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# Completely Edentulous Patients Screw-Retained Maxillary Complete Denture With Electric Welded Metal Framework Versus Cast One, Patient Satisfaction Assessment

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## ABSTRACT

This study aimed to evaluate patient satisfaction of electrically welded and cast metal frameworks in the screw-retained implant-supported prosthesis. 12 completely edentulous patients received complete dentures; six implants were inserted in maxillary arch. Second-stage surgery was performed following the usual protocol. Shaping abutments were connected to the implants on one side of the arch, and titanium wire was bent and attached to the implants by intraoral electric welding. On the other side, the cast metal framework was performed. Then both cast and welded frameworks were picked up in the complete maxillary denture after their modification. Patient satisfaction was assessed within 2 weeks, 4 months, 6 months, and 12 months after prosthesis delivery. Throughout the intervals, there was a significant increase in patient satisfaction with the prosthesis, but there was no significant difference between the two groups. The intra-oral electric welding is considered a promising treatment option compared to the conventional cast framework regarding patient satisfaction when used under screw-retained implant-supported prosthesis.

**Keywords**: Complete denture, Electric welded framework, Screw retained prosthesis.

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## INTRODUCTION

Conventional complete dentures have long been the treatment option in the oral rehabilitation of edentulous patients. These patients experience various issues, such as insufficient retention and stability (which leads to bone loss), chewing difficulties, low self-esteem, and a decreased quality of life and satisfaction. [1]

Implant-supported screw-retained prosthesis with six implants in the maxillary arch had a high success rate, reducing the complications the patient encountered in removable complete dentures and increasing the patient's self-esteem. [2]

Implant splinting provides a firm connection for better stress distribution and more stability for the overlaying prosthesis; the incidence of implant failure in splinted implants for supporting complete dentures is lower than in non-splinted ones. [3,4]

The cast metal framework is the standard most used framework. Its construction method is familiar to the technicians. All clinical and laboratory procedures included in cast framework construction as multiple impressions affect the passivity of the final prosthesis. Lack of passivity leads to mechanical complications such as screw loosening, screw fracture, or framework fracture, and biological complications such as (mucositis or peri-implantitis). These complications increase the need for maintenance and repair. [4,5]

Many other techniques have been evolved for metal framework construction, such as electric welding, to overcome the issue of misfit and hence decrease the predicted prosthetic complications. Welding eliminates the costly and time-consuming process of impression-taking with its inherent inaccuracies. (de Luna Gomes et al., 2019) The weld strength produced is comparable to that of a dental technician laboratory laser. [7]

The welded framework had high-stress distribution properties compared to other types of frameworks. Welding is the most effective at obtaining relatively low values of the marginal misfit, resulting in better precision when adapted. [6]

So, the question here is whether Dose the electric welded metal framework has better effects on patient satisfaction than a cast one when used under a screw-retained complete denture.

## MATERIALS AND METHOD

The research has been approved by the Ethics Committee, Faculty of Dentistry, Cairo University with approval number 8-4-20, and registered on clinical trials. gov with identifier number NCT04539210. The study has been performed at the Department of Prosthodontics, Faculty of Dentistry, Cairo University.

**Study Design:**

Split mouth Randomized controlled trial. Each half-arch of each patient was randomly assigned to one of two treatment groups using 1:1 allocation ratio. Maxillary screw-retained

implant-supported prostheses were constructed over six implants. The right or left maxillary sides were randomly allocated using a computer-generated system. One side received an electrically welded framework (EWF), and the other received a cast metal framework (CMF). A study of a continuous response variable from matched pairs of study subjects is planned. Prior data indicate that the difference in the response of matched pairs is normally distributed with a standard deviation of 0.8; we needed to study 10 pairs of subjects to reject the null hypothesis that this response difference is zero with probability (power) 0.8. The type I error probability associated with this null hypothesis test is 0.05. Then we increased the number of anticipated missing data by 20% to compensate for dropouts, 12 per group, total=12 patient. Twelve patients who attended the prosthodontics department outpatient clinic, faculty of dentistry, Cairo University, Egypt, are enrolled in the study.

One investigator, not involved in patient management, has been responsible for generating the random allocation sequence, enrolling the patients into the groups, and assigning patients to the intervention. Participants must provide written, informed consent before any study procedures.

The Inclusion criteria were completely edentulous patients with age ranges from 45 to 65 years old, without any medical disorder that could complicate the surgical phase or affect Osseo integration as uncontrolled diabetics. The patient must have a minimum length of bone of 12mm, Good oral hygiene, Adequate inter arch space for a screw-retained hybrid prosthesis(i.e., more than 15mm), and a properly attached gingiva thickness over or equal to 2mm. On the other side, patients with recent extraction, intra-oral pathological condition, peace maker, and Para functional habits such as clenching, an inflamed ridge, or candida infection were excluded.

Each eligible patient received both treatments and was randomly allocated using a computer-generated system to the right and left side of the arch (each patient served as their control, the intervention side (EWF) and the control side (CMF): First of all, a proper intraoral and extra oral examination was done before the prosthetics procedure

**a. Prosthetic diagnosis:**

Primary impressions (Cavex Alginate, Netherlands), facebow (Standard face bow, Bio Art, Brazil) record, and the diagnostic bite has been performed to obtain mounted casts on a semi-adjustable articulator (Bio Art A7 plus articulator, Brazil), and diagnostic setup of teeth. The upper trial denture base has been removed from the diagnostic mounted cast, and the distance from the maxillary ridge to the occlusal plane of the lower teeth has been measured. This distance was added to the mucosa thickness gained from bone sounding to give us the restorative space. The distance had to be 15mm or more to be indicated for hybrid prosthesis

construction. The occlusal putty index has been performed on the buccal surface of the maxillary denture to act as a prosthetic guide in metal bar construction.

**b. Radiographic diagnosis and virtual implant planning:**

After diagnostic setup and intraoral try-in, a hard vacuum-formed transparent acrylic resin (ABS resin sheets, China) 1mm in thickness was used to construct a radiographic stent for CBCT imaging.

The proposed implant positions are marked using gutta-percha in the middle of the cingulum of anterior teeth, and the central fossa of posterior teeth and the radiographic stent has been tried intraoral. The patient is instructed to wear the radiographic stent and bite on cotton rolls on both sides during CBCT scanning.

The width and height of bone are evaluated and implants planning using BlueSky Plan Bio software(Blue Sky Bio, LLC, IL, USA) at the marked positions of implants on bone.(Figure 1) The implants width and length were chosen in a manner that both sides had the same parameters as far as possible for standardization of the results.

The complete dentures were constructed for all patients following conventional procedures.

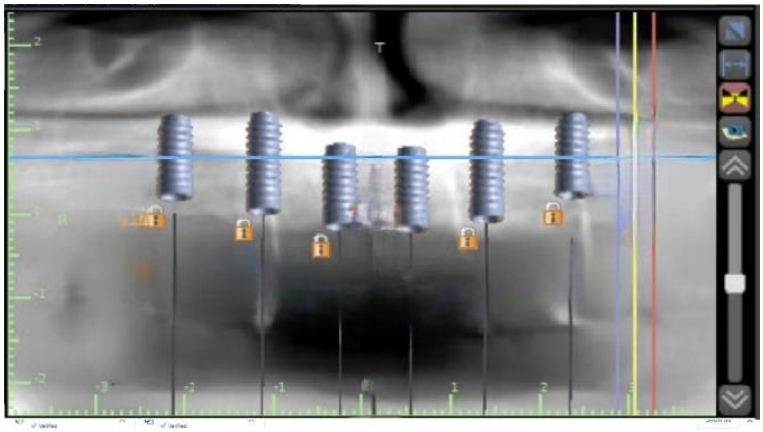

**Figure 1: Frontal view showing implants planning using bluesky plan bio software**

**c. Surgical procedures:**

For the surgical guide fabrication, the hard vacuum radiographic stent was transformed into a surgical one after removing gutta-percha, and the prospective implant sites were opened. This has been used as a cast-based surgical guide.

Crestal incision under local anesthesia(Artinibsa, Ctra. Sabadell a Granollers, KM 14,5 (C-155), 08185 LIica de Vall (Barcelona), Spain) made from the first maxillary molar area on one side extending to the contralateral side with two vertical releasing incisions buccally and full thickness mucoperiosteal flap has been elevated exposing the underlying bone

The surgical guide has been inserted in the patient mouth, supported by the operator's hands, and the pointed drill of the used implants (Biomate medical devices technology co, Ltd, Taiwan (ROC)) surgical kit is inserted through it, indicating only the implant position.

The sequence of drilling was then completed using the manufacture's instruction and surgical kit (Biomate medical devices technology co, Ltd, Taiwan (ROC)) with caution that every side implants were parallel to each other using the guiding parallel pins.

Implants with the same diameter and length (4.1 diameters and 10mm length) have been inserted in their prospective positions (central incisor, canine, and second premolar in both sides) (Figure 2) and primary stability was checked using insertion torque then suturing of the patient incision using continuous suturing (Vicryl Undyed Braided& Coated Absorbable Suture, Ethicon) with lock technique.

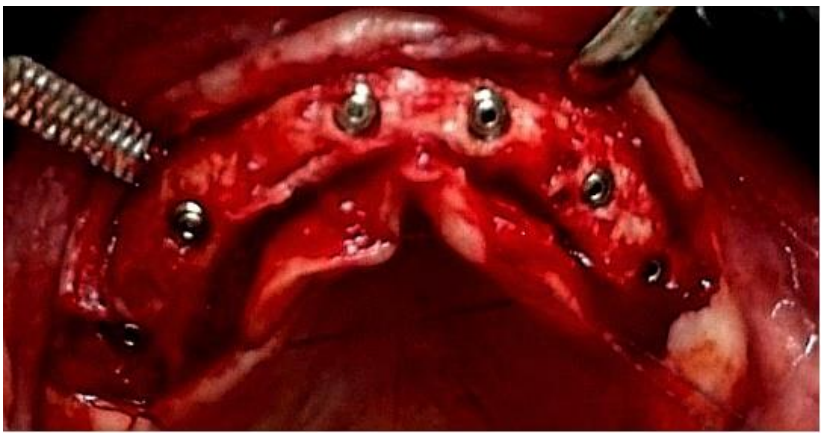

**Figure 2: Occlusal view of the inserted implants**

**d. Post-surgical phase:**

The patient denture has been relieved to avoid pressure to the surgical site. All patients have been instructed about oral hygiene measures, a soft diet for 4 weeks after surgery, cold fomentation for the first twenty-four hours, and warm fomentation.

Antimicrobial prophylaxes (amoxicillin 500mg twice daily for five days starting 1 hour before surgery). Postsurgical analgesic treatment with ibuprofen 600mg taken twice daily. After four months of osseointegration panoramic radiograph was performed to the patient to ensure proper osteointegration of implants.

After that, a second stage surgery was performed using the surgical guide to detect the position of the inserted implants to be exposed, and a healing collar was screwed to the implants. After the complete healing of soft tissue around the implants (Figure 3), prosthetic procedures have been initiated.

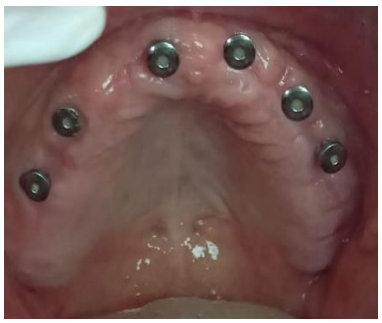

**Figure 3: Occlusal view of soft tissue healing around the healing collars.**

**d. Prosthetic procedures:**

**Electric welded side (EWF):**

The shaping abutment (Shaping screw-retained dental abutment, Biomate, Taiwan) has been screwed to the implant, and a periapical radiograph was performed to ensure proper seating of the abutments**; t**he welding point was a preexisting or prepared flat surface area of the implant's shaping abutment at the central incisor position on one side (right or left). The curve of the abutments has been followed by the contour of a titanium bar (JD weld titanium wire, Moderna, Italy, 1.5mm in diameter).

At the welding site, shaping abutments were welded with the ready-made curved titanium bar in the oral cavity with the help of the Syncrystallization Unit (JD weld Syncrystallization unit, Moderna, Italy). Welding is an electrical process shielded by an argon gas source (Syncrystallization) with three stages: preparation, welding, and cooling.

The two electrodes of the welding pincers were put on either side of the bar and the abutment (Figure 4), all of which must be clean and free of any surface oxidation. The pieces to be welded are delicately brought into contact with the copper electrodes at the tip of the pincers, and then hard pressure is applied. Firm and consistent pressure must be applied to guarantee a flawless bond between the components to be welded. Throughout the operation, full contact must be between the titanium bar and the welding abutment. The quality of the welded junction is unaffected by saliva or water.

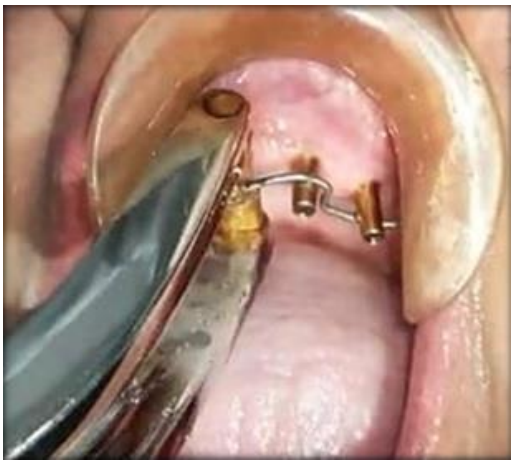

**Figure 4: Intra oral welding process.**

The parameters used in electric welding were 25V, 50 HZ, 312J. To the copper electrodes of the welding, pliers is passed an electrical current from a previously unloaded capacitor**.** The electrodes' electrical current immediately elevates the temperature of the two titanium components above their fusing point. The procedure raises the temperature of the titanium pieces' core to almost 1660°C in just 2 to 5 ms. During this stage, a barely audible clicking sound can be heard. There is no filler metal used during welding. The titanium crystallizes at this point; thus, the bar and abutment must be kept under tight pressure.

The procedure is carried out painlessly and without causing any harm to the surrounding tissue since no heat is passed to the peri-implant area due to the difference thermal conductivity of the copper electrodes and titanium components. The copper electrodes dissipate all of the heat produced. Finally, the prosthetic framework, constructed by welding the titanium bar to the implant abutments, will be removed and finished extra orally in the lab before the healing collars are fitted.

**Cast metal framework side (CMF):**

Transfer copings (Open tray transfer coping, Biomate, Taiwan) were fastened to the implants in the cast metal framework side. A periapical radiograph was performed to ensure complete transfer seating**.** Single-step open tray un-splinted impression has been performed using additional silicone (A-silicone Zhermack Hydroise Putty and Light body impression material, Spa,Badia polesine, Rovigo, Italy) impression material and the analogs mounted to the transfers.

The primary cast was obtained by pouring the impression with extra hard stone (Elite dental stone, Zhemack, Italy). After application of the tissue mimic material(Xilgum, Lascod, Italy) to the impression, the transfers were splinted together with auto-polymerizing acrylic resin (Duralay, Inlay pattern resin, USA) that was sectioned to be reassembled inside the patient mouth to ensure the passive fit of the transfers into the implants (Figure 5). A special acrylic tray with an opening corresponding to the transfer's positions was constructed then, a secondary impression was performed to obtain a master cast that was used in framework construction. [5]

**Figure 5: Side view showing splined transfers.**

**Metal framework construction and intra-oral try in:**

UCLA abutments (UCLA screw-retained dental abutment, Biomate, Taiwan) were fastened to the implant's analogs; the framework wax pattern was performed with the use of the previously made putty index to adjust the dimensions**,** the wax pattern was cast into cobalt chromium and tried on the cast. Then, an Intra-oral try-in was performed, and passivity was checked with one screw test.

In case of framework misfit, separation will be performed using a disc, followed by intraoral splinting using auto-polymerizing acrylic resin and soldering. After framework soldering, another try-in will ensure the framework's passive fit.

**Pick up and prosthesis screwing:**

The two frameworks with the attached abutments screwed (Figure 6) and radiographic images were taken to ensure complete seating. Passive fit ensured using one screw test. The maxillary denture was modified to contain the frameworks and completely seated intraoral. Occlusion was checked, and any needed adjustments were performed. Then the final pick-up of the frameworks into the denture was performed. At the same time, the screw channel openings were closed by Teflon, and the patient was guided to bite in centric until the complete set of the pick-up material (Luxa Pick-up material, DMG, Chemisch-Pharmazeutische, Hamburg, Germany).

The prosthesis was then unscrewed, the palatal vault and teeth distal to upper second premolars removed; any needed white acrylic was added, finished, and polished. The prosthesis was sectioned at the midline into two parts using a disk, then the prosthesis was re-inserted (Figure 7), and pressure areas were marked with pressure indicating paste and removed

The screw channel opening closed with Teflon and auto-polymerizing acrylic resin. Occlusions were checked, and occlusal adjustments were performed to obtain balanced occlusion.

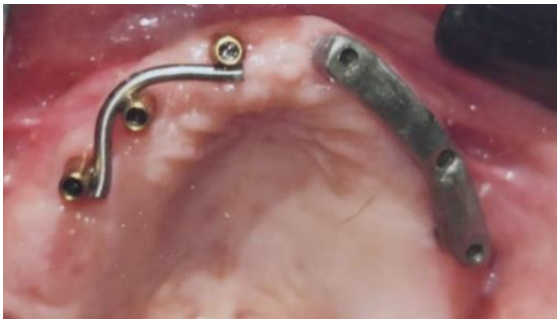

**Figure 6: Occlusal view of cast and electric welded frameworks.**

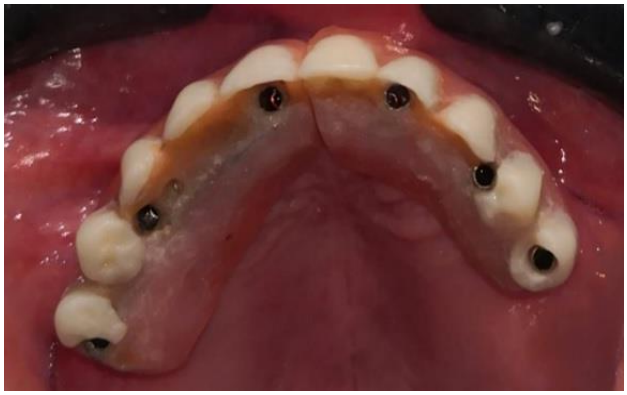

**Figure 7: Occlusal view of the final prosthesis.**

**e. Outcomes assessment:**

Patient satisfaction was evaluated using a questionnaire during the follow-up period two weeks, four, six, and twelve months after the final prosthesis delivery.

A comprehensive questionnaire (Table 1) taken from Boerrigter's technique has been used to assess patient satisfaction after its translation into Arabic. The educated patients answered the questions in printed copies by themselves. The uneducated patients were asked verbally by the outcome assessor. The questionnaire used has been evaluated in three domains. [8]

Each question has a score assigned to it, and the sum of the points can be generated for further analysis and review.

Visual Analogue Scale (VAS), is another evaluation technique used in one question. The greatest and worst are represented by the two endpoints (anchors) of a line about 10 cm long. Patients express their feelings by drawing a point between two anchors. Measuring and quantifying the distances from the site to the anchors is possible. Scores can be used to quantify the level of patient satisfaction.

Statistical analysis was performed with SPSS 20 (Statistical Package for Social Science, IBM, USA), Graph Pad Prism (Graph Pad Technologies, USA), and Microsoft Excel 2016 (Microsoft Co-operation). All Qualitative data were presented as frequency & percentages; all comparisons were performed using the Chi-square test. Comparison between different intervals was performed by using the Repetitive One-Way ANOVA test, followed by Tukey's Post Hoc test for multiple comparisons. Comparison between both groups was performed by using an independent t-test.

**Table 1: The patient questionnaire**

| | |
|---|---|
| **Masticating ability for different types of food**<br>1. Can you eat hard food with your prosthesis?<br>2. Can you eat soft food with your prosthesis?<br>3. Can you eat tough food with your prosthesis?<br>1. Score: 1–3 (1 = well; 2 = moderately; 3 = badly)<br>**Overall denture satisfaction**<br>1. How satisfied are you with your maxillary prosthesis?<br>2. How satisfied are you with your mandibular denture?<br>3. How satisfied are you in general with your prosthesis? | 4. How satisfied are you with the functional comfort of your prosthesis?<br>5. How satisfied are you about eating with your prosthesis?<br>6. How satisfied are you about speaking with your prosthesis?<br>7. VAS (Visual Analogue Scale) Were your expectations for your new prosthesis satisfied?<br>8. Would you repeat the same treatment? Y/N (yes/no) |

## RESULTS AND DISSCUSION:

12 patients has been included 7males and 5 females with mean age 65.

**Comparison between group EWF& CMF:**

**Masticating ability for different types of food.**

In masticatory ability of different food types, comparison between both groups revealed absolute insignificant difference as P =1.000 in all intervals of all questions as presented in Table 2 and **Error! Reference source not found.**

**Table 2: Percentage and frequency of masticatoy ability of different types of food in both groups and comparison between them**

| | | | | Well (1) | | Moderate (2) | | Bad( 3) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | N | % | N | % | N | % |
| 1. Can you eat hard food with your denture? | Baseline | | EWF | 10 | 83.3 | 2 | 16.6 | 0 | 0 |
| | | | CMF | **10** | **83.3** | **2** | **16.6** | **0** | **0** |
| | | | P value | **1** | | ---- | | ---- | |
| | After months | 4 | EWF | 11 | 91.6 | 1 | 8.4 | 0 | 0 |
| | | | CMF | 11 | 91.6 | 1 | 8.4 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| | After months | 6 | EWF | 11 | 91.6 | 1 | 8.4 | 0 | 0 |
| | | | CMF | 11 | 91.6 | 1 | 8.4 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| | After months | 12 | EWF | 11 | 91.6 | 1 | 8.4 | 0 | 0 |
| | | | CMF | 11 | 91.6 | 1 | 8.4 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| 2. Can you eat soft food with your denture? | Baseline | | EWF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | CMF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| | After months | 4 | EWF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | CMF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| | After months | 6 | EWF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | CMF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| | After months | 12 | EWF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | CMF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| 3. Can you eat tough food with your denture? | Baseline | | EWF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | CMF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| | After months | 4 | EWF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | CMF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| | After months | 6 | EWF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | CMF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |
| | After months | 12 | EWF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | CMF | 12 | 100 | 0 | 0 | 0 | 0 |
| | | | P value | 1 | | ---- | | ---- | |

**N: count %: percentage P: probability level which is significant at P ≤ 0.05 Q: Question**

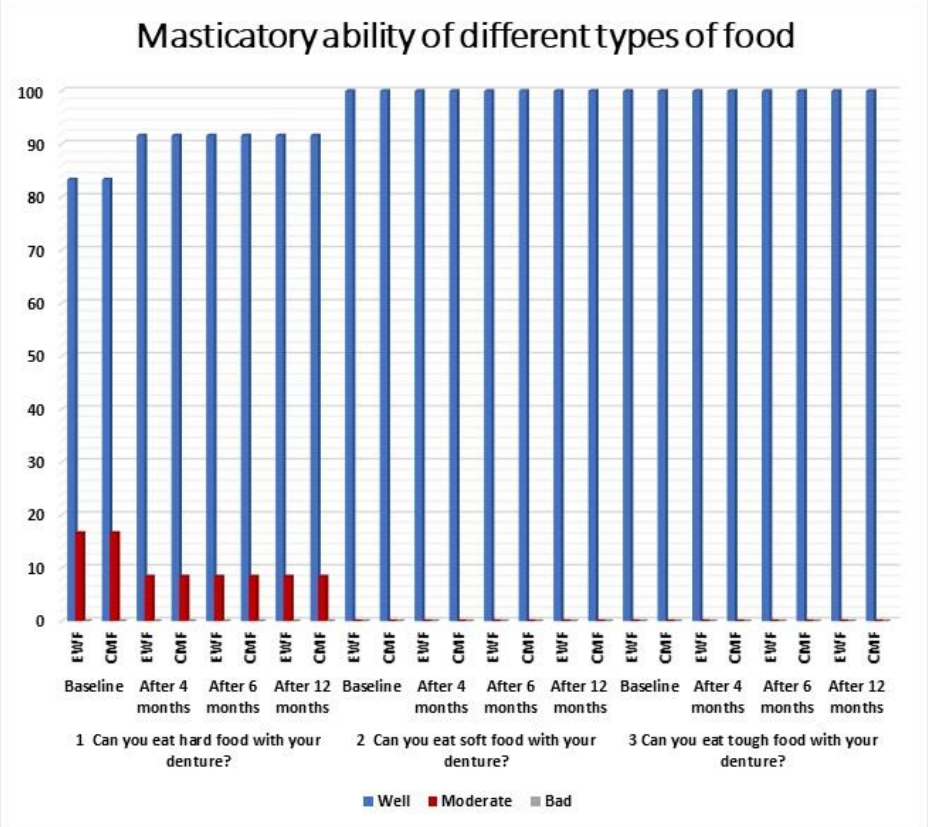


**Figure 8: Bar chart showing percentage of masticatory ability of different types of food in both groups and comparison between them.**

**Overall prosthesis satisfaction:**

In overall prosthesis satisfaction, comparison between both groups revealed absolute insignificant difference as P =1.000 in all intervals of all questions, as presented in Table 3 and **Error! Reference source not found.**

**Table 3: Mean and standard deviation of overall prosthesis satisfaction in both groups and comparison between them**

| | Follow up | EWF | | CMF | | P value |
|---|---|---|---|---|---|---|
| | | M | SD | M | SD | |
| 1 How satisfied are you with your maxillary prosthesis? | Baseline | 9.1 | 1.10 | 9.1 | 1.10 | 1.00 |
| | After 3 months | 9.5 | 0.97 | 9.5 | 0.97 | 1.00 |
| | After 6 months | 9.2 | 1.23 | 9.5 | 0.97 | 1.00 |
| | After 12 months | 9.5 | 0.97 | 9.3 | 1.06 | 1.00 |
| 2 How satisfied are you with your mandibular denture? | Baseline | 5.2 | 1.87 | 5.2 | 1.87 | 1.00 |
| | After 3 months | 4.9 | 1.73 | 4.9 | 1.73 | 1.00 |
| | After 6 months | 4.6 | 1.43 | 4.6 | 1.43 | 1.00 |
| | After 12 months | 4.3 | 1.25 | 4.3 | 1.25 | 1.00 |
| 3 How satisfied are you in general with your upper and lower prosthesis? | Baseline | 7.15 | 1.49 | 7.15 | 1.49 | 1.00 |
| | After 3 months | 7.2 | 1.35 | 7.2 | 1.35 | 1.00 |
| | After 6 months | 6.9 | 1.33 | 7.05 | 1.20 | 1.00 |
| | After 12 months | 6.9 | 1.11 | 6.8 | 1.16 | 1.00 |
| 4 How satisfied are you with the functional comfort of your | Baseline | 9.1 | 1.10 | 9.1 | 1.10 | 1.00 |
| | After 3 months | 9.5 | 0.97 | 9.5 | 0.97 | 1.00 |
| | After 6 months | 9.2 | 1.23 | 9.5 | 0.97 | 1.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| prosthesis? | After 12 months | 9.5 | 0.97 | 9.3 | 1.06 | 1.00 |
| 5 How satisfied are you about eating with your prosthesis? | Baseline | 9.1 | 1.10 | 9.1 | 1.10 | 1.00 |
| | After 3 months | 9.5 | 0.97 | 9.5 | 0.97 | 1.00 |
| | After 6 months | 9.2 | 1.23 | 9.5 | 0.97 | 1.00 |
| | After 12 months | 9.5 | 0.97 | 9.3 | 1.06 | 1.00 |
| 6 How satisfied are you about speaking with your prosthesis? | Baseline | 9.9 | 0.32 | 9.9 | 0.32 | 1.00 |
| | After 3 months | 9.9 | 0.32 | 9.9 | 0.32 | 1.00 |
| | After 6 months | 9.9 | 0.32 | 9.9 | 0.32 | 1.00 |
| | After 12 months | 9.9 | 0.32 | 9.9 | 0.32 | 1.00 |

*P: probability level which is significant at P ≤ 0.05* *Q: Question*

M: mean SD: standard deviation

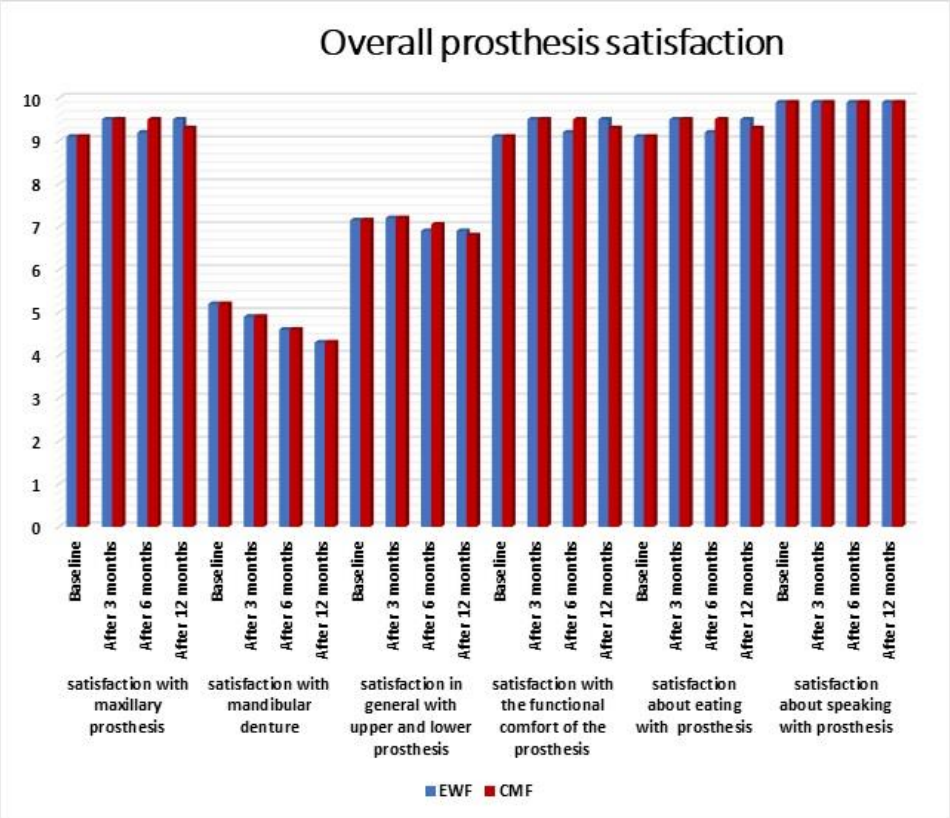


**Figure 9: bar chart showing mean of overall denture satisfaction in both groups and comparison between them.**

**Overall prosthesis satisfaction questions 7 & 8:**

In Q7 and Q8 of overall prosthesis satisfaction, comparison between both groups revealed absolute insignificant difference as P =1.000 in all intervals of all questions as present Table 4 and Figure 10.

**Table 4: Frequency and percentages of yes & no answers of Q7 & Q8 of overall prosthesis satisfaction in both groups at different intervals**

| | | | Yes | | No | |
|---|---|---|---|---|---|---|
| | | | **N** | **%** | **N** | **%** |
| Q8 Were your expectations for your new prosthesis satisfied? | Baseline | EWF | 9 | 90 | 1 | 10 |
| | | **CMF** | **9** | **90** | **1** | **10** |
| | | P value | 1.000 | | 1.000 | |
| | **After 4** | **EWF** | **9** | **90** | **1** | **10** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **months** | CMF | 9 | 90 | 1 | 10 |
| | | **P value** | 1.000 | | 1.000 | |
| | After 6 | EWF | 9 | 90 | 1 | 10 |
| | months | **CMF** | **9** | **90** | **1** | **10** |
| | | P value | 1.000 | | 1.000 | |
| | **After 12** | **EWF** | **9** | **90** | **1** | **10** |
| | **months** | CMF | 9 | 90 | 1 | 10 |
| | | **P value** | 1.000 | | 1.000 | |
| Q9. Would you repeat the same treatment? | Baseline | EWF | 9 | 90 | 1 | 10 |
| | | **CMF** | **9** | **90** | **1** | **10** |
| | | P value | 1.000 | | 1.000 | |
| | **After 4** | **EWF** | **9** | **90** | **1** | **10** |
| | **months** | CMF | 9 | 90 | 1 | 10 |
| | | **P value** | 1.000 | | 1.000 | |
| | After 6 | EWF | 9 | 90 | 1 | 10 |
| | months | **CMF** | **9** | **90** | **1** | **10** |
| | | P value | 1.000 | | 1.000 | |
| | **After 12** | **EWF** | **9** | **90** | **1** | **10** |
| | **months** | CMF | 9 | 90 | 1 | 10 |
| | | **P value** | 1.000 | | 1.000 | |

*N: count %: percentage P: probability level which is significant at P ≤ 0.05 Q: Question*

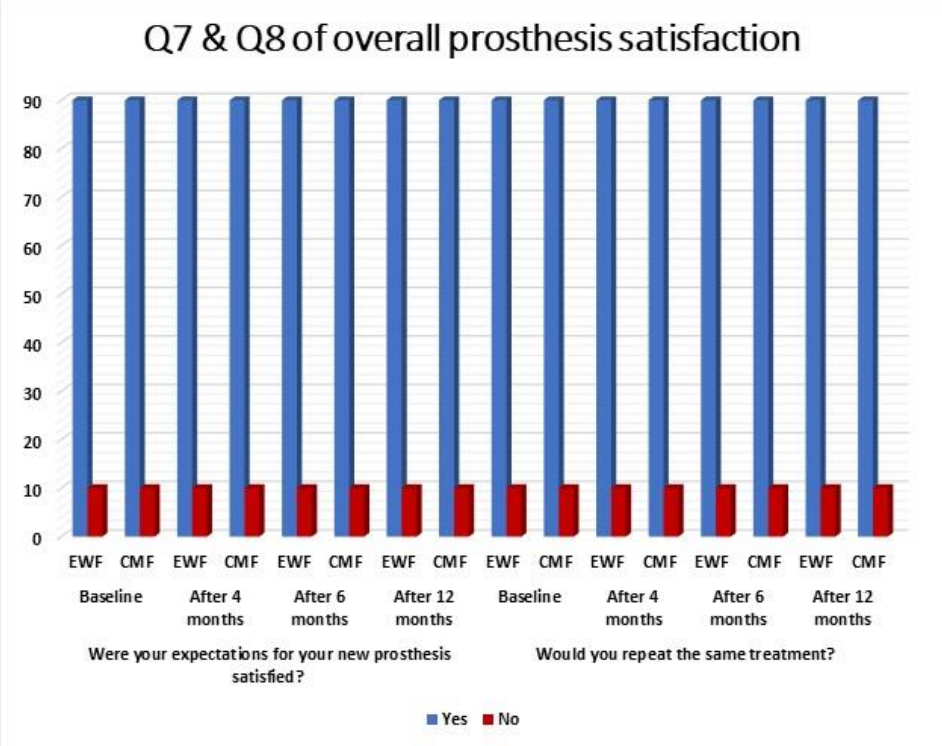


**Figure 10: bar chart showing percentages of yes & no answers of Q8 & Q9 of overall denture satisfaction in both groups and comparison between them.**

## DISCUSSION

The main issue of screw-retained frameworks has always been achieving passivity. Passive fit means the adaptation should be accomplished with no tension on the retaining screws. A

perfect passive fit is currently not possible especially for screw retained prosthesis, and a misfit of 30 to 150 µm has been deemed clinically acceptable. [9]

It has been demonstrated that there is a possibility of intraoral welding of metal prosthodontic components without risk, soft tissue damage, or discomfort to the patient. Welding eliminates the costly and time consuming process of impression taking with its inherent inaccuracies patient disturbing procedures. [10]

A lack of passivity of the definitive prosthesis can cause internal stresses in the framework of the prosthesis, the implants, and the bone surrounding the implant resulting mechanical complications as screw loosening, screw fracture, or framework fracture, as well as monolithic prosthesis fracture or biological complications as (mucositis or periimplantitis). [11]

Prosthetic complications can be divided into early prosthetic complications that occur during the first year of prosthetic loading, and delayed complications that occur after one year of prosthetic loading. A retrospective study about the effect of prosthetic complications of implant prosthesis on patient satisfaction revealed that patients with complications with implant-supported overdentures and screw-retained hybrid prosthesis reported the lowest levels of satisfaction, which were associated with worry or concern over potential issues with the implant prosthesis. [12,13]

Regarding masticatory ability and patient satisfaction reporting about the prosthesis, there was significant increase in patient satisfaction with the both treatments (EWF, CMF) at the base line (p value <0.0001) but there was no significant difference throughout the follow up or between both treatments (p value=1). All patients explained that just changing the prosthesis type from removable to a fixed one helped them in food chewing.

The insignificant difference in masticatory ability between the two groups indicates EWF can replace CMF in hybrid prosthesis without decreasing the masticatory ability.

It has been reported that implant fixed prostheses were significantly more satisfying than removable prostheses in terms of chewing ability, mastication, and eating comfort. [14,15] Just two patients representing 16.6% of patients complained difficulty in chewing especially hard food with no problems with soft food at the baseline. This was explained by the absence of the molars in one patient and occlusal discrepancy in the other patient. After equilibrium of occlusion in the second patient the masticatory ability has been improved.

The acceptance of speech, aesthetics, and sensation could be explained by the change from removable prosthesis with palatal coverage to fixed prosthesis without the palatal part. Also, the proper planning of teeth position and their relations by diagnostic data from examination and diagnostic mounting helped in proper alignment of teeth. The putty index taken during diagnostic set up to act as guide in construction of the framework also helped to adjust the prosthesis thickness without any increase. [16,17]

The traditional maxillary full denture covers the entire palate and prevents the tongue from making direct contact with the palate. Consequently, negatively impact speech understanding. Phonetics may be impacted by hybrid prosthesis designs and contours. [18] Prosthetic gingival tissues are frequently required because of the resorptive patterns of edentulous maxillae complicating the functional demands for maxillary hybrid implant prostheses.

According to the literature there was no significant difference between intra oral welded and cast framework regarding patient satisfaction. [19]

Although there was no significant difference in patient satisfaction between the welded side and cast side, in this study the operator found that the welding process is much simpler. Than casting long steps. Welding process is also less time-consuming than the casting process.

The welding process takes only few seconds while the cast frame work requires multiple impressions increasing chair time and multiple steps in the lab increasing the time needed for the final prosthesis insertion. The patients didn't recognize the difference between both treatments as the patient received one prosthesis by the end and when they were asked which side took a longer time in construction, they answered that we received the prosthesis at one time. Also in some questions like speech questions they couldn't differentiate well between sides. So, further randomized controlled studies are needed to overcome the limitations of this split mouth trial.

Another limitation of this study is the questionnaire didn't include the patient satisfaction about the cost of the final prosthesis. This concept couldn't be discussed with the patient as the study was totally funded by the operator. From the operator point of view, the welding decreased the framework construction cost by decreasing chair time and elimination of the need for multiple costly impressions and lab costs. The whole framework construction was made chair side.

## CONCLUSION

Within the limitation of this study, it has been concluded that. The intra-oral electric welding is considered a promising treatment option compared to the conventional cast framework regarding patient satisfaction when used under the screw-retained implant-supported prosthesis.

## CONFLICT OF INTEREST AND SOURCE OF FUNDING

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