



Shiraz University of Medical Sciences Health service
school of Dentistry

**Rehabilitation of the oral function of
edentulous patient by implants**

By:

Mohammad Reza

Rahmani-nejad

Thesis for the Degree of :

D. M. D. in Dentistry

Adviaor: Dr.mitra farzin

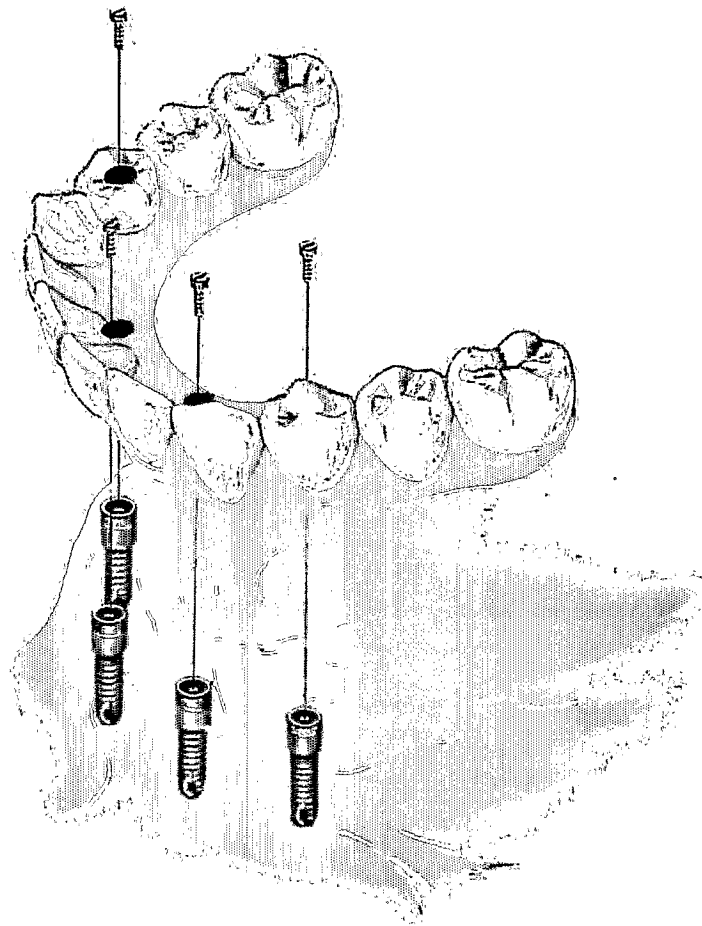
۱۳۸۵ / ۱۷ / ۱۷

Date: 2006

۱۰۹۰۱۲

Handwritten signature or mark.

Rehabilitation of the oral function of edentulous patient by implants



Contents(inhoud) page 1

Summary (samenvatting) page 20

Chapter 1 page 1

1.1 introduction

1.2 aims and questions

chapter 2 Method of research page 4

chapter 3 Results page 4

3.1. Edentulous patients who qualify for implant

3.1.1. Anamnesis

3.1.2. Clinical and radiographic research page 5

3.1.3. Indication area page 6

3.1.4. Contra indications page 9

3.2. Implant systems page 10

3.2.1. One or two phase implants

3.2.2. The IMZ implant system page 11

3.2.3. The Branemark implant system page 13

3.2.4. The ITI Bonafit implant system

3.2.5. The Dyna implant

3.3. Fixed or removable constructions page 14

3.4. Number of implants page 15

3.5. Treatment plan page 18

3.6. Rehabilitation of edentulous lower jaw with help of implants page 19

3.6.1. The overdenture prosthesis page 20

3.6.1.1. Combined implant mucosal worn prosthesis

3.6.1.2. Full implant worn prosthesis page 21

3.6.2. Fixed (bridge) construction

3.6.3. Anchoring systems	page 24
3.6.3.1. Dalbo tube retention	
3.6.3.2. magnet retenticon	
3.6.3.3. Push buttons	page 25
3.7.1. The overdenture prosthesis voor edentulous uper jaw	page 26
3.7.2. Fixed construction for edentulous upper jaw	page 27
3.8. Occlusion articulation concept	page 29
3.9. Complications and failures of implants	page 30
3.9.1. Wrong indication	page 31
3.9.2. Wrong choice of material	
3.9.3. Insufficient expericence surgeon	
3.9.4. Insufficient planning and preparation	page 32
3.9.5. Acute or chronic infections	
3.9.6. Wrongly carried out prosthetic supplies and overload	page 33
3.9.7. Insufficient readjustment	page 34

chapter 4 discussion and conclusion.

<u>4.1. Which patients quality for implants?</u>	<u>Page 34</u>
--	----------------

<u>4.2. Which implant systems and suprastructures can be applied at the edentulous patients?</u>	<u>Page 37</u>
--	----------------

<u>4.3. What is the role of impalnts for the edentulous upper and lower jaw?</u>	<u>Page 38</u>
--	----------------

<u>4.4. Which occlusion articulation concept can be applied at implants?</u>	<u>Page 40</u>
--	----------------

<u>4.5. Which complications and failures of implants and suprastructures on implants are frequently found?</u>	<u>Page 41</u>
--	----------------

<u>4.6. Final</u>	<u>page 42</u>
-------------------	----------------

Introduction:

1.

Implants are nothing more than artificial tooth roots which are introduced in the jaw on which removable or fixed supplies can be connected.

Implants are not new as thousands of years ago the Inca's and Egyptians tried to make new teeth out of shells or ivory and tried to place them in the jaw. Of course, modern implants are consisted of other material. The dental implantology in the past was characterised and developed on the basis of trial and error. After 1900, first experiments were performed using external material.

All first, it was especially consisted of gold while after the second world war, chromium, cobalt, molybdenum alloy, tantalum, carbon and polymethylmethacrylate (PMMA) were introduced. The so called materials had no real.

direct contact between implant and bone and only a thin layer of tissue covered the implant. Since that time, efforts were undertaken for small number of patients who did not want to carry a removable prosthesis at all.

The implantology had a doubtful reputation as therapy. At the end of the fifty's, a good biocompatibility of titanium was discovered accidentally and With the introduction of this material, the foundation of the modern implantology was established.

In the sixty's and seventy's, the attention was especially paid at the implant material and a good healing of the implant in the bone was observed. late seventy's and eighty's more and more implant systems appeared on the market. The acceptability of

implantology increased and the real treatment concepts such as the two phases implant arose.(1)

Dental implantology receive a lot of attention nowadays as More and more dental implants appear of public health importance and the well-being of patients are influenced as a positive sense of feeling.

Partial and complete edentulous jaws not only disturb the oral function but also cause aesthetical problems. Aesthetics is an important factor nowadays for the patients. People with prosthesis, who already in young age became edentulous, are clear examples. These patients after many years' of carrying a prosthesis still consider them in acceptable (in dental sense) due to the extreme reduction of the processus alveolaris.

The reduction of the processus alveolaris will not only cause loss of function of prosthesis but also have aesthetical problems for the patients. It is estimated that 10-20% of patients with prostheses are not satisfied with their prosthesis. The main complaints may be looseness of the lower prostheses, pain , difficulties during eating and talking. Furthermore, there are aesthetical complaints such as bad facial appearance and insufficient closure of the lips.(5,7)

All these complaints can lead to a general feeling of dissatisfaction. Such patients have a strong need to oral rehabilitation and repairing of the oral function as well as the aesthetics are needed and the application of implant technology could lead to oral rehabilitation(2,4)

Many complaints of the edentulous patients result from an insufficient grip and particularly stability of the lower prostheses. The most important cause is resorption of the jaw and also to a lesser degree of the upper jaw of the lost elements.

Much of these problems can be solved by using implants. An example is attaching of implants under the prosthesis. So, loose prosthesis is strongly improved. In this survey, attention was paid on the rehabilitation of edentulous patients using implants.

1.2. Aims and questions:

The expectation of patients. In relation to the result of the treatment with implants is frequently high and if these expectations are not satisfied, it must not be chosen. The bad function of a prosthesis beside the fact implants are technically possible can not be a direct reason for that the use of indication implants.

For this reason the dentist must do a thorough clinical and radiographic investigation to determine if the patient is qualified, for receiving implants or not.

The objective of this survey was to determine the important factors implants in order to offer a realistic solution for oral rehabilitation of an edentulous patient the following questions were discussed.

- Which patients are qualified for implants?
- Which implant systems and suprastructures can be applied for edentulous patients?
- What is the role of implants for the edentulous patients below and upper jaw?
- which occlusion and articulation concept can be applied for implants
- which complications and failures and suprastructures on implants are frequently found?

Finally the data of this research will be used for a recommendation to give more visibility on rehabilitation for edentulous patients

Chapter 2 Method of Research (Materials and Methods):

This survey relies on literature research. Including publications and articles from 1990 up to now . Topics which are selected are as follows: oral implants, edentulous patient and oral implants over denture prosthesis. The selection criteria had been based on the data about rehabilitation of edentulous patients by implants. Approximately fifty Articles were included.

Chapter 3 Results :

3.1 Edentulous patients who were qualified for implants:

3.1.1. Recall of memory:

The most important, if not, reason to implant edentulous patients their complaints concerning the prosthesis. So, it was important to clarify these complaints at the ir first consult.

During the recalling of memory not,the complaints must become clear but and the patient's expectation should be determined such of the prosthesis complaint is primary or other factors play a role?.

To actieve a successful implant prosthesis, it is important to know the expectation of the patient and, to know the acceptability of the removable prosthesis and (figure 1) When there any is doubt of the quality of the obtained information and from the patient, a questionnaire can be provided(figure 2).(5,7,8,9,38)

3.1.2. Clinical and radiographic research:

Clinical judgement starts with a systematic oral research while a complete medical condition of the mouth, health condition of tongue and soft tissue and pharynx will be provided(Fig. 1-3). Moreover, the altitude and breadth of processus and firmness of jaw the rampart must be determined, nad are determined finally the extent of possible implants and if there is any chance of complications concerning the general health of the patient, it will be clarified to.(5,7,38)

By examining a carried prosthesis one gets important information on the care, possible particular habits and the existence of para functions and among other things, plaque and tartar.

Attention must also be paid to shape, retention and stability of existing prosthesis. As a result, it can become more clear what the problem is, what the possibilities are and what can be improved with a new prosthesis or which problems must be taken into account.

The clinical research must be always completed with radiographic research about the shape and dimension of implant bases, the bone quality and the place and form of shape of anatomic structures.(5,6,7,38)

Solitary photographs are suitable to trace possible root remains and local bone deviations. The orthopantomogram provide a panoramic prerecording of the jaw and is suitable for judging general bone deviations. It is less suitable for tracing root remains. Finally a skull profile photograph must be made to get a good impression of the bone volume in the symphysis area(Fig. 4-6).(5,38)

3.1.3. Indication areas:

The edentulous lower jaw forms the most important area of indication for implants. The edentulous jaw after strong bone resorption would be difficult to be treated. Especially the lack of retention of teething prosthesis is a large problem and can cause patients much discomforto this retention problem can be solved by application of implants in the interforaminal area, however the use of implants in the upper jaw runs up against a number of particular problems. By presence of the nose cavity and the sinusmaxillaris, the available bone volume for application of implants in the upper jaw has been limited. When the processus alveolaris is strongly resorpted, the application possibilities become less. At that point, extra surgical interventions are frequently necessary. Though it can be desirable to apply implants in the upper jaw. For example, in case of patients with extremely flat jaw or with choking problems or the loss of retention and stability of upper prosthesis.(5,6,7,29,38)

Please check or write:

1. Is your health good? YES NO
2. When was your last check up? _____
3. Are you currently being seen by a physician? YES NO
4. Do you have allergies to medications? YES NO
5. Have you ever had a major disease? (Heart, Liver, Kidney) YES NO
6. Are you taking any medications? YES NO
7. How long since your last visit to a dentist? _____
8. What work was done at that time? _____
9. Have you noticed your bite changing? YES NO
10. Do you clench or grind your teeth? YES NO
11. Have you ever had your bite adjusted? YES NO
12. Do you have difficulty in opening your mouth wide? YES NO
13. Do you have pain in or near your ears? YES NO
14. Have you ever been told that you had gum trouble? YES NO
15. Have you ever been treated for periodontal disease (Pyorrhoea)? YES NO
16. Have you ever had orthodontic treatment (braces)? YES NO
17. Have you had any complication associated with any previous dental treatment? YES NO
18. Do you now or have you ever had sinus trouble? YES NO
19. Have you ever had any injury to your face or jaws? YES NO
20. Have you been examined by your physician within the last year? YES NO
21. Are you being treated for any condition by a physician now? YES NO
22. Have you been taking any medicines within the past year? YES NO
23. Has there been any change in your general health in the past year? YES NO
24. Have you lost or gained weight in recent months? YES NO
25. Have you ever been seriously ill? YES NO
26. Have you ever been hospitalized? YES NO
27. Have you ever had surgery? YES NO
28. Have you ever had a blood transfusion? YES NO
29. Have you ever had x-ray or surgery treatment for a tumor growth or other conditions about your head, mouth, or on your lips? YES NO
30. Have you ever been treated for a growth or tumor in any other part of your body? YES NO
31. Are you frequently ill? YES NO
32. Do you often feel exhausted or fatigued? YES NO
33. Have you ever had any of the following diseases or conditions:

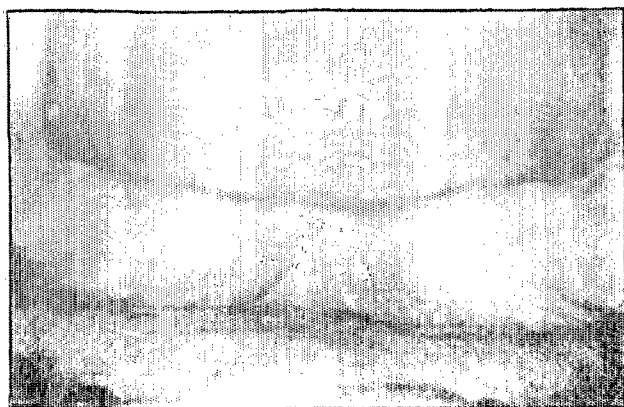
A. Jaundice (yellow skin & eyes) YES NO B. Hepatitis YES NO C. Tuberculosis YES NO D. Venereal disease YES NO E. Heart attack YES NO F. Stroke YES NO G. Ulcers YES NO H. Epilepsy YES NO I. Diabetes (sugar disease) YES NO	J. Measles YES NO K. Chicken pox YES NO L. Mumps YES NO M. Polio YES NO N. Rheumatic fever YES NO O. Scarlet fever YES NO P. Glaucoma YES NO Q. Prostate Disorders YES NO R. AIDS-related complex YES NO
--	--

34. As a child, did you have growing pains or twitching of the limbs? YES NO
35. Have you had painful or swollen joints? YES NO
36. Have you been told by a physician that you have a heart murmur? YES NO
37. Do you now have or have you ever had any heart trouble? YES NO
38. Do you have high blood pressure? YES NO
39. Do you bleed for a long time when you cut yourself? YES NO
40. Do you bruise easily? YES NO
41. Do you have any blood disorder such as anemia (thin blood)? YES NO
42. Do you have any chest pain on exertion? YES NO
43. Are you short of breath on mild exertion? YES NO
44. Do you ankles ever swell? YES NO
45. Do you have a persistent cough? YES NO
46. Do you have asthma? YES NO
47. Do you have hay fever? YES NO
48. Do you have any allergies (to food, cat's fur, dust, etc.)? YES NO
49. Do you have hives or skin rash? YES NO
50. Have you ever experienced an unusual reaction to any of the following drugs:

A. Penicillin YES NO B. Barbiturates (sleeping pills) YES NO C. Aspirin YES NO	D. Iodine YES NO E. Sulfu drugs YES NO F. Other medicines YES NO
--	--
51. Have you ever experienced an unusual reaction to a dental anesthetic ("Novocaine" injection)? YES NO
52. Do you often have to get up at night to urinate? YES NO
53. During the day, do you usually have to urinate frequently? YES NO
54. Are you thirsty much of the time? YES NO
55. Has anyone in your family ever had diabetes? YES NO
56. Has a doctor ever said you had kidney or bladder disease or infection? YES NO
57. Has a doctor ever said you had liver disease? YES NO
58. Do you have any numbness or tingling in any part of your body? YES NO
59. Has any part of your body ever been paralyzed? YES NO
60. Do you ever have fits or convulsions? YES NO
61. Do you have a tendency to faint? YES NO
62. Do you have frequent severe headaches? YES NO
63. Do you consider yourself to be a nervous person? YES NO
64. Do you suffer from severe nervous exhaustion? YES NO
65. Do you often feel unhappy and depressed? YES NO
66. Do you often cry? YES NO
67. Are you easily upset or irritated? YES NO
68. Women — Are you taking female hormones (oral contraceptives, etc.)? YES NO
69. Women — Are you pregnant at the present time? YES NO
70. Women — Are you in or have you passed through menopause (change of life)? YES NO
71. Women — Have you had a hysterectomy or ovariectomy? YES NO

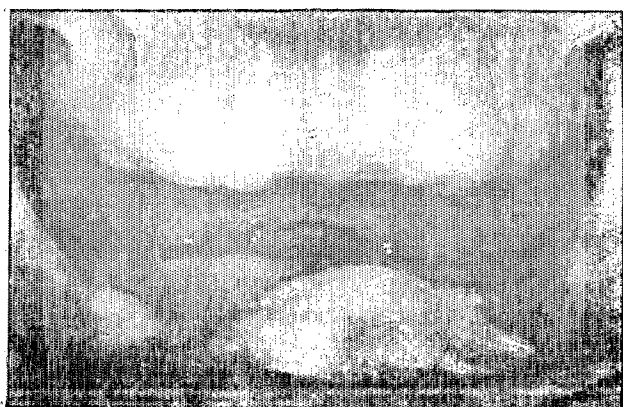
Please inform the doctor if your health changes in any way.

Signature _____ Date _____



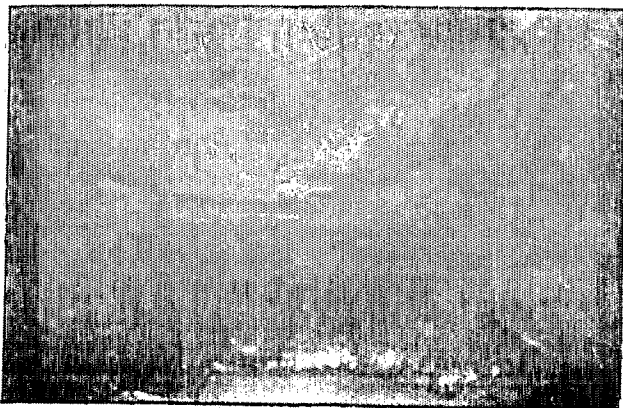
Figuur 1

Een hoge processus in de onderkaak met weinig aangehechte mucosa. De bostrand is scherp en dun; vergelijk de RSP, fig 9.11.



Figuur 2

Bij het intra-orale onderzoek kan blijken dat er sprake is van een onregelmatige processus of te weinig intermaxillaire ruimte.

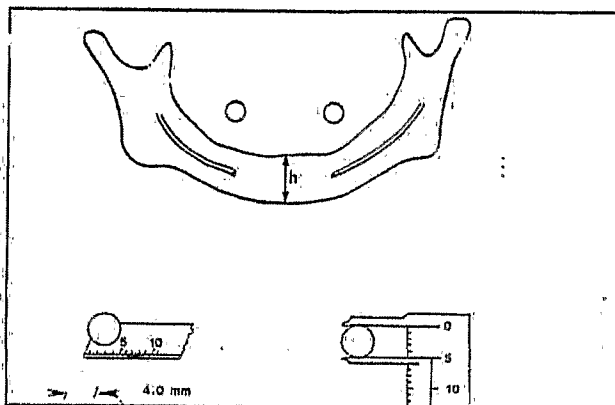


Figuur 3

Sterke atrofie van de processus in de onderkaak. Er is een uitpuilende mondbodem en een ondiepe omslagplooi buccaal. De bovenzijde van de processus is komvormig. Alleen linguaal is er aangehechte mucosa; vergelijk de RSP, fig. 9.12.



a



b

Figuur 4

- a. Kogeltjes van 4 mm doorsnede zijn ideaal om de vervorming te constateren en te berekenen.
- b. Berekenen van de bothoogte met behulp van kogeltjes. De gemeten doorsnede op het orthopantomogram (4,0 mm) wordt gerelateerd aan de werkelijke doorsnede (5,0 mm). De vergrotingsfactor is dan te berekenen: hier 1.25 x.

3.1.4. Contraindication:

Because implants are bleeding interventions with medical dangers, it has to be clarified in what extent there is a risk for a patient. Existing health questionnaire (Figure 2) is at this stage a useful appliance. With this form, the health condition of the patient and the possible medicine use becomes clear.

When treating edentulous patients it concerns frequently older patients. With respect to young people, the elderly use more medication and the chances on medical complications increase. Questions concerning heart, lungs, kidneys and pancreas functions are relevant ones. Also information concerning blood concentration, diabetes, system disorders, calcium metabolism, use of medicine and medical treatments is of importance.

A useful classification of health risks is reported by American Society of Anaesthesiologists (Asa-criteria). Health dangers are classified as follows: - healthy patient ASA 1

- light systemic deviations ASA II
- activity obstructing deviations ASA III
- live restrictive deviations ASA IV

So implant treatment will be strongly contraindicated or precautions must be taken into consideration. In general, one will not treat patients of ASA III and ASA IV categories.

There is a number of medical and other indications for using implants sycg as Patients with endocrine disorders, uncontrolled diabetes mellitus, pituitary and adrenal insufficiency and hypothyroidism which may experience considerable healing problems.(5,6,7,9,16)

Patients with uncontrolled granulomatous diseases, such as tuberculosis and sarcoidis may also have a poor healing response to surgical procedures.

Patients with cardiovascular diseases, such as arteriosclerosis with angina, aortitis with marks aortic insufficiency, or aortic aneurysms don't usually have a problem with healing, but may pose a management problem in elective surgeries.

Patients with bone disease such as histiocytosis X, paget's Disease and Fibrous dysplasia may not be good candidates for implants, because there is a higher chance for the implant to fail due to poor Osseointegration.

Finally patients with uncontrolled haematologic disorders such as generalized anaemia's, haemophilia (factor VIII deficiency). Factor IX, X and XII deficiencies and any other acquired coagulation disorders are contraindicated to surgical procedures due to poor haemorrhage control.

A patient who smokes regularly is definitely contraindicated! Numerous studies have shown that the success rate of implants drops sharply in heavy smokers.

3.2 Implant systems:

There are several implant systems which are arranged to rehabilitate the oral function of edentulous patients. To be able to make a choice from the quantity of types is not only dependent of the situation of the patient but it also depends on the experience and the insight of the person who treats the patient. In this survey some implant systems which are frequently applied come up for discussion.(5,6,9,19,38,50)

3.2.1 One Or two phases implants

At two phase systems implants are fixed on bone height and are directly covered with mucoperiosteals,(first phase). After healing, they are uncovered during the second

operation and implants are introduced into the jaw (abutments). At one phase system implants stick out of the gums after placing and remain exposed towards the mouth hole during the healing period. Two phases implants are now mostly used.

When they are entirely covered with mucosa after their introducing, one has the possibility to do additional bone corrections during the implant procedure. But there is a second surgical phase necessary to look up the implant and place the abutment. During this step, there is an occasion to complete the peri-implant mucosa. This is not possible during implantation of a one phase implant.

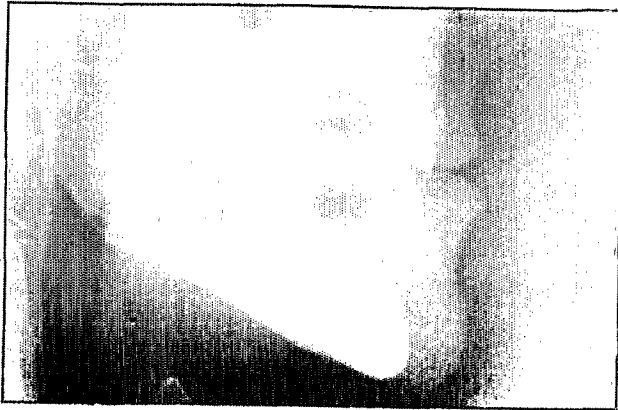
In both strongly arthritic under and upper jaw, it would be important. For the functioning of a overdenture prosthesis it is not important if a one or two phases implants are applied. However, it is important that all desired prosthesis requirements can be met.

It has become clear that there is no significant difference between one and two phases implants concerning plaque, tartar, gingivitis and haemorrhage sores during observation.(5,7,15,19,38)

3.2.2. The IMZ Implant system :

the IMZ system exist from a cylinder implant, a set of matching drills and several screw suprastructures. The implant cylinder of the IMZ system has a wound up base where its point pressure can be prevented. The implant has been made of technically pure titan with varies in surface structure, such as titan plasma Spray and coating with hydroxylapatite.

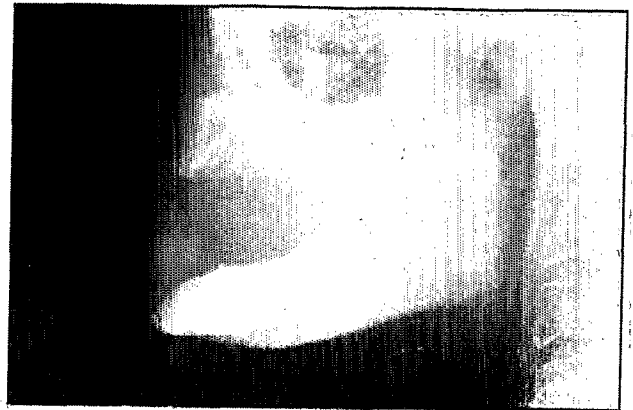
IMZ implants can become indicated for patients with edentulous upper and lower jaw. THE IMZ implant asks relatively little bone volume. The smallest implant is applicable at a bone thickness of about 4 or 5 mm.(5,6,38)



Figuur 5

Röntgen-schedelprofielfoto (RSP).

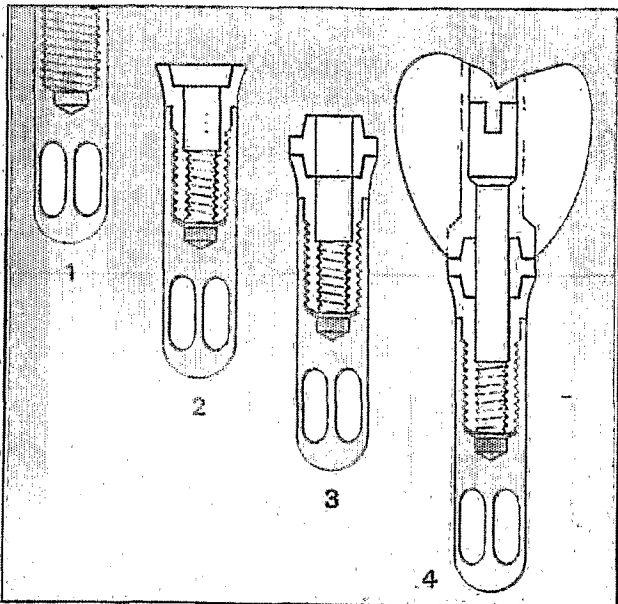
Op een RSP krijgt men een goede indruk van het botvolume van de onderkaak in het mediane gebied. Er is een hoge scherpe processus. Bij het implanteren is het nodig het bot enkele millimeters te verlagen totdat een plateau van 5 mm breedte is bereikt. (Zelfde patiënt als van fig. 9.2.)



Figuur 6

Röntgen-schedelprofielfoto.

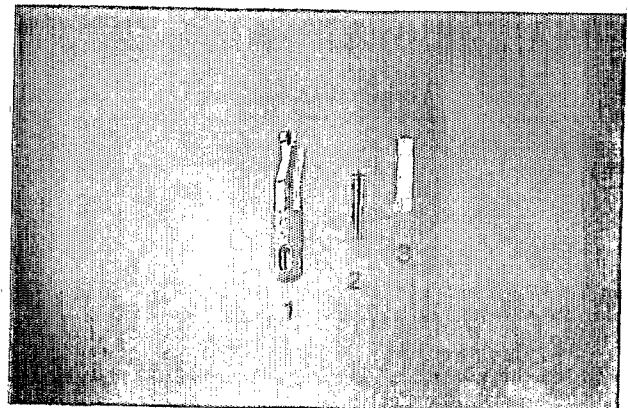
Er is een sterke atrofie van de onderkaak (Cawood klasse 7). In dit geval is er voldoende breedte. De hoogte is gering. Voor het maximaal benutten van de beschikbare bothoogte moeten de implantaten iets achterover hellen. Let op de komvormige bovenzijde van de kaak t.g.v. de sterke atrofie. (Zelfde patiënt als van fig. 9.3 en 11.4.)



Figuur 7

De anatomie van het IMZ-implantaat.

1. Het implantaat met afsluitschroef.
2. Het implantaat met titanium insert.
3. Het implantaat met titanium insert, plus intramobile connector (IMC).
4. Het implantaat als boven plus kroon, vastgezet via een oclusale fixatieschroef



Figuur 8

IMZ-implantaat (1) met een opbouw onder een hoek van 15° en een lange fixatieschroef om af te drukken, de korte fixatieschroef (2) en een kunststof stopje (3) om de opening boven de verzonden fixatieschroef af te dichten

3.2.3 The Branemark - implant system :

This implant is of the oldest implant system and is named for the designer, P.I. Branemark. The implant is manufactured of titanium and has a propeller wire to increase the initial stability and retention. The original application area of this system was aimed itself on the complete edentulous jaw as a replacement of the complete prosthesis by placing several implants in upper and lower jaw.(5,6,12,38)

3.2.4. The ITI - Bonefit implant system:

The Bonefit system includes several implant types such as screws and hollow cylinders which have been all manufactured with titanium and provided of plasma flamespray coating. It is a one phase implant at which the surgical and prosthetic phases are well standardized. It is arranged by its diversity for application for several indications. Therefore, it is suitable for application in combination with an overdenture prosthesis.(5,6,10,38)

3.2.5. The Dyna implant:

The Dyna implant is a cylindrical two phases implant with a left turning wound up propeller wire. The implant is not screwed into the bone. The prepared implant area has been dimensioned in such a way that the implant can be placed under light pressure.

The neck of the implant is just as broad as the apical (propeller wire) part and concludes the implant bed entirely. After healing, the propeller wire must cause a larger retention by more implant bone contact (surface enlarging). The Dyna implant is manufactured from titanium and is provided with calcium hydroxyl apatite. The Dyna implant system

have been particularly intended for the edentulous patient to support overdenture prostheses on two or four implants.

Other applications are moreover conceivable such as a fixed construction in the edentulous jaw on five or six implants.(5,38)

3.3. Fixed or removable construction:

While making a choice between a removable construction (overdenture prostheses) or a fixed construction (bridge construction), several factors play a role. The largest advantage of a fixed construction is that these become as more body-own, which can promote prosthesis acceptance strongly. At small intermaxillar distance, it will not be often possible to manufacture a removable construction due to shortage of space. The only option is a fixed bridge construction. But a shortcoming of this is frequently a lisping speech and sometimes combined with spits of saliva, by escape of air or cervical saliva along the implant pillars.

The large aesthetic advantage of a removable construction is that the missing support for lips and cheeks can be repaired by means of art resin extension in the buccal gingival buccal volt. Also it is easier for the patient to keep his implants free of plaque.

At parafunctions, a removable prosthesis has the large advantage while removing of the prosthesis overload for implants can be avoided. The comparison between fixed and dismountable construction have been summarised in Table.(5,7)

Table 4.1:

- vertical bone loss, upper front
- sagittal bone loss, upper front
- antagonists under/upper jaw
- motivation

- intermaxillair distance
- aesthetics
- intermaxillair relation
- speech
- mental factors
- oral hygiene
- financial factors
- pression factors concerning prosthetic construction

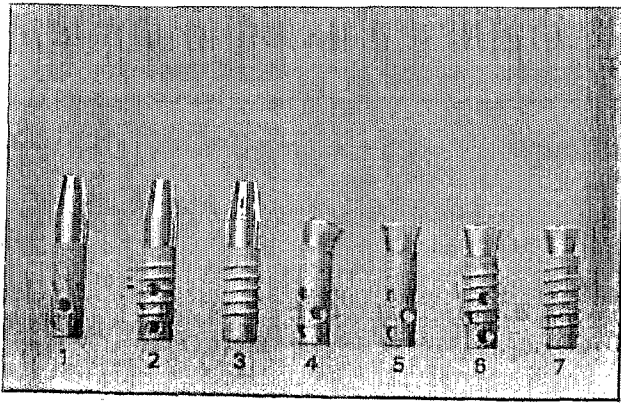
3.4. The number of implants:

One of the most frequently asked questions in relation to dental implant of supported restorations is “How many implants should be used to support a given restoration?” There are no scientific based rules to indicate how many implants are necessary are for a construction of implants.

The number of implants necessary to support a given restoration is dependent on several factors which can be organized into five broad categories:

1. The amount or volume of bone
2. Bone density
3. The occlusion and opposing dentition
4. Available proprioception
5. Overall location of implants

These five categories are used to help us to evaluate a given treatment situation in terms of the minimum number of implants necessary to insure the success of a restoration. In this evaluation, there are two other factors which should be considered.(5,7,38)

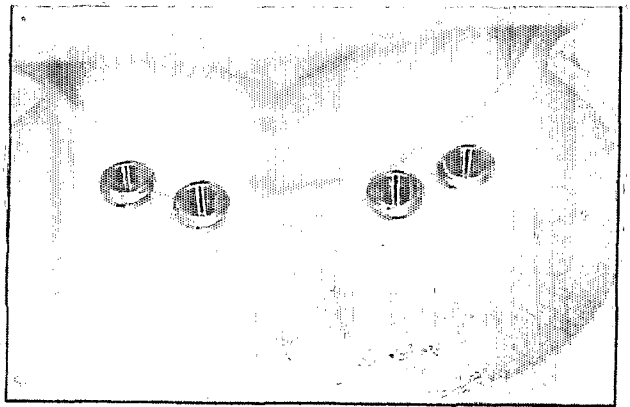


Figuur 9

De ITI-Bonefit-implantaten van titanium zijn cilindervormig en worden permucosaal geplaatst.

1. hol cilinderimplantaat ééndelig
2. hol cilinderimplantaat met schroefdraad, ééndelig
3. schroefimplantaat ééndelig
4. holle cilinder met 15° hoek, tweedelig
5. holle cilinder, tweedelig
6. holle cilinder met buitenschroefdraad
7. schroefimplantaat, tweedelig

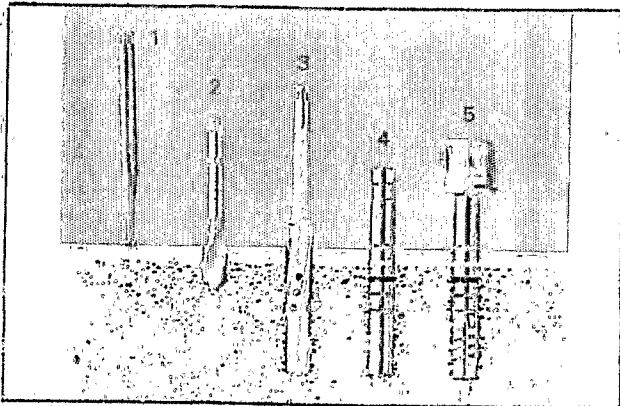
Foto: Institut Straumann, Waldenburg, Zwitserland.



Figuur 10

Edentate onderkaak met vier ITI-Bonefit-implantaten, permucosaal geplaatst.

Met dank aan Dr. C. ten Bruggenkate.

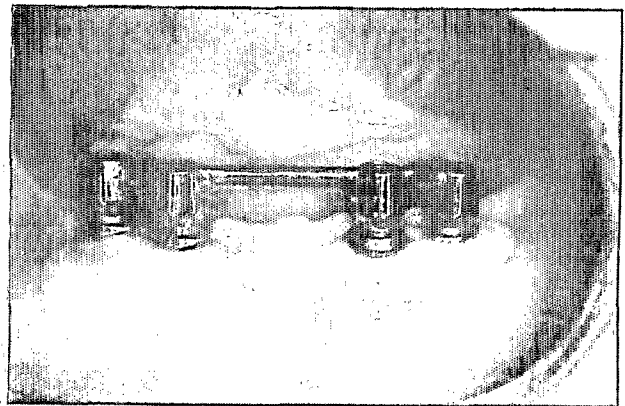


Figuur 11

De boren van het ITI-Bonefit-implantaatsysteem. 1. markeringsboor, 2. spiraalboor van 3,5 mm diameter 3. holle frees 3,5 mm.

4. dieptemeter, 5. schroefdraadsnijder

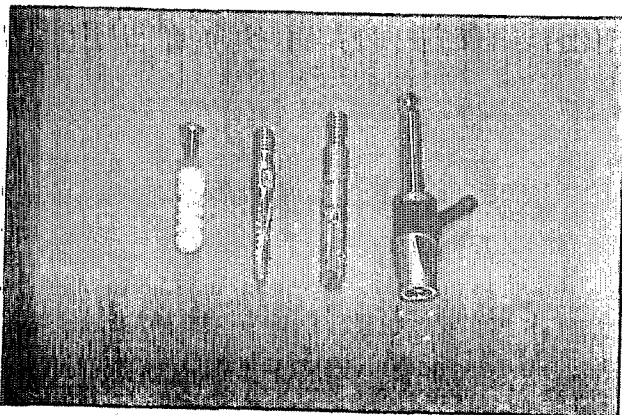
Foto: Institut Straumann, Waldenburg, Zwitserland.



Figuur 12

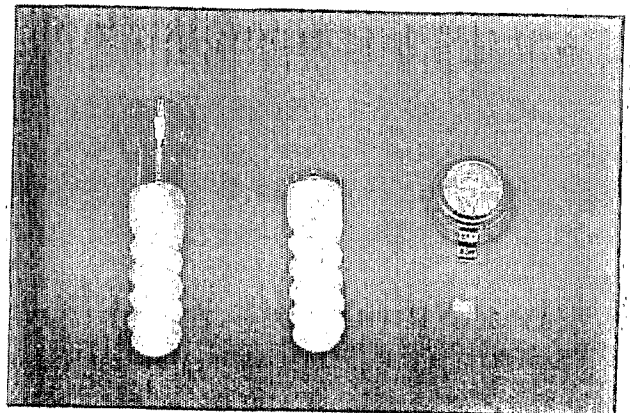
Een staafconstructie op vier ITI implantaten. Rond de implantaten is een mucosatransplantaat aangebracht om meer aangehechte gingiva te verkrijgen.

Met dank aan Dr. C. ten Bruggenkate.



Figuur 13

Het Dyna-implantaatsysteem. De borenset, behorende bij het Dyna-implantaat, bevat één voorboor, een cilindrische schachtboor en een adaptor voor de koeling met een fysiologische zoutoplossing.



Figuur 14

Dyna-implantaat met opbouw van een ferromagnetische legering.