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OVERDENTURES AND OSSEOINTEGRATED IMPANTS

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Indications for overdentures supported by osseointegrated implants

Nowadays the concept of an overdenture supported by osseointergrated implant can be accepted as an alternative treatment to that of a fixed prosthesis.

Parel(1986) stated that the overdenture principle could be applied for economic reasons. The use of overdentures with osseointegrated fixtures had been proved valuable : 1) to overcome complications caused by fixture placement, 2) to reduce stress over the long - term in severely atrophic edentulous mandibles, 3) to restore ablative oral or congrenital defects, 4) to permit correct tooth position for the maxillary denture.

Engquist et al (1988) published the treatment results from a retrospective study on overdentures supported by osseointegrated implants. They stated that the overdenture concept may be advantageous for the restoration of severely resorbed upper jaws, unfavourble jaw relationships, cosmetic enhancement, for phonetic reasons, and where maximal mucosal support is required.

Kopp (1989) calculated implant predictability and restorative predictability to establish a predicted level of restorability. The implant predictability is based upon the bone morphology and the restotative predictability is based upon the individual implant predictability, the number of implants required to support the prosthesis, and the load bearing capacity of the implants. He explanined the overdenture therapy in implant approach for edentulous patients. He stated that overdentures might useful in restoring the edentulous mandible when there were either economical or anatomical limitations to placing five or six fixtures.

It seems that this approach is a part of a sound treatment rationale. As for the maxilla he felt that overdentures had limited advantages when resorption was minimal. Their aesthetic and phonetic advantages become apparent when resorption is greater.

Eckert and Laney (1989) stated that an alternative approach to a fixed prosthesis supported by osseointegrated implants involved the use of an overdenture prosthesis with a small number of implats. They pointed out that this design had advantages in plaque control, cost, tooth positioning, lip support, and the possibility of conversion to a fixed prothesis. The primary disadvantage of this technique was that functional compressive forces would be appied to the underlying mucosa and bone. Rebasing would be necessary as for a conventional overdenture. They suggested that the application of the overdenture should be limited as a superstructure of the osseonitegrated implants.

Davis (1990) suggested a number of situations, for which the overdenture could be considered with the prosthesis supported by osseointergrated implants :

1) Resorbed residual ridge unsuitable for the placement of the five or six fixtures needed to support fixed restoration,
2) Unfavourable arch relationship that makes it difficult to reconcil the position of the teeth and fixtures,
3. Aesthetic problems requiring position of adequate

facial support,

4) Phonetics can be a problem with the maxillary prosthesis,
5) Financial limitations,
6) Patient has coped reasonably well with complete denture, but is looking for some improvment in retention and stability.

This could be a general guideline to select overdenture therapy in the osseointegrated approaches.

Clinical experiences with overdentures supported by osseointegrated implants.

Despite the work of Branemark and coworkers on the long term results of fixed prostheses supported by osseointegrated implant, little clinical results and information have been pulished on overdenture experience.

Parel (1986) explained the different types of retention device for overdentures suppotred by osseointegrated implants. He obtained retention by the splinting bar attachment and by magnetic retainers. Radiographic monitoring of the patients treated with the bar splinting method, showed significant bone resorption crestally on all three fixtures joined with bar splinting after 11 months of use with an overdenture. However there were no bone changes in the free standing fixtures with magnetic retention units following 2.5 years of functional use. Later, in 1991 he reported that he encountered problems with magnetic retainers and suggested that the free standing approach with stud attaihments was the better. From his illustrations it appears that the connecting bar was located on the three fixtures, one in each canine region, one in the midline, and was designed with distal cantilevered extensions bilaterally.

It is possible that he might have gained better retention and stability from a gold round bar with distal extensions. The significant crestal bone loss on the fixtures with relatively long distal extensions might be the result of torque on the supporting fixtures.

Engquist et al (1988) revealed a twenty per cent implant failure rate in a retrospective study to evaluate ossointegrated implants supporting overdentures. To explain this high failure rate they made two groups, A and B depending upon jaw bone quantity and quality according to the classification of residual ridge proposed by Lekholm and Zarb(1985). Group A included patients with acceptable jaw bone quantity and quality while group B included those with severe jaw bone resorption and or poor bone quality. The major faliures had occurred in group B, particularly in the maxilla. The investigated material exhibited a high occurrence of fixture loss prior bone quality were considerably higher in overdenture therapy than earlier reported with fixed prosthesis.

The authors pointed out that extrem bone resorption and poor bone quality were the reasons for choosing an overdenture as an alternative to fixed prostheses in two thirds of the cases and this explained the high faliure rate.

In lower jaw, the failure rate was low, and well in accordance with failure rated reported for fixed prostheses. They suggested that comparative studies of different attachment systems for overdentures supported by implants were necessary.

Block et al (1990) described the use of osseointegrated implants for overdenture stabilization with different type of retentive attachments. They discussed clinical experience of 90 overdenture patients with follow-up of periods up to 56 months post restoration. They employed the Dolder bar, the hader bar, the ASC 52, and magnet attachments for retention. They pointed out the relative advanrages of the attachments :

1) The Dolder bar provided versatility in height and length, effective retention mesh, and a shim that allowed vertical and rotational movement for "stress breaking".
2) The Hader bar includes a preformed plasic bar for casting in any alloy, easy replacement of the

plastic rider, and a simple assambly technique.

3) The ASC 52 attachment allowed vertical movement as well as increasing retention. It could be adujusted easily by the dentist.
4) The magnetic attachment provided excellent resistance to vertical forces. In other words it provided retention rather than stabilization.

During the observation period the Dolder bar proved to work satisfactorily and none of the implants supporing the bars failed. Ten maxillary overdentures used a bar (8 Dolder bars, 2 hader bars) and associated clips for denture retention. Posterior cantilevered bars were also connected to allow removal of the palatal portion of the maxillary prostheses, while maintaining a buccal and labial flange for facial support and sufficient proshesis retention for parient satiafaction. Three patients with thin maxillary bone at the time of implant placement demonstrated bone loss buccal to ten implants ranging from 2 to 6mm after 1 year of function.

It seems that bone loss might be caused by the long extension of cantilever together with the reduced support and rigidity of the overdenture beacuse of the removal of palatal portion of the maxillary prostheses.

Patients treated with an overdenture attached to osseointegrated implants with ASC 52 attachments were satisfied with the comfort of the prostheses and during this period none of supporting implants failed. Four of seven patients treated with magnetically retained mandibular prosthesis complained of lack of retention, sores along the lingual aspect of the mandibular ridge, and tissue reactions to the magnet. They stated that one of the disadvantages of magnet was that the denture could slide along the magnet surface. They concluded that the magnet was not suitable for patients with severely resorbed residual ridges.

Naert et al (1988) described clinical results, guidelines, and limitations of overdentures supported by osseointegrated implants for the edentulous mandible. Forty-four patients were treated with a 97.9% success rate over a period of 2.5 years. Compared with previous situatios involving very uncomfortable dentures, the patients were satisfied with new overdentures annul standardized radiographs to check the crestal bone level adjacent to the fixtures. No measurable bone resorption during this 1 month to 2.5 year follow up period was observed. They felt that the higher success rate over the 2.5 year period was attributed to several prosthodontic factors :

1) Proper location of the fixtures and resilient denture design to allow axial loading on the fixtures during function,
2) Optimal passive fit of the bar cylinder unit on the abutments,
3) Optimal occlusion and articulation,
4) Supervision of the oral hygiene together with routine recall appointment.

The risk of an adverse soft tissue response at the marginal epithelium is well known for overdenture treatment. They empolyed a soft 'permanent' lining material to fill the inner side surface of the overdentures and to minimize twisting forces on the fixture during function. Nevertheless, they experienced proliferation of the gingiva in five patients. They concluded that oral hygiene was the main factor in preventing an irreversible adverse soft tissue response.

It seems that they had made an effort to employ the bar joint attachments properly for overdentures supported by osseointegrated implants. They stated that further research should be done to evaluate the number and location of the fixtures that should be involved and the design of retention systems.

Setz et al (1989) measured the chewing pattern with the use of kinesiograph on 18 mandibular edentulous patients who had been treated with complete dentures retained by the Dolder bars supported by osseointegrated implants. The chewing cycle both with and without the bars inserted in the patient's mouths were recored. With the dentures attached to the bar, chewing movement became wider and centric relation position was reached earlier and more often as compared to the same test without the bar.

Thses effects resulted from a greater certainty of

patients in finding an effective chewing position, leading to an increase in bite force, which again decreased the time for reducing the food bolus. They stated that these findings indicated more effective masticatory functionn. In an stress analysis with strain gauges on the implants, they found that there were no uniform stress loading either during fixation or during mastication. They conclued that Dolder bar acted as a retainer rather than as a rest. They stated that further research should determine whether the resilient space between bar and clip was obliterated in function.

Mericke - Stern (1990) reported results of using osseointegrated titanium implants as abutments for overdenture restorations in the mandibles of 62 edentulous patients.

Evaluation after periods of 6 to 66 months postoperatively revealed good clinical results.

She suggested that two implants supporting stud attachments might adequately serve as retention for a mandible complete denture.

Enquist (1991) reported as experience of splinted and non - splinted implants supporting overdentures with retropective and propective studies.

He concluded that in lower jaws the relationship between stress and osseointegration area served favourable for a high fixture survival rate even with two supporting fixtures and regardless of attachment system, and in patients with maxillary bone of poor quality using linger fixtures or increasing the number of fixture was highly recommended.

Occlusal forec and masticatory function of complete denture wearers compared with patients with overdentures supported by osseointerated implants

Natural teeth are rooted in the jaw bone and in consequence they can incise, tear, and finely grind food of any character. However complete dentures merely rest on the mucosa covering the edentulous ridge and are held there by weak forces. Occasionally they are subjected to powerful displacing forces so that their efficiency as a masticatory apparatus is limited.

Indeed, Bergman and Carlsson (1985) stated that bite force and chewing efficiency have shown to be greatly reduced, though complete denture wearers themselves often regarded their function as satisfactory.

Haraldson et al (1979) evaluated oral function of complete denture wearers by using a questionnaire, clinical examination and bite force measurement with gauges. The maximal bite force was one fifth or sixth less in the denture wearer than in the dentate subject. They confirmed that edentulous persons were oral invalids and very handicapped in masticatory function. Even clinically satisfactory complete dentures were poor substitutes for a complete set of natural teeth and usually also functionally inferior to a reduced natural dentition.

Haraldson and Carlsson (1977), and Haraldson and Zarb (1988) evaluated oral function in a group of patients with osseointergrated implants. They found similar function results for the patients with fixed bridges supported by osseointergrated implants as for the matched dentate control group.

Stlblad et al (1985) studied the function of the masticatory system in patients with overdenture supported by osseointergrated implants. They employed questionnaire, clinical and laboratory examinations. They concluded that treatment with overdentures supported by osseointergrated implants could be a great advantage to the edentulous patient as the method was neither time consuming nor expensive.

Jemt and Stalblad (1986) analysed mandibular movement patterns in complete denture wearers before and after their mandibular dentures were converted to overdentures supported by osseointergrated implants without introducing any major change of dimension of the dentures. The results showed that overdentures supported by osseointergrated implants approached more closely to the data accumulated from dentate patients.

Haraldson et al (1988) evaluated nine patients with overdentures supported by osseointegrated implants in the mandible before and after treatment. They carried out subjective and clinical examination, biting force with strain gauges, and chewing efficiency measurements. All the patients improved subjectively and clinically after treatment. The biting force during gentle biting increased on average from 17.3N before treatment to 24N after treatment after one year. A corresponding improvement of biting when chewing was also found, from an average 24.0N before to 38.7N after treatment. The bite forces during chewing were in the central incisor, 33N in the canine, and 50N in the second premolar regin at the 1-year follow up. The maximal bite force increased from an average 74.6N at the baseline examination to 131.5N ant the 1-year follow up.

These results demonstrated that treatment with conversion of a mandibular complete denture to an overdenture supported by osseointegrated fixtures improved oral function. Overdentures supported by osseointegrated implants have proved a viable method of treatment. They produce masticatory efficiency close to those of fixed prostheses and of dentate patients.

Conclusion

The overdenture technique in the osseointegrated approaches and be recommended to solve clinical problems such as cosmetics and phonetic problem, unfavourable jaw relationships, and lack of soft tissue support.

Nowadays, the consept of an overdenture supported by osseointegrated implants can be accepted as an alternative treatment to that of an fixed prosthesis.

A number of attachments can be used as connecting elements between removable prosthesis (overdenture) and osseointrgrated implants. These attachments are stud attachments, magnetic attachments, bars and clips. At a moment, there are no unambiguous results showing which attachments system would be most favoured by osseointegrated implants produce masticatory efficiency close to those of fixed prosthesis and of dentate patient. It feels that overdenture application is widespread and growing.

However, it is not easier to apply an overdenture than to apply a fixed bridge. We have to estimate overdentures supported by osseointegrated implants very carefully in long term clinical evaluation.

REFERENCES

1. Bergman B and Carlsson GE. (1985) Clinical long-term study of complete denture wearers. J Prosthet Dent 53 : 56−61.
2. Block MS, Kent JN, and Finger IM. (1990) Use of the integral implant for overdenture stabilization. Int Oral Maxillofac Implant 5 : 140−147.
3. Davis DM. (1990) The role of implants in the treatment of edentulous patients. Int Prosthod 3 : 42−50.
4. Eckert SE and Laney WR. (1989) Patient evaluation and prosthodontic treament planning for osseointergrated implants. Dent Clin North Am 33 : 599−618.
5. Engquist B, Bergendal T, Kallus T, and Linden U. (1988) A retrospective multicenter evaluation of osseointegrated implants supporting overdentures. Int Oral Maxillofac Implant 3 : 129−134.
6. Engquist B. (1991) Six years experience of splinted and non-splinted implants supporting overdentures in upper and lower jaws : In overdentures and implants : an osseointegrated appeoach in overdentures on oral implants. ed. by Schepers E, Naert I, and Theunciers CR. Leuven University Press. Leuven : 27−43.
7. Haraldson T and Carlsson GE. (1977) Site force and function in patients with osseoi-

ntegrated oral implants. Scand J Dent Res 85 : 200－208.

8. Haraldson T, Karlsson U, and Carlsson GE. (1979)
Bite force and oral function in complete denture wearers, J Oral Rehabil 6 : 41－48.

9. Haraldson T, Jemt J, Stalblad PA, and Lekholm U. (1988)
Oral function in subjects with overdentures supported by osseointegrated implants. Scand J Dent Res 96 : 235－2452.

10. Haraldson T and Zarb GA. (1988)
A 10 - year follow - up study of the masticatory system after treatment with osseointegrsted implant bridges. Scad J Dent Res 96 : 243－252.

11. Jemt T and Stalblad PA. (1986)
The effect of chewing movements on changing mandibular complete dentures to osseointegrated overdentures. J Proshet dent 55 : 357－361.

12. Kopp CD. (1989)
Branemark osseointegration, Prognosis and treatment rationale. Dent Clin North Am 33 : 701－731.

13. Mericske - Stern R. (1990)
Clinical evaluation of overdenture Restoratims supported by osseointegrated titanium implants a retrospective study J Oral & Maxillofac Implant 5 : 375－383.

14. Neart I, De Clercq M, and Theuniers G. (1988)
Overdentures supported by osseointegrated fixtures for the edentulous mandible : A 25 - year report. Int Oral Maxillofac Implant 3 : 191－196.

15. Parel SM. (1986)
Implants and overdentures : The osseointegrated approach with conventional and compromised applications. Int Oral Maxillofac Implant 1 : 93－99.

16. Setz J, Kramer A, Benzing U, and Wber H. (1989)
Complete dentures fixed on dental implanrts : Chewing patterns and implant stress. Int Oral Maxilloface Implant 4 : 107－111.

17. Stalblad PA, Jansson T, Jemt T, and Zarb G. (1985)
Osseointegration in overdenture therapy : Preliminary comments. Swed Dent J Suppl 28 : 169－170.

〈국 문 초 록〉

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저작압을 골에 직접 분산시키고 의치를 직접 골에 부착시켜 의치의 안정성을 증진시키는 가능성을 실현하는 것이 오랫동안 보철과의사들의 목표였다.

수십년 동안 골과 티타늄 임프란트가 결합(적합)되는 골융합성 술식이 발전되어 왔으며 이 임프란트의 상부구조물로 고정식 보철물이 받아들여져 왔다. 현재까지 가장 흔한 상부구조는 고정식 보철물이다.

요즈음 골융합성 임프란트에 지지를 받는 오버덴춰의 술식이 고정식 보철물과 다른 하나의 방법으로 간주되어질 수 있게 되었다.

오버덴춰 술식이 심미적 경제적 이유 그리고 다양하게 적용할 수 있기 때문에 최근에 확대되는 경향이 있다.

골융합성 임프란트에 의한 고정식 보철물에 대한 광범위한 장기 결과들이 있는데 반하여 여러 어태치먼트를 이용한 오버덴춰 술식은 임상결과나 적용에 과한 지식들이 거의 발표되지 않았으며, 현재까지 임프란트 오버덴춰를 가진 환자의 구강기능에 대한 단지 몇개의 연구들만이 발표되었다.

우리는 장기 임상평가에 의해서 임프란트 오버덴춰를 아주 조심스럽게 평가해야 한다.