

IMMEDIATE LOADING IMPLANTS IN EDENTULOUS PATIENTS: A STUDY OF TWO TYPES OF IMPLANTS

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ABSTRACT. The need of patients for a better quality of life in terms of mastication and aesthetics which for them are in the first place, induced by everyday needs, made the branch of implantology to develop more and more types of implants, starting around the years 50s with the implants with late loading, at 6 months after implant insertion, to this days, when we have a great range of implants, techniques and technology. Our study compares two types of immediate implants with immediate loading placed in a single environment at one patient. Our study follows the evolution of 16 patients over a period of 1 and a half years. We have placed both types of implants to allpatients, these were required by the environment,depending to the height and the thickness of the bone. After 18 months the survival rate of the implants was 100%.

KEYWORDS: dental implants, types of implants, bone loss around implants, immediate implants

INTRODUCTION

Edentulism is a disability affecting millions of individuals worldwide. Edentulism remains prevalent in some elderly communities with more than 50% of the population(Douglass CW et al).

In the case of patients with edentulous atrophic mandibles, this can create discomfort owing to the instability of the provisional denture, which frequently occurs because of reduction of sulci and superficial insertion of muscles, such as mentalis, genioglossal and mylohyoid muscles. In recent years an increasing interest toward a shortening of times between implant placement and implant loading has developed[2].

Loading protocols for the dental implant treatment of edentulous jaws have been widely discussed inthe dental literature. Initial implant stability, implant surface characteristics, bone quality, bone healingin term of prosthesis design, and occlusion pattern during the healing phase have been identified as influential factors in successfully achieving osseointegration with modified loading protocols[1].

Implants are usually left to heal unloaded for 6 months to obtain osseointegration[3], but this healing period may cause some discomfort to patients because of the instability of the provisional dentures. Shortening

treatment time can be achieved with one-stage surgery and immediate loading of dental implants[3].

A variety of attachment systems have been used to retain the overdenture, such as bar and ball attachmentsand locator and magnet attachments. In general, these systems are divided into two major categories: splinted and non-splinted[2]. The use of two to four implants connected with a bar seems to dominate the literature[2], although the use of two to four unsplinted implants has been reported to be a feasible option[10]. The advantages of the latter technique are simplicity and low costs[8].

Over the last years, a considerable number of surface modifications, such as sandblasting, acid-etching, gritblasting, anodization, discrete calcium-phosphate crystal deposition, coatings with biologic molecules, and chemical modification have been introduced to obtain microrough and nanorough implant surfaces[4-6]. All the traditionalmethods used formanufacturingandprocessing dental implants, however, result in a high-density titanium structure with a microrough or nanorough surface; using these methods, it is not possible to fabricate implants with a functionally graded structure, possessing a gradient of porosity perpendicular to the

long axis, a relatively high porosity at the surface, and a high density in the core[4-6].

MATERIALS AND METHODS

For our study we have selected a number of 16 healthy patients, all of them having total edentation or a partial edentation in which, after evaluating the remaining teeth we arrived to the conclusion that they have to be extracted. Selected patient had no: heavy smoking habit, uncontrolled diabetes, thyroid disease, previously they had local radiotherapy, or undergoing chemotherapy, medication (bisphosphonates) for osteoporosis, neurologic diseases.

We evaluated all the selected patients clinically and that they comply with the requirements of the dental implants. All of them had a good oral hygiene, consisting of a thorough brushing together with the use of adjunctive brushing means. Also every patient had no periodontal disease, they all had a healthy gingival structures.

At every patient we have required a set of analysis which implied: a radiographic investigation such as orthopantomography, a computer scanner of the maxillary bones and blood tests (fig. 1). For each selected patient with partial edentation we elaborated a treatment plan, which led us to the extraction of the compromised teeth because they could not benefit from conservative treatments. However we kept remaining teeth on the arcade until we discover the implants (after 3-6 months).

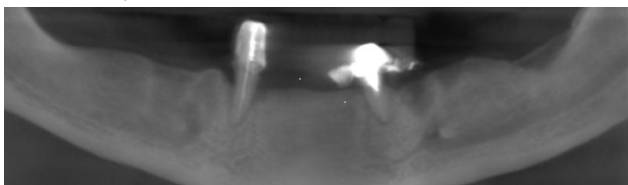


Figure 1. Computer scanner of the mandibula

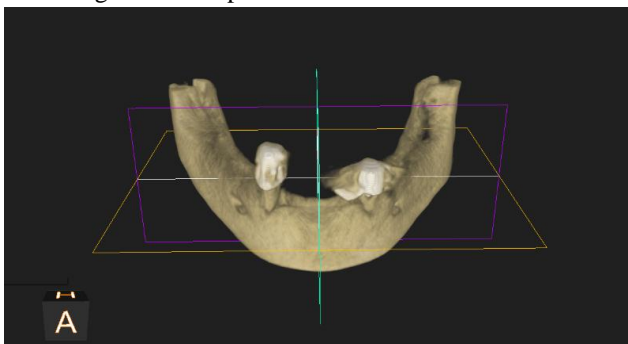


Figure 2. Volumetric 3D CT-CBCT

At every patient, after a thorough analysis we have established the best place with the best quality of bone and the most appropriate height and thickness involving the diameter of the bone.

By choosing the best place we considered all of the three zones which are taken into consideration by the specialized literature, meaning the two posterior areas of the arches and the frontal area.

The best quality of bone was established by the bone density but also considering the areas where the masticatory forces will be propagated uniformly throughout the edentulous dental arch but also by the future prosthetic restoration.

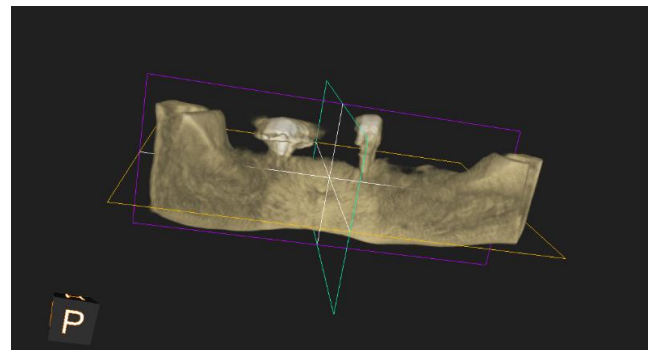


Figure 3. Levels in volumetric 3D CT-CBCT

The height and thickness was evaluated first on the radiography and after with a computer scanner investigation like volumetric 3D CT-CBCT.

In terms of radiographic we had taken into consideration and evaluate adjacent anatomical structures such as maxillary sinus, nasal cavities, mandibular canal, mental foramen. In choosing the place for the future implant we took into consideration that we should place them at a safe distance from all of the above.

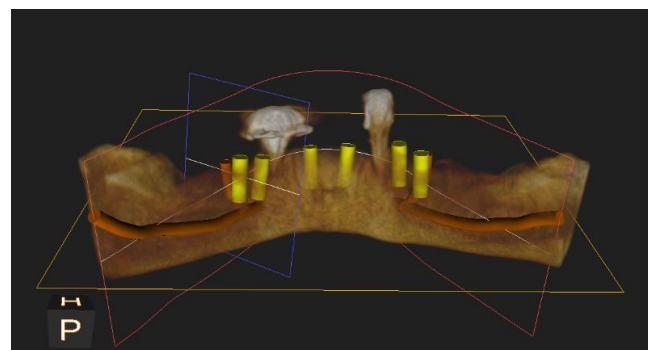


Figure 4. Implant simulation on volumetric 3D CT-CBCT

At the selected lot of patients we didn't need to make any additional intervention such as sinus lifting because there was enough height and thickness of the bone in the surrounding areas. Also we could approximate the height of the bone so that when we examined the volumetric 3D CT-CBCT we could examine it further.

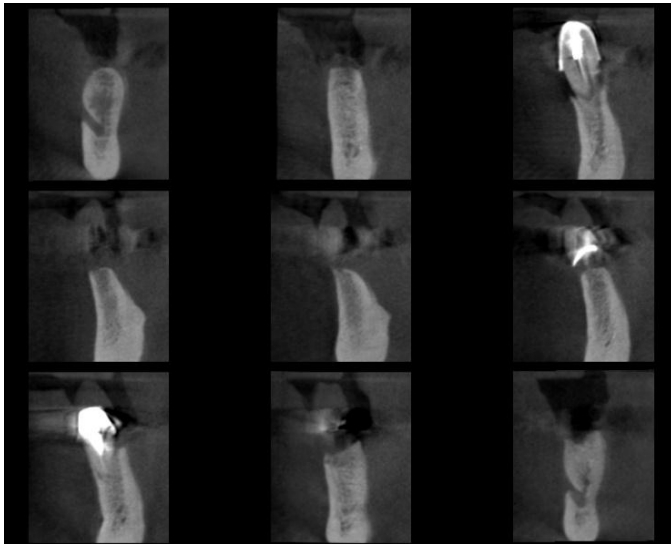


Figure 5. Different section on volumetric 3D CT-CBCT

After we established on radiography the enough height of the bone for applying a implant the volumetric 3D CT-CBCT has provided us with the exact height and width resulting in the end the implant diameter and height. The exact height and width was expressed in millimeters and then we compared it with our implants and so we have chosen the future implant.

By making this kind of investigations we reduced dramatically the chances for complications, as well as the operating time and the number of visits to the practice.

For the selected lot we used screw-type implants, and we had chosen the ones that are covered with a layer of hydroxyapatite, because we consider that they assure a good osseointegration for the future implants. We used two brands of this types of implants.

During the actual procedure of inserting implants, at every patient we a linear incision was made on the alveolar crest, taking off the soft parts, we pointed the implant, we realized the future implant orientation

and length working with a cylindrical cutter and we examined the cavity walls with a periodontal probe. Then we passed to the preparation of the bone using cutters from the smallest diameter to the one that has a diameter equal to that of the implant itself. When we reached the last millwe applied parallelization pins to finally get parallel implants one to other in order to achieve a good future prosthetic insertion. The implants were inserted with 0,5mm under the edge of bone. The remaining teeth on the arcade we used them for a temporary prosthetic until we discover the implants after 3-6 months, depending on the case.

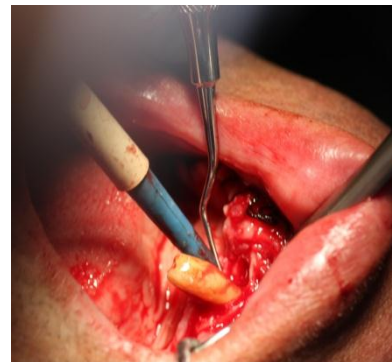




Figure 6. Intraoperative stages of the insertion of implants

After 3-6 months, during osseointegration, we discovered the implants in order to apply the gingival healing abutments. After their application we waited three weeks and took the dental impression in order to achieve future prosthetic. After it was made we applied it in to the oral cavity of the patient.



Figure 7. Dental impression of the dental arch and the finite prosthetic.

RESULTS

We recalled the patients after 6 months and evaluated the healing process clinically and radiological. We had to examine a number of 107 implants that were placed in 16 patients. We used two brands of implants and they were chosen randomly.

number of patients	Alpha Bio	Denti	number of implants
16	32	75	107

Figure 8. Table with the number of patients and implants

We examined every three months the clinical involvement of the implants but also the radiographic involvement.

In the clinical involvement we had followed four aspects, namely: if there was any pain in the area of the implant static or dynamic (regarding the mastication), the mobility of the implant, the gingival inflammation and also if it was present on the dental arch.

In the radiographic involvement we study the bone loss.

After the first six months the survival rate was a percentage of 100%. There was no clinical involvement

such as pain in the area of the implant, no mobility, no the gingival inflammation and also all of the implants were present on the dental arch. As the radiographic involvement we can say that there was a bone loss less than 0,5mm at 41 implants, basically these implants had a size less than 9.5 mm. At the rest of 66 implants we had a bone loss between 0,5mm-1mm, and those implants had a length greater than 9,5mm. Of course the loss of bone ranged from one implant to the other, and it was not uniform.

		implants affected			implants affected
clinical involvement	mobility	0	radiographic involvement (radiographic bone loss)	< 0,5 mm	41
	pain	0		> 0,5-1 mm	66
	currently on the dental arch	0		>1-1,5 mm	0
	gingival inflammation	0			

Figure 9. Table with the results after 6 months

At the second recall, after one year the survival rate was also 100%. There was no clinical involvement such as pain, mobility, gingival inflammation and also all of the implants were present in the oral cavity. For the radiographic involvement we can say that there was a bone loss less than 0,5mm at 34 implants, basically these implants had a size less than 9.5 mm. At a number of 62 implants we had a bone loss between 0,5mm-1mm, and those implants had a length greater than 9,5mm. The loss of bone ranged between 1-1,5mm was at 11 implants and all of these implants had a length greater than 13mm.

		implants affected			implants affected
clinical involvement	mobility	0	radiographic involvement (radiographic bone loss)	< 0,5 mm	34
	pain	0		> 0,5-1 mm	62
	currently on the dental arch	0		>1-1,5 mm	11
	gingival inflammation	0			

Figure 10. Table with the results after 12 months

At the third recall after eighteen months the survival rate was also 100%. There was no clinical involvement such as pain in the area of the implant, no mobility, there was a slight gingival retraction but there was no gingival inflammation and also all of the implants were present in the mouth. As for the radiographic involvement we can say that there was a bone loss less than 0,5mm at 31 implants, basically these implants had a size less than 9.5 mm. 64 implants with a length greater than 9,5mm had a bone loss between 0,5mm-1mm. The loss of bone ranged between 1-1,5mm was at 12 implants with a length between 13-15mm.

		implants affected			implants affected
clinical involvement	mobility	0	radiographic involvement (radiographic bone loss)	< 0,5 mm	31
	pain	0		> 0,5-1 mm	64
	currently on the dental arch	0		>1-1,5 mm	12
	gingival inflammation	0			

Figure 11. Table with the results after 18 months

DISCUSSION

In our study we used randomly two brands of implants, both of them being a screw-type implant, covered with a layer of hydroxyapatite, for good osseointegration. Both of those implants were placed in one patient and they were chosen randomly. All implants were placed in the elective areastaking into account of course the size of the bone in both ways: the height and the thickness of the bone, meaning the diameter of the existing bone.

We examined the patients every six months and we observed that there was no clinical involvement. At 18 months we observed clinically, that there was a slight gingival retraction at a large proportion of implantsbut was not significant in terms of the success rate of the implants.

During the surgical procedure there were particular events. To allpatients,surgical incision was made straight, perpendicular to the crest, slightly toward the oral side of the mouth.Achievingthe guidelines for directing the implant, we made the drillingparallel to the boneso that it remainedtheadequate bone support in every way for a good primary stability of the future implant, of course we took in to consideration the anatomical peculiarities of the zone where it was inserted. To this type of implants (both brands)we made the bone condensation with Osteotomesespeciallywhere there was no sufficient bone density.All implants were inserted into the bone by screwing.

When applying the implants we inserted them under the edge of bone, taking into considerationthatin the healing process there is a boneretraction.Basically, to all of the 16 patients, all implants were inserted about 0.5

mm below the edge of the bone. Our study revealed a bone loss between 0,5mm and 1,5mm, which was assessed radiographically by OPG andvolumetric 3D CT-CBCT. Usually the healing process around the implants goes with a bone loss, so when we lost 1,5mm of bone we lost only 1mm.

When we ended our study there was a bone loss less than 0,5mm at 31 implants, with a size less than 9.5 mm, a bone loss between 0,5mm-1mm at 64 implants with a length greater than 9,5mm and a loss of bone ranged between 1-1,5mm at 12 implants with a length between 13-15mm.

After 18 months all 16 patients had all the implants in the mouth, without clinical manifestations tracked by our study, meaning pain, gingival inflammation or mobility, but they had a slight gingival retraction probably due to the bone loss around the implant. There was not a loss that jeopardized the viability of the implant.

CONCLUSION

Our study revealed that after 18 months there is a bone loss between 0,5mm-1,5mm, but this doesn't influence the survival rate of the implant.

The bone loss following the healing process of the implant with osseointegration is not dependent on the type of implant inserted

With all the types of implants that appear on the market and the great variety of brands that they produce them, for the implantologists is hard to choose the best variant of implant for the patient. Our study shows that using two types of implants in one patient is a success.

REFERENCES

1. Chiapasco M. Early and immediate restoration and loading of implants in completely edentulous patients. *Int J Oral Maxillofac Implants* 2004;19(suppl):76-91.
2. Douglass CW, Shih A, Ostry L. Will there be a need for complete dentures in the United States in 2020. *J Prosthet Dent*. 2002;87:5-8
3. Gallucci GO, Morton D, Weber HP. Loading protocol for dental implants in edentulous patients. *Int J Oral Maxillofac Implants* 2009;24(Suppl.):132-146.
14. Alsabeeha N, Atieh M, Payne AG. Loading protocols for mandibular implant overdentures: A systematic review with meta-analysis. *Clin Implant Dent Relat Res* 2010;12(Suppl. 1):e28-e38.)
4. Mangano C, De Rosa A, Desiderio V, et al. The osteoblastic differentiation of dental pulp stem cells and bone formation on different titanium surface textures. *Biomaterials* 2010;31:3543-3551.
5. Mangano C, Piattelli A, d'Avila S, et al. Early human bone response to laser metal sintering surface topography: A histologic report. *J Oral Implantol* 2010;36:91-96.)
6. Mangano C, Raspanti M, Traini T, et al. Stereo imaging and cytocompatibility of a model dental implant surface formed by direct laser fabrication. *J Biomed Mater Res Part A* 2008;88:823-831.
7. Matteo C., Claudi G., Implant-retained mandibular overdentures with immediate loading: A 3-to 8 years retrospective study in 328 implants. *Clin Imp. Dent. Relat. Res.* 2003; 5:29-38
8. Naert I, Alsaadi G, van Steenberghe D, Quirynen M. A 10-year randomized clinical trial on the influence of splinted and unsplinted oral implants retaining mandibular overdentures: Peri-implant outcome. *Int J Oral Maxillofac Implants* 2004;19:695-702.)
9. Shibli JA, Mangano C, d'Avila S, et al. Influence of direct laser fabrication implant topography on type IV bone: A histomorphometric study in humans. *J Biomed Mater Res Part A* 2010;93:607-614.
10. Trakas T, Michalakakis K, Kang K, Hirayama H. Attachment systems for implant

retained overdentures: A literature review.
Implant Dent 2006;15:24-34.