Overdenture – Implants versus Teeth – Quality of Life and Objective Therapy Evaluation

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Abstract: An overdenture is a complete or removable partial denture that has one or more tooth roots or implants to provide a support. The study compares two types of prosthodontic treatment – overdenture supported by remained own teeth with ball attachments and that held by implants. The cohort of 35 patients (recall from 1 to 5 years) was evaluated. When subjectively and objectively assessed no significant difference between both groups was observed.

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Introduction

Teeth may be lost because of trauma, caries, periodontal disease, congenital defects, and iatrogenic treatment. Tooth loss has a negative impact on masticatory function, aesthetics, and self-image [1]. Fixed partial dentures, removable partial dentures, complete dentures, and implant-supported dentures can replace missing teeth comfortably and aesthetically, but it is not known whether they differ in their ability to reconstruct the masticatory force, phonetics, and aesthetics and preserve the residual bone ridge.

An overdenture is a complete or removable partial denture that has one or more tooth roots or implants to provide a support. The concept of overdentures was presented at the World Dental Congress in 1861 by Butler, Roberts and Hays who presented history of 12 years treatment results [2]. The currents concepts of overdentures were presented at the American Dental Association during the 1970 annual meeting in Las Vegas [2]. This treatment was not accepted worldwide that time and its renaissance came in the sixties of twenties century when new clinical procedures in the field of periodontology and endodontics were used. These procedures significantly prolonged the lifetime of the remaining teeth. In comparison with the complete denture the main advantage is preservation of the alveolar bone which resorbs as a consequence of the teeth loss. The landmark articles were published in 1969 by Morrow et al. and Lord and Teel. Later textbooks described the various principles, concepts, and practices specific to overdenture therapy [3, 4].

The key factor to this procedure is the effective endodontics. This allowed for a shortened dental crown, which created adequate space for the overlying artificial denture tooth and denture base. Moreover the shortened crown also changes the crown to root ratio thus the reduced mobility of the root improves the bone support. The second important factor is the better retention of the denture when leaving any root. At the same time there is significantly lower resorption of the alveolar bone, so the remained tooth prevent rapid bone loss [2]. Over a five-year period the bone loss averages 5.0 mm. Furthermore in the same period, the vertical bone loss was only 0.6 mm in patients wearing overdentures [5].

Overdentures have certain advantages and disadvantages. Preeminent among advantages is the conservation of natural teeth and concomitant reduction or slowing of residual ridge atrophy. Stability and support of the overdenture also can be better in comparison with a conventional complete denture. In addition, sensory feedback of the periodontal receptors is maintained and masticatory performance may be enhanced [6]. The chewing efficiency of patients with natural dentition was measured at 90%, complete denture wearers at 59%, and patients with overdentures at 79% [5]. Disadvantages of the overdenture treatment include the need for inevitable treatment, which requires additional time and increases costs [6].

During the same time period that techniques for producing tooth-supported overdentures were being perfected, P. I. Brånemark was developing the science of

osseointegration. Once established that osseointegration is a predictably successful treatment, it was a natural progression to the notion of using osseointegrated implants to bear overdentures [7]. Jemt et al. reported 100% cumulative success rate for overdentures supported by 2 implants; the mean marginal loss was 0.5 mm during a 5-year period [8]. Treatment considerations for implant overdentures on the maxilla appear to be different from those on the mandible. The atrophy of the edentulous jaws may limit implants placement on the maxilla, whereas in the mandible, the reduction of alveolar ridge often leaves a significant depth and width of basal bone anteriorly to accommodate implants. The maxilla consists of a looser arrangement of trabecular bone which is less capable of stabilizing and supporting implants [9].

Further, the extraction of the last remaining teeth and the replacement with complete dentures has many consequences. The patient has to adapt to a new situation with a respect to teeth, chewing, swallowing etc. The patient has to accept edentulousness, which may lead to psychological problems and social isolation [10]. Some people associate the loss of teeth with growing old, which may be emotionally depressing. It has been argued that the retention of some teeth as overdentures abutments prevents the negative feeling of total loss and allow the patient to adjust more easily to the acceptance of denture wearing [10]. To make a gradual transition from a natural dentition to complete dentures, overdenture therapy is recommended by prosthodontics [9]. The question is how the patients are satisfied with wearing this type of denture.

In the presented study we evaluated two different types of overdenture treatment. The first group was treated by overdenture supported by own remained teeth and the second group included patients with osseointegrated implants.

Material and Methods

Overdenture procedure

Axial ball root-supported attachments (Figure 1a) Firstly, root canal treatment was provided; in the most cases we used canines. Afterwards all the treated teeth were decapitated. Using pilot drill we removed two thirds of the root canal filling. The impression was taken with the polyether impression material. The dental technician fabricated post and core either with axial ball attachment or bar. For these purposes Cr-Co alloy was used, in two cases then precision noble alloy (Au, Pt). After fitting post and core, the second impression was taken in the individual tray also with polyether material. Subsequent procedure follows common phases as when preparing complete denture. Matrices could be polymerized in the direct or indirect way. We used both procedures.

Implant-supported overdenture (Figure 1b) Edentulous patients were treated in this way, when their financial situation for fixed prosthodontics or bone quality/quantity was unsatisfactory. In the same time, these patients had problems with the retention of their dentures.

After the proper examination and taking all needed X-rays, two implants were inserted in the canine regions in each jaw. Healing period lasted in the lower jaw 3 months, in the upper jaw 4–6 months as a result of the bone quality. In this time period the patient wore immediate dentures provided with a soft rebase material. Next technique was generally the same as mentioned above.

Methodology of evaluation The whole group of patients comprised 35 people (11 men, 24 women) with the average age of 66.7. They wore their dentures from 1 to 5 years. All of the patients were clinically examined. We evaluated especially overdenture stability and retention. We proved the stability pushing the overdenture to left and right way in the premolar area using our fingers, and then the retention was assessed placing our fingers orally in the frontal area slightly pulling labially. The result was defined as: no movement/slight movement that does not influenced the function/movement, which is necessary to solve. Next questions included time period of denture wearing, placement of the overdenture in the upper or lower jaw, using certain system of treatment etc. The questionnaire contains also information about complications wearing this denture.

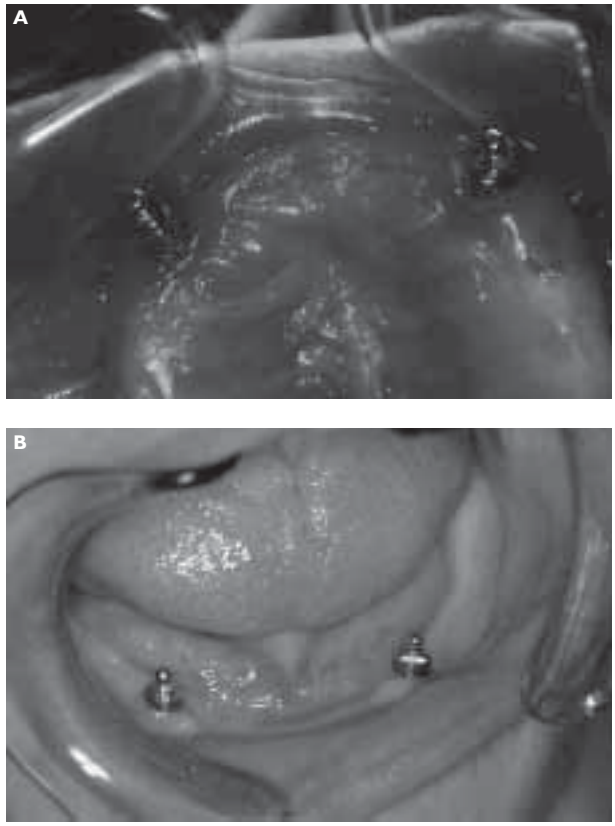

Figure 1 – (a) Ball attachments – teeth 13, 23 – 3 years post insertion; (b) Implants – ball attachments in lower jaw – 3 years post insertion.

The second part of the questionnaire comprised subjective evaluation from the point of patients. The previous experience with the removable denture was of the highest interest. These patients who had any previous experience should have evaluated their experience as better/same/worse than the previous prosthodontic treatment. Thereafter our patients were asked to reply questions such as their feeling about the denture, retention (excellent/good/sufficient/satisfactory/unsatisfactory), patients' problem when starting wearing their new denture (does not remember/minimal/long time). The last question was if they recommended this type of treatment to anybody else (certainly yes/rather no/certainly no).

Clinical observation was prepared supporting voice supported interactive dental cross (Figure 2) [11, 12].

Overdenture supported by implants

We wholly treated 18 patients (5 men, 13 women) with edentulous alveolar ridge. In the canine area there were inserted two implants, in the lower jaw in 16 cases, in the upper jaw in 2 cases. The average age was in this group 66.7 years (from 52 to 83 years). In the time of filling in the questionnaire, the average time of wearing the denture were 24 months (from 12 to 30 months).

Objectively, we examined retention and stability of the dentures. We noticed excellent retention in 7 patients, slight movement that does not influenced the function in 8 patients and movement, which is necessary to solve in 3 patients. 14 patients found the stability of their denture as excellent, 2 as satisfactory and 2 patients found their denture as a functional because of its instability.

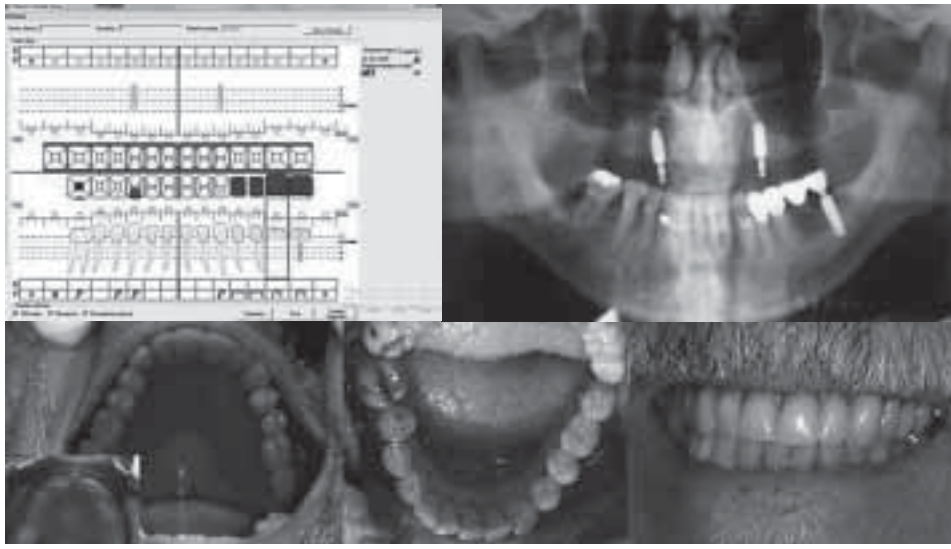

Figure 2 – Identification card based on voice supported interactive dental cross.

In our interest was also previous necessity of rebase and other complications with dentures (necessity of the repair of the broken denture new matrices or implant disintegration). The essential need of rebasement was in 3 patients, complications occurred in 8 patients.

In the second part of our questionnaire, we focused on the subjective feeling of overdentures wearing. However 16 patients had previous experience with wearing any removable denture, only 2 did not. 12 patients from this group found their overdenture as better than the previous one, 2 patients as the same and 2 did not answer this question at all. When we asked the question how they found the whole procedure, 8 found it as excellent, 7 as satisfactory, 1 as unsatisfactory but still wearing it and 1 did not answer. Any problems with getting familiar with the new implant supported overdenture had minimally 2 patients, 15 did not remember any problems, and 1 did not answer. The retention appreciated subjectively as excellent 7 patients, 6 as good, 1 as satisfactory, and 1 as sufficient, 2 as unsatisfactory and 1 did not answer. Aesthetics was rated as excellent in 8 cases, good in 7 cases and in 2 cases as satisfactory (one patient did not answer). One question, which we found very interesting, was if they recommended this type of treatment to anybody else – 12 patients replied certainly yes, 3 rather yes, 1 rather no and 1 certainly no as well.

Root-supported overdenture

There were treated 17 patients (6 men, 11 women; 11-times the upper jaw, 8-times the lower jaw) in this group, 2 patients had overdenture in the lower jaw as well as in the upper jaw. There were used as retentive system 5-times a bar connecting teeth 43 and 33 (Cr-Co alloy or Au-Pt alloy), 3-times axial attachments fixed retentive ball attachment system in root canals of teeth 43, 33 (Bredent). In the upper jaw, the situation was similar; axial attachments fixed ball attachments (Bredent), mostly in root canals of teeth 13, 23. The average age was in this group 66.64 years (from 53 to 82 years). In the time of filling in the questionnaire, the average time of wearing the denture were 22.8 months (from 12 to 60 months).

Objectively, we noticed excellent stability in 16 overdentures, slight movement that does not influenced the function in 2 cases and movement, which is necessary to solve in 1 case. In 8 cases we found the retention as excellent, 7 as satisfactory and 4 as unsatisfactory.

Complications appeared in 13 cases (necessity of the repair of the broken denture, matrices changing, post recementation, the need of root resection. Rebasement was needy in 2 cases. In two cases there was made new prostheses after 3 years of wearing.

Only 8 patients in this group had any previous experience with wearing removable denture in the past; 7 from them appreciated their new overdenture as better than the previous one, 1 patient thought it was worse. 1 patient did not answer.

Eleven patients found their overdenture as excellent, 5 as satisfactory, 2 as unsatisfactory but still wearing it. Any problems with getting familiar with the new overdenture did not remember 16 patients, 1 did not answer. The retention was appreciated subjectively as excellent in 8 patients, in 1 as satisfactory, in 1 as sufficient and 1 did not answer. Aesthetics was rated as excellent in 12 cases, good in 4 cases and in 1 case as satisfactory (two patients did not answer). 14 patients would certainly recommend this treatment to anybody else, rather yes was marked in 3 cases.

The whole treatment and evaluations were accomplished in agreement with the Helsinki declaration. Ethical approval for the study was obtained from the general faculty hospital – 2nd Medical Faculty of Charles University Ethics Committee, Prague.

Patients who were diagnosed as requiring therapy were being asked to consider joining the trial. The objectives of the study were explained to patients who were given the opportunity to give informed consent to the treatment. Prior to their involvement, patients obtained an explanatory letter providing details of the project.

Results

Comparison between both groups

We used statistical evaluation of all values for comparing both groups – implant-supported overdenture versus root-supported overdentures.

Figure 3 compares age in both group and the average age is nearly the same. It is shows the period of wearing the denture. It could leave an impression that root-supported overdentures are wearing for longer time but the reason is that we included also patients who were treated several years before.

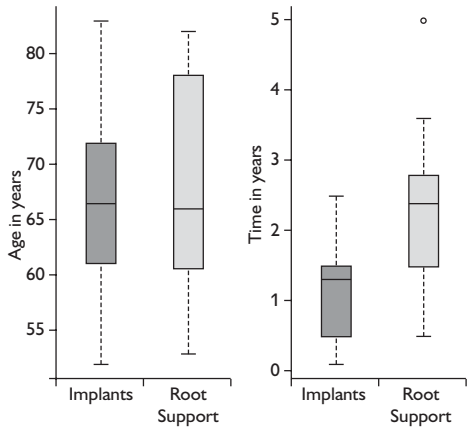

Figure 3 – Age and time of replacement.

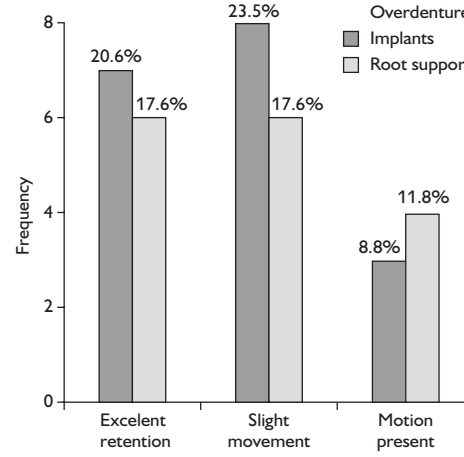

Figure 4 – Retention objectively.

Concerning sex, women were treated more often, 38.2% implant supported, 29.4% root-supported. Men were mostly treated with classical root supported overdenture.

Slightly better retention showed the implant-supported overdentures – excellent retention in 20.6% in opposite to 17.6% in the classical denture, slight movement 23.5% vs. 17.6%. Movement, which is necessary to solve show 8.8% implant-supported vs. 11.8% root-supported overdentures (Figure 4).

Stability was almost balanced in both of the groups – excellent in 41.2% implant-supported, 38.2% root-supported; slight movement in both groups 5.9% and movement which is necessary to solve 5.9% implant- and 2.9% root-supported dentures (Figure 5).

Incidence of complications was found to be slightly higher in the root-supported overdentures (26.5%) than in case of implant-supported ones (23.5%) however the difference was not of statistical importance. No complications occurred in 29.4% in implant-supported and in 20.6% in root-supported overdentures.

The rebasement was claimed in 8.8% (implant-supported) and 2.9% (root-supported). No need of rebasement was found to be of the same rate in both groups (44.1%).

More patient treated with root-supported denture had previous experience with removable denture (41.2% vs. 20.6%). Only 11.8% patients wearing implant-supported dentures had no previous experience with any removable denture, in group of patients with root-supported 26.5%.

Subjectively evaluated there were no substantial differences. Saying their opinion about the overdenture satisfaction, as excellent (respectively good) 24.2% (21.2%)

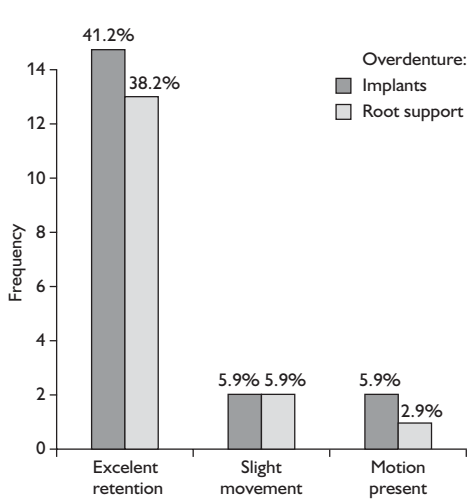

Figure 5 – Stability objectively.

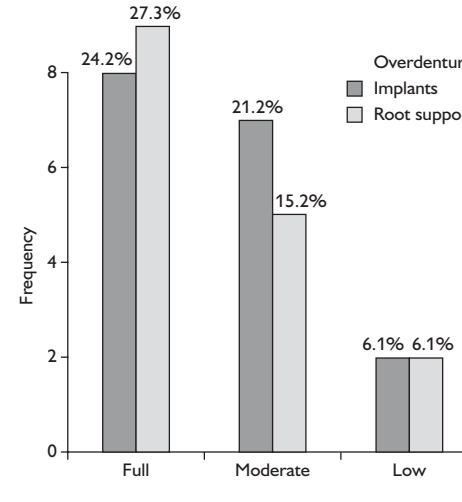

Figure 6 – Overdenture satisfaction.

patients marked wearing implant supported versus 27.3% (15.2%) in the second group. Dissatisfaction was in both groups the same – 6.1% (Figure 6).

Minimal difficulties getting used to wearing the denture (or did not remember) felt 47% patients in both groups, 6% of the group with implant-supported had problems with getting used to the new denture.

Patients estimated overdenture's retention as excellent in 22.6% (implant-supported) and 19.4% (root-supported), as good equally both groups 19.4%, as satisfactory and sufficient 3.2% implant-supported and zero in root-supported. Dissatisfaction was also of the same rate in both groups – 6.5% (Figure 7).

From the aesthetical point of view, 24.2% (implant-supported) and 36.4% (root-supported) found it excellent, as good 21.2% (implant-supported) and 9.1% (root-supported), and as sufficient 6.1% (implant-supported) and 3.0% (root-supported) (Figure 8).

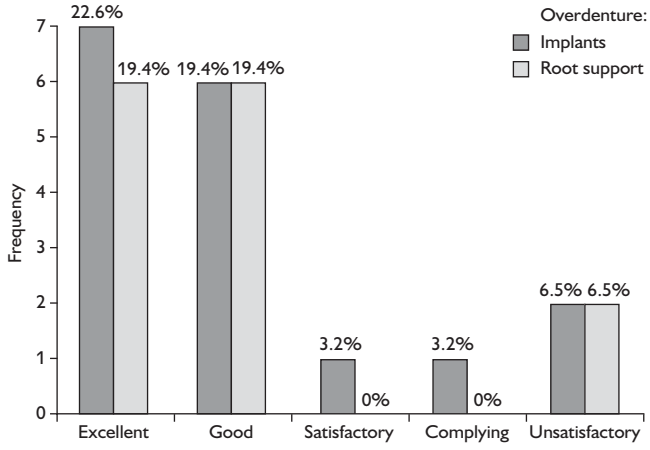

Figure 7 – Retention subjectively.

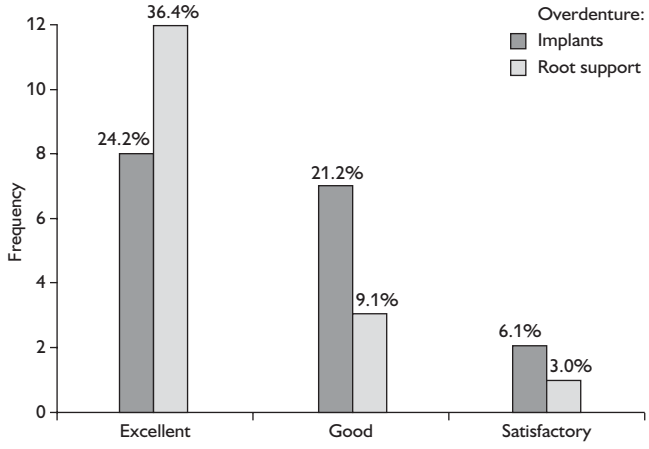

Figure 8 – Aestethics evaluation.

Almost the same number of patient would surely recommend this type of treatment to anybody else (36.4% vs. 39.4%), rather yes in both groups 9.1%; as rather no and no only 3% of patients in implant-supported group.

Discussion

Overdentures are designed to distribute the masticatory load between the edentulous ridge and the abutments. The overdenture transfers occlusal forces to the alveolar bone through the periodontal ligament of the retained tooth roots [13]. Proprioceptive feedback, from the periodontal ligament to the muscles of mastication, may act to prevent occlusal overload and thereby prevent bone resorption because of excessive forces.

We agreed on the fact, as well as the other authors [6, 14], that there are no statistically significant differences in both groups. It is obvious because own remained teeth, as well as osseointegrated implants give the feeling of self-confidence and stability in function. It was estimated that satisfaction with dentures is not so much influenced by its function and aesthetics but in the first place by the ability of acceptance its as a foreign body [9]. We proved differences only in period of overdenture's wearing. This was influenced by the fact that there were several patients wearing their denture for many years in the root-supported group. We found a very interesting detection that the average age was almost the same in both groups; the higher age variability was noticed in the root-supported group. However in these days the implant insertion is not problem as far as in older patients and the probability of osseointegration is almost 100%.

Comfort in function significantly increases overdenture's rehabilitation [14, 15, 16]. We proved that women are treated more often with overdentures than men; it could relate to the lower jaw atrophia. So that most of implants are demanded to insert in the lower jaw.

On the other hand there was not identified a big difference in any parameter in both groups. Only when questioned about recommendation to the other patients, we noticed negative reaction by the patient with implant-supported overdentures (3% no and 3% rather no). In our opinion it could be in close connection to the cost of this treatment and the expected cost of the reconstruction [5].

Our results correspond with the paper of Jonkman et al. [9] very well. The author compares three groups (immediate complete denture, immediate overdenture, and immediate overdenture with attachments). There were found no significant differences in satisfaction with any of these dentures.

Finally, we could say that the overdenture is a very advantageous type of treatment from the aesthetical and functional point of view. We presume very little complications in five years interval also when osseointegrated implants are used.

The use of own teeth or implant-supported fixed prostheses to replace missing teeth in partially or completely edentulous jaws is a highly successful prosthodontic

treatment. An often-overlooked benefit of implant-supported fixed prosthetic treatment is the preservation of residual alveolar bone.

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