

What's new for the clinician?

Summaries of and excerpts from recently published papers

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Compiled and edited by V Yengopal

1. Immediately loaded implant-supported mandibular fixed prostheses- a RCT

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The continued popularity of dental implants for prosthetic rehabilitation and the need for time and cost savings has led to a revision of numerous aspects of the original treatment protocols including the timing of implant loading.¹ Immediate implant loading is defined as implant placement with primary stability and prosthetic loading with a provisional prosthetic tooth at the same clinical visit.¹ There are several factors that need to be considered in this technique –these include primary implant stability, implant geometry and surface topography integration, surgical technique, bone quality and quantity, prosthesis design, and occlusal forces.¹ Alfadda (2014)¹ reported on a randomized controlled trial (RCT) that sought to determine whether four dental implants in the mandible can be loaded immediately, thereby providing successful implant-supported fixed prostheses and further, to evaluate implant success, clinical function, and prognosis of implant-supported fixed prostheses.

The null hypothesis was that there is no increase in the failure rates of prostheses and immediately loaded implants in comparison with implants placed with a delayed loading protocol.

Materials and Methods: This parallel group RCT comprised of 42 subjects (24 females and 18 males) who were randomly assigned to an experimental arm (EA), where patients underwent the immediate loading protocol, and a control arm (CA), where patients were treated using the standard delayed loading protocol.

A sealed numbered randomization envelope assigned to each patient was opened only when the implant-placement surgery had been completed in order to eliminate any possible operator bias during surgery.

Prior to implant surgery, each patient and each proposed prosthetic site was assessed by a prosthodontist. For

ACRONYMS

CA: control arm randomized
EA: experimental arm
RCT: controlled clinical trial

inclusion, patients had to be edentulous adults. The teeth at the implant site had to have been extracted or lost at least 3 months prior to the date of implant placement and the bone quality and quantity was sufficient to allow placement of four TiUnite dental implants (NobelBiocare®), of at least 3.75 mm in diameter and 10 mm in length between the two mental foramina without the use of concurrent bone augmentation techniques. Patients were excluded on their basis of their health or poor oral hygiene status. Heavy smokers (>20/day) were also excluded.

The surgical protocol followed was standardized in both groups. A crestal incision in the mandible was made, extending about 1 cm beyond the mental foramina. Then, the mucoperiosteum was elevated and the implant site was prepared. Four TiUnite dental implants (NobelBiocare®) were placed between the mental foramina. Immediately following surgery, the initial stability of the implants was assessed by hand testing using a torque wrench (torque value ≥ 35 Ncm). Right after surgery, allocation to either arm of the study was determined using the randomization envelope.

In the EA with immediate loading, the existing mandibular denture was converted into an interim implant-supported fixed prosthesis. This was inserted the same day as implant-placement surgery. The occlusion was evaluated and refined when necessary. The fabrication of the permanent implant-supported prosthesis was initiated 2 weeks after surgery.

In the CA, healing abutments (NobelBiocare®) were placed on the four implants and the soft tissues were then sutured. The mandibular denture was hollowed out and relined with a soft tissue reline material and adjusted so that it was not resting on the healing abutments in order to prevent loading of the implants. The permanent implant-supported fixed prosthesis fabrication process was initiated 3 to 4 months post-surgery.

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Patients were assessed regularly and in a blinded fashion by a calibrated, independent investigator at 2, 6, and 12 months following completion of treatment.

During follow-up visits, prosthesis and implant success was evaluated by torquing the implants with a standardized torque wrench set at 20Ncm. If an implant was shown to be mobile or painful while torquing, it was considered a failure and removed.

Standardized long-cone intraoral periapical radiographs were used to assess peri-implants bone levels. These radiographs were taken at the insertion of the permanent mandibular implant-supported fixed prosthesis stage (baseline) and during the 12-month recall visit.

The measurement of bone level was performed by a blinded calibrated investigator. The mean of two measurements for each site was utilized for statistical analysis of changes in crestal bone level.

RESULTS

Of the 42 patients, one was excluded from the study and 4 patients from the EA were transferred to the CA of the study. The mean ($\pm$ SD) age of the patients was 61.5 ± 10.35 years. Twenty-four (57.5%) of the participants were female and 18 (42.5%) were male. Demographic data of the patients in both study arms did not differ significantly. Overall, one hundred sixty implants were placed between the mental foramina; one hundred thirty-five were 3.75-mm-wide implants, one was 3.3 mm wide, and the remaining 24 implants were 4 mm in diameter. Implant length ranged between 10 and 15 mm,

with the majority being 15 mm (75.6%). No statistically significant difference was found between the two arms in terms of implant diameter distribution ($p = .103$). The implant success rate was comparable between the two arms and exceeded 96%.

Bone loss analysis for the two arms of the study showed that there was statistically significantly more bone loss during the first year of loading in the immediate loading arm (mean -0.296) as compared with the conventional loading one (mean -0.037).

CONCLUSIONS

The prosthesis survival rate 1 year post-loading in the immediate and the control loading arms was the same (100%). No statistically significant difference in implant success rate (96%) was observed between the two study arms.

IMPLICATIONS FOR PRACTICE

The high clinical success rate in this randomized controlled clinical trial contributes to a growing body of evidence that supports the use of immediate loading protocols for dental implants using mandibular implant-supported fixed prostheses. This treatment modality should reduce treatment time, cost, and surgical morbidity significantly.

Reference

1. Alfadda SA. A Randomized Controlled Clinical Trial of Edentulous Patients Treated with Immediately Loaded Implant-Supported Mandibular Fixed Prostheses. *Clin Implant Dent & Related Research* 2014; 16: 806-816.

2. Can a shortened dental arch result in TMJ pain?

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Recent clinical studies have found that oral and systemic health and indeed quality of life or patient's satisfaction do not specifically depend on the presence of a full complement of Teeth.¹ It has been observed that a large proportion of middle-aged and elderly patients are satisfied with their oral function even after molar loss and that the retention of solely the anterior and premolar teeth may be sufficient to satisfy the aesthetic and functional requirements of the majority of elderly patients. Several studies have been performed to investigate whether missing posterior teeth, a situation named shortened dental arch (SDA) can cause or is related to Temporomandibular disorders (TMD), which comprises a heterogeneous group of conditions affecting the temporomandibular joint (TMJ), the masticatory muscles, and/or surrounding tissues.² There have been contradictory findings on the relationship between SDA and TMD and the quality of published studies is poor.

Treatments of SDA comprise the replacement of missing teeth by removable dental prostheses (RDP), cantilever or implant-supported fixed dental prostheses (FDP), or the preservation/restoration of the premolar occlusion. The randomized shortened dental arch study (RaSDA) as reported by Reissmann and colleagues (2014)² aimed to provide information on a variety of outcomes for two treatment

ACRONYMS

FDP:	cantilever or implant-supported fixed dental prostheses
RaSDA:	randomized shortened dental arch study
RDP:	removable dental prostheses
SDA:	shortened dental arch

options in patients with missing posterior teeth, retaining or preservation of an SDA and replacement of missing posterior teeth by RDPs, with tooth loss as the primary outcome. The aim of this analysis was to assess the impact of missing posterior support on the risk for TMD pain.

MATERIALS AND METHODS

This was a multi-centre, RCT using consecutively recruited patients in 14 prosthodontic departments of dental schools in Germany. For inclusion in the study, patients had to request prosthodontic treatment and have all molars missing in one jaw, with at least both canines and one premolar present on each side of the jaw. Patients with acute signs or symptoms of TMD or a Grade 2 or higher of the Anamnestic Helkimo Index were excluded. A total of 152 patients received allocated interventions and were analyzed. Data were collected before treatment and at follow-ups after treatment

(4–8 weeks, 6 months, 12 months, 24 months, 36 months, 48 months, and 60 months).

Sample size calculation was based on the primary outcome of the study which was tooth loss. This resulted in a required sample size of 70 patients per group. For this paper, the secondary outcome, TMD pain, was considered.

Patients were randomly allocated either to the shortened dental arch (SDA) group or to the removal dental prostheses (RDP) group. SDA was considered the intervention and RDP the control.

In the SDA group, molars were not replaced. If the SDA was complete up to the second premolar, no dental treatment was performed in the posterior region. In cases with missing second premolars, cantilever fixed dental prostheses (FDP) were incorporated to replace the missing tooth.

In the RDP groups, molars were replaced. Tooth replacement was carried out by means of RDPs retained with precision attachments, connected to either splinted crowns or FDP abutments on the posterior-most teeth on both sides. If the second premolar was missing, it was replaced by the RDPs as well.

Any missing tooth up to the second premolar was replaced by conventional tooth-supported FDP in both groups. All patients received appropriate dental pretreatment, including oral hygiene instructions, periodontal treatments, and endodontic treatment, if necessary, to ensure adequate conditions prior to the final prosthodontic treatment phase. In cases with missing teeth in the opposite jaw, teeth were replaced up to the second premolar in the SDA group, and up to the first molar in the RDP group, to ensure adequate occlusion and posterior tooth support. All dental procedures were performed standardized in all participating study centers.

The outcome TMD pain was assessed using patient self-reports and was verified by clinical signs of pain in the physical examination consisting of bilateral palpation of the masticatory muscles (Temporalis and Masseter) and the lateral pole of the TMJ, and pain in the TMJ during jaw movements (mouth opening or closing) in both sides. TMD pain was considered clinically verified when at least one sign of pain occurred in any of the examined regions on either side. Additionally, characteristic pain intensity was assessed using the mean of the pain intensity items (current pain, worst pain, average pain in the last 6 months). Possible scores of characteristic pain intensity could range from 0 (no pain) to 10 (pain as bad as could be).

Logistic regression analyses were applied for self-reported and clinically verified TMD pain, linear regression analyses were applied for characteristic pain intensity, and analyses were controlled for gender, sleep bruxism, and awake bruxism as covariates. All analyses were performed as intention-to-treat analyses using the statistical software package STATA.

RESULTS

152 patients were included in the trial (71 in the SDA group; 81 in the RDP group). At baseline, mean age of the participants was 59.7 years and about half of the participants were female (53.9%) with no significant differences between

intervention groups. About two-thirds (70.8%) were married and lived with their spouse. Participants in the SDA group were more often divorced (18.5% vs. 2.5%) and less often lived with their spouse (63.1% vs. 77.2%) than those in the RDP group. No significant group differences occurred for level of education, professional activities, or alcohol and tobacco use.

There were no significant group differences in oral para-functions or physical health conditions. There were also no significant differences between groups with respect to both psychosocial measures.

Prevalence of self-reported TMD at follow-ups ranged from 11.7% (48 months) to 18.1%. More than a third (36.2%) of the participants reported having TMD pain on at least one follow-up. TMD pain was clinically verified in 3.3% (48 months) to 5.4% (36 months) of the participants, with a prevalence of 12% of clinically verified TMD pain at any follow-up. Characteristic pain intensity ranged from 0 to 10 with means between 0.33 (48 months) and 0.43 (4–8 weeks). The overall mean pain intensity for the complete study period was 0.39.

Tooth replacement (RDP group) did not change the risk for self-reported TMD pain significantly compared to no tooth replacement (SDA group). Mean characteristic pain intensity was virtually identical in both groups.

When analyzing the effect of tooth replacement on TMD pain at each follow-up separately, only one of the regression analyses revealed a statistically significant effect. Odds Ratios for the effect of tooth replacement (RDP group) on self-reported TMD pain were all around 1, indicating no effect. While at 6 months after treatment the prevalence of self-reported TMD pain was higher in the RDP group (20.5 % vs. 14.9 %), at 36 months, prevalence was higher in the SDA group (21.3 % vs. 13.9 %). Results were similar for clinically verified TMD pain. Differences in mean characteristic pain intensity between SDA and RDP group were close to 0, except for the 6- and 60-month follow-up with small effect sizes. While pain intensity at 6 months was higher in the RDP group (0.48 vs. 0.21), results were contrary at 60 months with higher values in the SDA group (0.62 vs. 0.21), with a statistically significant difference in the adjusted analysis. However, the absolute value of the difference was still low. All three analyzed outcomes indicated no effect by the time between treatment and follow-up on risk for TMD pain.

CONCLUSION

The researchers concluded that retaining or preservation of an SDA is not a major risk factor for TMD pain over the course of 5 years when compared to molar replacement with RDPs.

IMPLICATIONS FOR PRACTICE

These results suggest that missing molars do not have to be replaced in order to prevent TMD pain.

Reference

1. Elias AC, Sheiham A. The relationship between satisfaction with mouth and number and position of teeth. *J Oral Rehabil.* 1998; 25:649-61.
2. Reissmann DR, Heydecke G, Schierz O, *et al.* The randomized shortened dental arch study: temporomandibular disorder pain. *Clin Oral Invest* 2014; 18: 2159-2169.