away from inferior alveolar nerve. (G), a photograph showing the guided tube and the outline of the surgical guide (violet color) before its fabrication. (H), a photograph showing the tooth supported surgical guide (blue color) adaptation on the cast. (I), a photograph showing the final surgical guide and the surgical guide tube through which the drilling will be done. (J), a photograph showing the printed surgical guide.

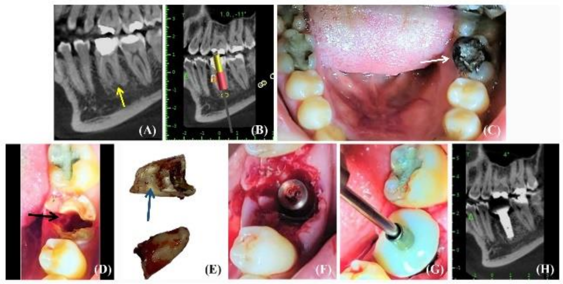

Figure (2): Root-guided technique in immediately placed implant. (A), Pre-operative CBCT x-ray showing badly destructed mandibular left first molar (yellow arrow). (B), CBCT x-ray showing the virtual planned implant. (C), a pre-operative clinical photograph with severely damaged left mandibular first molar (white arrow). (D), a photograph showing the drilling site between the roots before extraction (black arrow). (E), a photograph of the extracted roots with drilling trace (blue arrow). (F), a photograph of the implant insertion. (G), A photograph of the customized healing abutment. (H), a post-operative CBCT x-ray showing implant placed in the inter-radicular bone like the treatment plan in (B).

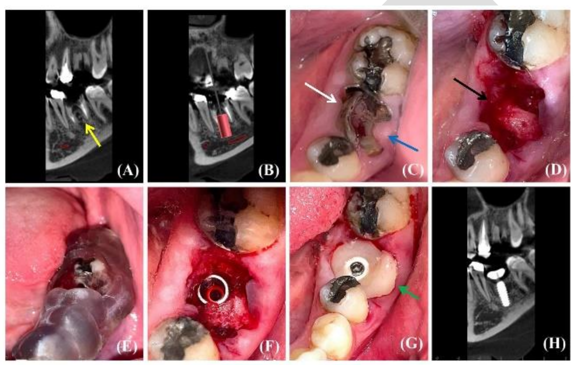

Figure (3): Computer-guided technique in immediately placed implant. (A), pre-operative CBCT x-ray showing severely damaged left mandibular first molar (yellow arrow). (B), CBCT X-ray showing virtual planned implant placed in the inter-radicular bone. (C), a pre-operative clinical photograph showing badly destructed left mandibular first molar (white arrow) with gingival epulis (blue arrow). (D), a photograph showing the socket after extraction with adequate inter-radicular bone (black arrow). (E), a photograph showing the surgical guide inside patient mouth. (F), a photograph showing the implant inserted in the inter-radicular bone. (G), a photograph showing the custom-made healing abutment (green arrow). (H), a post-operative CBCT x-ray showing the implant placement in the inter-radicular bone like the treatment plan in (B).

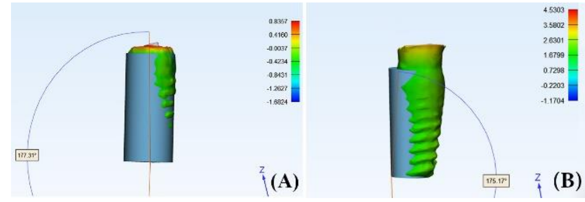

Figure (4): Superimposition of the actual implant (green shadow) on the virtual planned implant (blue shadow) to verify implant accuracy. (A), Photograph showing accuracy of Computer-guided implant by measuring the angular deviation between the actual and planned implant. (B), a photograph showing accuracy of Root-guided implant by measuring the angular deviation between the actual and planned implant.

RESULTS

In the current study, which involved 24 patients, 12 immediate implants were inserted using the Root-guided technique into fresh extracted lower molars sockets (group I). The other 12 immediate implants were inserted using Computer-guided technique (group II) into fresh extracted lower molars sockets. The participants who were chosen ranging in age from 21 to 43 years old with a mean age of 31.2 years, and included 16 females and 8 males.

A very high rate of survival was achieved in this study, where twenty-four of the twenty-four implants were effectively operating throughout the assessment period. Just 1 implant didn't provide enough primary stability, which made it impossible to apply a customized healing abutment.

Clinical evaluation

Implant stability

Osstell TM device was utilized intra-operative and after 3 months to measure implant stability. Focusing on repeated assessment per implant at zero and 3 months on more than one surface, RFA results were generated. The evaluation was accomplished along the bucco-lingual and mesio-distal planes, the midpoint values between the two measures were documented.

Primary stability

The measurements intra-operatively showed that all implants had adequate primary stability (except for one implant placed by Root-guided technique). The primary stability of the 12 implants placed using the root-guided technique ranged from (45-69) ISQ with an average of (57.12± 4.02) ISQ, according to the data, whereas the primary stability of the 12 implants placed using the computer-guided technique ranged from (63-71) ISQ, with an average of (67.33 ± 2.74) ISQ. There was a statistically significant difference between the mean of two groups. (Table 1)

Secondary stability

After 3 months all implants demonstrated an elevation in ISQ readings. The findings revealed that the secondary stability of twelve implants placed by root-guided technique ranged from (70-85) ISQ with an average of (74.75 ± 5.17) ISQ, while the secondary stability of the other twelve implants placed by computer-guided technique ranged from (75-85) ISQ with an average of (80.50 ± 3.18) ISQ. There was a statistically significant difference between the mean of two groups. (Table 1)

Assessment of coronal deviation

The twelve implants placed using a root-guided approach had a range of (0.74-3.06) mm with a median of (2.11 ± 0.74) mm while the twelve implants implanted using computer-guided technique had a range of (0.22-0.38) mm with a median of (0.30 ± 0.06) mm. There was a statistically significant difference between the mean of two groups. (Table 2)

Evaluation of the apical deviation

The twelve implants placed using the root-guided approach ranged in horizontal plane displacement at the apex from (0.31 to 2.28) mm, while the twelve implants placed using the computer-guided technique ranged in the apical displacement from (0.0 - 0.24) mm. There was a statistically significant difference between the mean of two groups. (Table 2)

Evaluation of angular deviation

In group I, the angle of deviation between the longitudinal axes of the exact implants and the digital implants ranged from (3.05-8.50) degrees, with a median of (5.59 ± 1.94) degrees, while in group II, the angle of deviation was between (2.5-3.5) degrees, with a median of (2.99 ± 0.41) There was a statistically significant difference between the mean of two groups. (Table 2)

Table (1): Comparison between the two studied groups according to implant stability ISQ

Implant stability	Group I Mean ± SD	Group II Mean ± SD	t	p
Primary stability	57.12± 4.02	67.33 ± 2.74	2.492*	0.021*
Secondary stability	74.75 ± 5.17	80.50 ± 3.18	3.282*	0.003*

SD: Standard deviation t: Student t-test

p: p value for comparing between the studied groups

*: Statistically significant at $p \leq 0.05$

Table (2): Comparison between the two studied groups according to implant accuracy

Implant accuracy	Group I Mean ± SD	Group II Mean ± SD	t	P
Coronal deviation	2.11 ± 0.74	0.30 ± 0.06	8.412*	<0.001*
Apical deviation	1.24 ± 0.75	0.13 ± 0.09	5.065*	<0.001*
Angular deviation	5.59 ± 1.94	2.99 ± 0.41	4.528*	<0.001*

SD: **Standard deviation t: Student t-test**

p: p value for comparing between the studied groups

*: Statistically significant at $p \leq 0.05$

DISCUSSION

A widely used technique, immediate dental implant insertion has rates of survival that are equivalent to the conventional implant strategy (9, 16). Despite the availability of academic papers describing this technique in the anterior regions, there is insufficient data about the immediate implant placement in the posterior zones, in which aesthetics have less impact but the operational challenge is more complex. Anatomical issues such as variations in implant diameters and alveolar bone size following tooth extraction, height of the roots, and root diverging make this surgical treatment more difficult (11, 23). This study evaluated the accuracy of position and stability of immediate implant placement in the mandibular molar areas using Root-guided and Computer-guided approaches.

In our study the primary stability was assessed intra-operative for both groups by ISQ values using (Osstell TM) device.

Regarding implant primary stability for group I, the average values of implant stability immediately post-operative was (57.12+-4.02) indicating accepted primary stability except for one implant that showed less primary stability because of presence of inadequate inter-radicular bone after implant's osteotomy preparation. In light of that the presence of adequate inter-radicular bone after implant's osteotomy site preparation is essential to give a good primary stability in case of immediate implant placement in molar region. After 3 months the secondary stability increased and assessed again with a mean value of (74.75+-5.17) and this is in coincide with Abdelazim et al. (17) who inserted 10 implants with root guided technique in the posterior mandible and found that the average of implant stability immediately after surgery was (55.87 ± 15.54) and the average implant stability three months later was (66.33 ± 17.03).

The bone found apical to the tooth might not be the only key element that influenced to stability of the implant as these findings of higher stability values using Root-guided technique were thought to be due to presence of adequate inter-radicular bone which preserved during extraction and drilling for the implant (24). This supports Rebele et al. (25), who claimed that immediate implant placement with tooth guidance boosted stability. Additionally, this is in agreement with Scarano et al. (9) who claimed that all immediate implants done using this method had superior stability than those inserted using the conventional method.

Concerning implant stability for group II, all implants showed high primary stability. We found that the mean implant stability immediately after the surgical procedure was (67.33±2.74). After 3 months the secondary stability increased and assessed again with a mean value of (80.50±3.18) and this agrees with Pozzi (26) who inserted 60 implants using computer guided technique and found that the average initial stability spontaneously after the surgery was (71±2.8). After the primary stability was assessed, a customized healing abutment inserted and the gap found between the implant and the socket walls did not filled by any types of bone grafts as the customized healing abutment act as a physical seal that prevent the growth of the soft tissues inside the empty socket creating space for new bone to fill this gap. This in agreement with Ragucci, G.M (27) who did a systemic review and meta-analysis for 20 studies of immediate implant placement in molar region. Sixteen studies used grafting materials and four did not perform any grafting. Implant survival was 92.2% with 95% CI (85.1-99.2) for studies that did not graft the gap, while studies that grafted the gap presented with 97.7% with 95% CI (94.3–100). There were no significant differences in survival according to presence or absence of grafting material (p = 0.168). Also this is in agreement with Tarnow and Chu in (2011) (28) who stated that osseointegration occurs with excessive horizontal gap distance of an implant placed into an immediate extraction socket without primary flap closure, a bone graft, or a barrier membrane

In our study, Atraumatic extraction, which preserves the highest percentage of bone contacting the implant was fundamental for effective immediate implant placement (29-30), and provided us with good primary stability. Atraumatic extraction allowed the preservation of the buccal and inter-radicular bone, prohibit the breakage of them, which may make an immediate implant placement inappropriate. This supports the claims made by Acocella et al. (31) and Douglass and Merin (32) that preserving bone tissue during an atraumatic bone extraction is crucial for stability of the implant.

Throughout our study, using a superimposition of the pre-operative and post-operative CBCT x-rays, the accuracy of inserted implants was measured by calculating the entire discrepancies between virtually planned and actually inserted implants.

Findings for (group I) have an average of horizontal plane displacement at the coronal part of the implants (2.11 ± 0.74) mm. While, at the apical part of the implants was (1.24 ± 0.75) mm. The average angle of discrepancy between the actual implants' longitudinal plane and the virtually planned implants was (5.59 ± 1.94) degrees and this is additionally in conjunction with, Abdelazim et al. (17) whom recorded that the implant accuracy in the coronal part of the implants had an average of (0.99+-0.51) mm. and in the apical part had an average of (1.28+-0.50) mm and angular deviation with an average of (3.78+-3.22).

Findings indicated that implants placed in (group II) have superior accuracy regarding coronal, apical positions and implant angulation and this is in agreement with Ku (33) who did a retrospective cohort study to assess implant accuracy using the computer guided technique and found that the computer guided technique demonstrated a great accuracy in implant's coronal, apical positions and angulation. Also, agrees with Ayman et al. (34) who assessed the precision of immediate implant placement for 22 patients using Computer-guided approach and found that computer guided technique showed a superior accuracy in implant's coronal, apical positions and angulation.

These findings demonstrated a significant variance in implant position among the both groups (coronal, apical and angulation). Group II showed more accurate position than Group I and this this agrees with Varga (35), who inserted 207 implants in 101 patients using all types of computer guided techniques and free hand technique and compared the results to investigate the implant accuracy in all techniques. He found that the implants inserted by fully guided technique showed more accuracy than implants inserted by free hand technique in the coronal, apical positions and implant angulation. Also, this in agreement with Chen (36) who inserted 24 immediate implants, 12 of them by surgical guide and the other 12 implants by free hand he noticed that the implants inserted by surgical guide showed superior accuracy than implants inserted by free hand in coronal, apical positions and implant angulation.

According to our findings, this explains the great variance in accuracy, primary stability, and secondary stability among the 2 groups since group II showed more accurate position, primary and secondary stability than group I because of the most accurate position given by the computer guide allowing the implantation of the implants in a favorable prosthetic planned location surrounded by bone from all directions and thus increase the primary and secondary stability. Even though the root guided technique still comparable with computer guided technique with a low cost and less time and gives reasonable results related to implant accuracy and stability.

There was some limitations for both techniques throughout this study. For group I, the limitations were increased hardness of the root tissue, which may result in longer clinical time and greater risk of increasing intra-bone temperature and altering the normal healing because of the remains of dental tissue from drilling. Regarding the later point, Davarpanah and Szmukler-Moncler (37) made a case report on 5 patients; according to results, dental waste did not seem to interfere with implant ossiointegration, but there was little scientific evidence on thios latter point, so caution is recommended, with an emphasis on meticulous irrigation and surgical cleaning. For group II, the limitations were increased cost (38) for the guide fabrication and in some cases accessibility for insertion of the guided kit drills through the computer guide was difficult due to over eruption of the opposing teeth (39). Also there was a risk of increasing intra-bone temperature when used computer guide due to less irrigation reach the osteotomy site through the guide tube (40).

From our study we found that the root-guided technique was a comparable technique in immediate implant placement in the posterior mandibular molar region. However, further researches should be conducted to investigate and compare immediate implant placement using the Root-guided technique and other techniques in implant accuracy, bone quality and implant success rate over longer follow up period. Also, to compare the Root-guided technique in both maxilla and mandible to assess the effect of two-rooted molar teeth and three-rooted molar teeth in implant accuracy and stability.

CONCLUSION

This study revealed that immediate implant placement in the mandibular molar region using root-guided technique shown adequate accuracy and stability and still comparable with the results of the literature. However, the computer guided technique is more superior in terms of accuracy and stability.

CONFLICT OF INTEREST

The authors affirm that they don't have any conflicting interests.

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