

OUTCOME IMPLANT TREATMENT IN COMPLETE EDENTULISM: A RETROSPECTIVE 5-YEAR FOLLOW-UP STUDY

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ABSTRACT

The study was conducted on 39 complete edentulism cases; in 19 cases (48.72%) the clinical and anatomical conditions allowed to place implant-supported fixed prosthetic restorations, in 12 cases (30.77%) - removable prosthetic restorations and in 8 cases (20.51%) - combined (hybrid) prosthetic restorations. The prosthetic restorations were supported by 260 screw type implants, out of which 160 were of one stage with early functional loading and 100 implants of two stages with functional loading after their integration. For the treatment-planning and design fixed prosthetic restorations the following indicator was suggested: PU/SU (prosthetic units / support units) ratio. An efficient method for the treatment of complete edentulism was elaborated, through FPR on one stage implants.

Key words: complete edentulism, prosthetic restorations on implants, one stage implants, early functional loading.

INTRODUCTION

Complete edentulism is considered a serious pathological condition of the maxillofacial system that affects its basic functions (mastication, phonation, physiognomy, etc.) [1]. Out of these considerations, the prosthetic treatment of complete edentulism is considered to be the most complicated, because both require restoring basic features of the stomatognathic system - such as OVD (occlusal vertical dimension), occlusal plane, lost intermaxillary relations - and stability of total prostheses on an atrophied prosthetic field.

Oral implantology has opened up new horizons in the field of dentistry in general and prosthodontics in particular [1, 2, 4, 6, 10, 11]. Currently many complete edentulism

cases can be restored by implant-supported restorations (ISR), but many aspects of using endosteal one stage implants are still not sufficiently elucidated in the literature yet.

Aim of the study

The aim of the study is to evaluate the rehabilitation of total edentulous patients by highlighting the features of implant-supported prosthetics.

MATERIAL AND METHODS

Over 5 years (2004-2008) 58 patients with complete edentulism were examined (51 with unimaxillar complete edentulism and 7 with bimaxillar complete edentulism), i.e. 65 total edentulous jaws, that have not required any specific pro-implant interventions prior the

placement of endosteal screw type implants. The examination of the patients was done according to the standard scheme [2, 9]. In all cases alternative methods of a specific clinical situation were taken into account [4, 6, 8, 10, 11]. The treatment plan for restoring the edentulous maxilla with implant-supported restorations was accepted by 34 patients - 58.62% (17 men and 17 women), 5 of them with bimaxillary complete edentulism, i.e. 39 implant-supported restorations (60.0%). The patients' ages ranged between 34 and 76 years (Fig. 1). Most patients had accepted one stage implants (convenient price, short term treatment). After receiving the patients' approval on the treatment, the clinical situation and the diagnostic models were studied. After joint consultation with the maxillofacial surgeon the treatment plan was drawn up, coordinating the terms of surgical and prosthetic intervention.

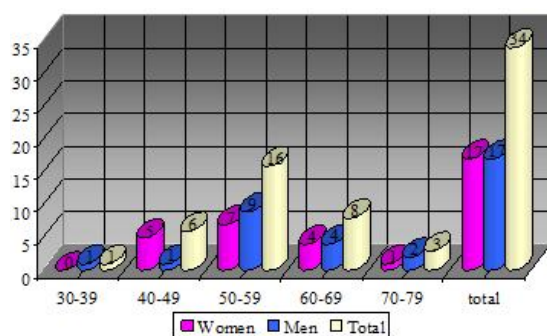


Fig. 1. Distribution by gender and age

For the 26 cases of mandibular complete edentulism (Table 1) the clinical and anatomical terms allowed the use of: 10 FISPR (Fixed Implant Supported Prosthetic Restorations) – 7 on one stage implants and 3 on two stages implants, 11 RISPR (Removable Implant Supported Prosthetic Restorations) – 8 implants of one stage and 3 of two stages implants and 5 HISPR (Hybrid Implant Supported Prosthetic Restorations) – 3 on implants of one stage and 2 on implants of two stages.

For the 13 cases of maxillary complete

edentulism - FISPR were made in 9 cases (3 on implants of one stage and 6 on implants of two stages) and RISPR and HISPR were made on 2 cases for each on implants of one stage.

FISPR (19, representing 48.72% of all the restorations) were represented by:

- **Fixed Crown Block (FCB)** – one restoration in the maxilla, representing 7.69% of implant-supported maxillary restorations and 2.56% of the total number of restorations,
- **Fixed Partial Prosthesis (FPP)** – 2 (15.38%) in maxilla and 3 (11.54%) in the mandible, representing 12.82% of all dentures,
- **Fixed Partial Prosthesis with uni- or bilateral cantilever (FPPC)** – 6 (46.15%) in maxilla and 7 (26.92%) in the mandible representing 33.3% of the total number of prostheses.
- **RISPR** – 12 (30.77% of all prostheses) were represented by: 1 removable overdenture maintained on ball-attachment in the mandible, which constitutes 3.85% of the implant supported mandibular dentures and 2.56% of total prostheses, overdenture with mezostructure-support (presenting a combination of several special means of maintaining, support and stabilization) – 2 (15.38%) in the maxilla and 9 (34.61%) in the mandible, representing 28.21% of all prostheses.
- **HISPR** - 8 (2.51% of all prostheses) were designed as a combination of implant-supported fixed prostheses for the anterior regions in maxilla and mandible and a traditional removable prosthesis (clasps or laminar dental prosthesis) in the distal regions. Fixed and clasps combination – 7 per total (17.95% of all prostheses) were made in number of 1 (7.69% of 13 prostheses) in maxilla and 6 (23.08% of the 26 prostheses) in the mandible and the fixed and laminar combination only in one case in the maxilla.

	Infrastructure			Superstructure						TOTAL PROSTHESES
	one stage	two stages	total implants	Fixed		Removable		Hybrid		
				total prosthesis	total implants	total prosthesis	total implants	total prosthesis	total implants	
Maxilla	45	56	101	9	84	2	7	2	10	13
Mandible	115	44	159	10	97	10	38	6	24	26
TOTAL	160	10	260	19	181	12	45	8	34	39

Table 1. Distribution of types of implants and prosthetic restorations according to the jaw

In the present study, implant-supported prosthetic restorations were made on 260 endosteal screw-type dental implants: 160 one stage casted implants (the "СТИ-ЮЛ", S. Petersburg, Russia) with early functional loading and 100 two stages implants (Alpha-Bio, Israel) with functional loading after their integration.

FISPR were performed on 181 implants corresponding to 98 of one stage implants (10 prosthesis – 3 in maxilla, 7 in mandible) and 83 of two stage implants (9 prosthesis - 6 in maxilla, 3 in mandible). RISPR were supported by 45 implants corresponding 34 of one stage (9 prosthesis - 2 maxillary, 7 mandibular) and 11 of two stages (3 prosthesis - all in the mandible). HISPR were realized on 34 implants: 28 of one stage (6 prosthesis – 2 in maxilla, and 4 in mandible) and 6 of two stages (2 prosthesis in mandible).

7 two stages implants did not integrate into the "waiting" period, the reason being related to the wearing of transitional removable prosthesis; 4 implants were lost and 3 replaced (maxillary). 5 implants were inserted (2 patients) in the second stage of the surgery in areas where the remaining teeth were extracted during the first surgical stage. These implants were functionally early loaded in combination with two stages implants. Two of lost implants receiving HISPR were replaced by of one stage implants, inserted in the second stage of the surgery and then combined in bloc with integrated two stages implants. Pre-prosthetic loss of implants of two stages had no impact on the initial

treatment plan and design of prosthetic restorations.

7 one stage implants were lost:

- 3 in the pre-prosthetic period, the reason being the loss of primary stability by widening the indications for early functional loading for bones with low density - type D4 (2 clinical cases),
- 4 implants (one clinical case) - one year after the application of the overdenture because of the non-compliance of the basic hygiene norms.

Clinical situations have been solved by refurbishing the prosthetic restorations. At all implants was achieved a good primary stability, assessed using the Periotest - Siemens (Germany) device.

The treatment was performed respecting the requirements of prosthodontics treatment on endosteal dental implants [1, 2, 6, 7, 10].

RESULTS AND DISCUSSION

Out of the initially 58 examined patients with complete edentulism which did not require pro-implant surgical interventions, 34 (58.62%) gave their consent for the treatment plan. This constitutes in 39 complete edentulous jaws. FISPR were made in 19 cases (48.72%), RISPR in 12 cases (30.77%) and HISPR in 8 cases (20.51%). The main reasons for refusing the implant-supported prosthodontics by the other 24 patients were implant-phobia and difficult financial condition.

Fixed implant-supported prosthetic restorations (FISPR)

Implants	Maxillary	Number FISPR	Media $\pm \sigma$		
			Support units (SU)	Prosthetic units (PU)	Ratio PU/SU
One stage	Maxilla	3	9.33 \pm 0.47	11.33 \pm 1.25	1.22 \pm 0.18
	Mandible	7	10.00 \pm 1.41	13.00 \pm 0.76	1.32 \pm 0.18
	Total	10	9.80 \pm 1.25	12.50 \pm 1.00	1.29 \pm 0.14
Two stages	Maxilla	6	9.33 \pm 1.17	11.67 \pm 0.75	1.26 \pm 0.12
	Mandible	3	9.00 \pm 1.63	11.00 \pm 2.16	1.22 \pm 0.08
	Total	9	9.22 \pm 1.36	11.44 \pm 1.20	1.25 \pm 0.09
TOTAL		19	9.53 \pm 1.43	12.00 \pm 1.56	1.27 \pm 0.16

Table 2. FISPR distribution depending on the jaw, implants and PU/SU index

In the cases limited by the unfavourable anatomic and topographical conditions and / or financial motivations of the patient, the dental arch may be reduced to the level of second premolars or to the first molars. According to Bratu [1] the masticatory efficiency may be restored up to 90-100% in the case of long term denture wearers.

Considering this aspect, we proposed to implement a quality indicator in the evaluation stage of implant-supported prosthodontics treatment planning: the ratio PU/SU, where PU - prosthetic units, and the SU - support units. This indication should exceed 2 for two stages implants and 1.5 for one stage implants for types of bones D1-D3 (Table 2). The minimum allowed number of implants should be 6 for two stages implants and 8 for one stage implants. For the D3-D4 bone density type it should be calculated according to the implant isotopes principle [3, 2, 6, 11].

Removable implant-supported prosthetic restorations (RISPR)

The implant-supported overdentures are especially indicated when there is a deficiency of available bone in the lateral sectors of the jaws. Among the conditions to achieve implant-supported overdentures are the following:

- the minimum number of implants should be:
 - 2 for mandible;
 - 4 to maxilla;
- the implants should be distributed uniformly

- the line joining neighbouring implants should not be outside the ridge
- the distance between two neighbouring implants should be as great as possible
- in the placement case of only two implants, the minimum distance between them should be 20 mm
- uniform and multiple occlusal contacts over the occlusal surface

Hybrid implant-supported prosthetic restorations (HISPR)

Hybrid implant-supported prosthetic restorations are, in fact, combining the features of RISPR and FISPR both in clinical and technical stages.

The choice of treatment solution for complete edentulism - fixed, removable or combined - is strictly individual and depends on the supporting bone, the jaw bones density, age, gender, profession etc. Most patients require fixed prosthetic restorations which have all the advantages of traditional fixed prostheses and only after discussions and explanations support many other solutions [1, 2]. Fixed prosthesis on implants has some disadvantages more in the aesthetic plan than in the functional one:

- elongated tooth effect because of the need to restore the OVD in case of atrophied alveolar ridge;
- big cervical embrasures caused by the atrophy of the interdental papilla;
- wide interdental spaces due to dystopia of the implants against the missing teeth positions.

For all the treated patients (except the case described above) a good functionality of fixed prostheses was obtained. The clinical evaluation during the follow-up visits showed a significantly higher functional efficiency of implant-supported prostheses and a satisfactory gingival integration of implants. The radiological examination (orthopantomography, periapical radiography) found a good osseointegration of the implants, insignificant alveolar bone loss - up to 1 mm. No one-stage implant included as abutment for FISPR and HISPR was compromised; the success rate was 100%. For post-prosthetic RISPR only 4 one-stage implants were compromised, the survival rate being 88.24% of the total number of one-stage implants used as support for removable dentures and 97.5% of the total number of one-stage implants. For two-stages implants, the success rate in all cases was 100%, thus nearly equalling their reliability and functionality.

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CONCLUSIONS

1. In order to make implant-supported restorations in complete edentulism cases, the probability of placing a sufficient number of implants without any pro-implant surgical interventions is 58.62%.
2. Considering the prosthetic solution, the probability of restoring a complete edentulism without the pro-implant surgical interventions is: FISPR - 48.72% RISPR - 30.77% and HISPR - 20.51%.
3. The rehabilitation of complete edentulous patients by prosthetic restorations supported on one-stage screw type and early functional loaded implants is effective and can be successfully used in practice.
4. While planning the rehabilitation of the patients with complete edentulism the PU/SU index is necessary to be considered.