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Long Term Evaluation of the Immediate Functional Loading of Single Piece Implants

Mehul Jani[1], Anita Gala Doshi[2], Vivek Gaur[3]
[1] *Private practitioner, Bhavnagar, Gujarat*
[2] *Department of Prosthodontics,Sankalchand Patel University, Visnagar, Gujarat, India*
[3] *Department of Oro-Maxillofacial Surgeon, Jaipur Dental College, Maharaj Vinayak Global University, Jaipur, India*
Correspondence: DrAnita GalaDoshi, Phd Scholar, Department of Prosthodontics,SankalchandPatel University, Visnagar, Gujarat, India.

Purpose: *The purpose of this study was to evaluate the presently used protocol for immediate functional loading (within maximum 3 days) of one-piece implants which are placed according to the methods as prescribed by the IF(Implant Foundation,Germany).*
Materials and Methods*: This prospective cohort study included totally 291 consecutively treated patients who receive 2193 immediately loaded one-piece Strategic Implant®, supporting fixed complete‑arch maxillary or mandibular metal‑ceramic bridges or segment reconstructions in both the jaws. All implants were placed by one treatment provider, who restored the tooth and followed up the patients over the years. Data was obtained from the panoramic radiographs and clinical examination over a period of 90 months.*
Results: *Immediate functional loading of using multiple, cortically anchored basal screw implants as a support for fixed full‑arch and segment prosthesis in the upper and lower jaw demonstrated a high cumulative implant survival rate after an observation period of up to 90 months. Within the limits of this study (2193 Strategic Implants were observed over a period of up to 90months). There was no clinical signs of periimplantitis.*
Conclusion: *Strategic Implant® have a good survival and success rate and are also resistant to "peri-implantitis".*
Key words: *Bendable implant necks, complete arch reconstruction, immediate functional loading, segment reconstruction, Strategic Implant®*

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I. Introduction:

In the major developed countries, there has been a steep decline in edentulism with an increase in the number of partially edentulous patients[1]. However, in countries like India, there will likely be an increase in edentulism owing to the shift in older age groups because the populations are growing older[2]. In India, most people with reduced dentition demand and receive partial removable dental prostheses that are either retained by double crowns, clasps, ball- or other attachments and the longevity and success of the prosthesis depends upon the number and localization of the abutments.In order to support partial prosthesis, either double crowns or resilient ball-attachments are used on standard-diameter implants (>3.5 mm)[3, 4].One of the major limitation of implant anchorage in the dentulous maxilla is linked to the atrophied maxilla owing to bone resorption,that is frequently noted in the posterior maxillary region. Yet, standard-diameter implants require a sufficient width of the alveolar ridge (>5.5 mm) without which bone augmentation procedures are indicated, that would increase the risk of possible side effects as well as increase costs and treatment duration[5, 6].

In order to overcome these limitations, basal implants were introduced in the field of implant dentistry[7]. Over the years, these implants underwent several modifications and currently new basal implants are inserted via crestal approach and screws are anchored into the basal bone[7, 8]. The predictability of these implants are due to the fact that these implants are anchored in the resorption free basal cortical bone and not into the alveolar bone.Furthermore, the incorporation of implant tilting in the maxilla has been reported in literature to present as an excellent alternative to bone grafting. By distal tilting of distal implants in the arch, a more posterior implant and abutment position can be reached, for example, in the "All-on-4 concept" thus allowing and permitting a steep improvement in the anchorage that can be established usingthecorticalboneof thewallofthesinusandthenasalfloor.

The purpose of this study was also to evaluate after up to 90monthstreatmentprotocolinimmediatefunctionalloading forfixedcomplete‑ archprostheses,segmentreconstructions, and single implants in the completely edentulous mandible and maxilla supported by cortically anchored implants and to evaluate implant success rate for those implants, where the abutment heads were parallelized through bending after implant placement. Moreover, in this paper, we report the success and survival rate of the basal implants, secondary variables such as associated pain, discomfort and healing.

II. Materials And Methods:

The study design was adapted from Lazarov et al[9].

Patient characteristics

In this study, all 291 consecutively treated patients who received treatment in the implantology center from the year 2012-2016 were included into the study. Amongst the patients, 155 of them (46.73) were male and 136 (51.7%) were female; the average age of the patients was 52.76 years. About 10.99% of the patients were smokers, while 49.48% of the patients were suffering from hypertension and nearly 46.73% from diabetes [Table 1].

Implant characteristics

For the treatment of the patients,8 different types of Strategic Implant® implants in a prospective cohort study were utilized according to the preference of the treatment provider in the individual case (Table 2). All implants in this study were bent in the neck area to align in the direction of the abutment head to facilitate easier insertion of the prosthesis. All providers were trained to treat the patients and provide dental implant treatment in an immediate loading protocol. Implants were placed in the locations as shown in (Table 3).

Criteria of success and failure and data acquisition Criteria of possible failure were noted as follows: the existence of "discomfort," radiologically observable bone loss.

Implants were placed as previously described by Lazarov et al[9]. Briefly, absence of pain, mobility, no detectable infection and no bone loss visible on the panoramic picture contributed to the success criteria of the implant. All implants were placed under local anesthesia and with the primary aim of anchoring the load transmitting apical (basal) threads in resorption free second/third corticals (for screwable cortical implants) or horizontal bi-cortical support (for lateral basal implants) regardless of the parallelism between the heads of the implants. Compression screw implants were rigidly anchored through compression of trabecular bone areas and in the first cortical. The patients were followed up regularly. Patients who failed to follow up regularly were dropped from the study, however; if they presented themselves for control during the observation period, they were not left out from the study and their last control appointment was recorded as their date of last control.
On the X-rays, the following parameters/criteria were assessed:

- The marginal bone level close to the implants shaft on the panoramic radiograph
- The integration of the load transmitting parts of the implants observed through the visible direct contact between bone and the vertical implant part on the radiograph
- The radiologic observation of the healing of the sockets containing implants.

Technique and treatment protocol

Treatment planning was established on the basis of panoramic radiographs or computed tomographydata. In both the jaws, the implants were inserted into fresh extraction sockets even in situations where profound periodontal involvement and/or periapicalosteolysis was presentprior totoothextraction. If teeth were extracted during the same appointment during which the implants were placed, we recorded if the implant placement was done into healed jaw bone or the fresh sockets. Furthermore, it was assessed radiographically during the 12-month radiographic assessment appointment,if the sockets with the implants developed mineralized tissue, i.e., if the vertical bone growth occured in order to establish whether the socket healed uneventfully and in comparison to the (preoperative) bone level and mineralization. The implants were placedwiththeprimary aim of cortical anchorage of the load transmitting thread at least in the second/third cortical.Compression screw implantsintheupperandlowerjawwereinsertedwiththe primary aim of achieving stability through compression of trabecular bone along the vertical (endosseous) axis of the implant. In all cases, the implants were splinted with a first fixed stable bridge (circular or segmental) within maximum72 hours. Implants for the replacement of a single tooth (with one or two implants) were equipped either within the same period with a fixed crown. Furthermore, segment bridges and full bridges in both the jaws were installed in full functional loading [Table4].

The prosthetic workpieces were created by following the concept which Ihde and Ihde had outlined and all the bridges consisted of a metal frame and veneering from ceramics. Thepositionandorientationoftheimplantswascharacterized in two differentways: The point of penetration in the first cortical was noted with the usual tooth positions 11-48. The point of anchorage on the implant`s thread in the $2^{nd}/3^{rd}$ cortical (target cortical) waschosenbythesurgeonindependentlyofthepointofinsertion. Tilting was performed in all directions (either in lingual, vestibular, palatal in medial direction). In the upper jaw, anchorage regions were recorded: 85(4.06%) in the sinus floor and the tuberopterygoid for 210 (10.03%). In the distal mandible, the mandible interforaminal anchorage 459 (21.93%) implants, the Distal mandible anchorage without cortical engagement for 349 (16.67%), , and the Cortical distal mandible for 199 (9.50%) [Table 5]. For KOS-series of implants, the second cortical anchorage is not mandatory.

Statistical methods

Statistical analysis was performed using SPSS-17.0 software (Manufacturer: IBM Corp., Armonk, NY, USA). Where indicated, experimental data were reported as mean ± standard deviation of. Data were analyzed using Student's t-test and one-way analysis of variance and Tukey's HSD test was applied as a post hoc test if statistical significance was determined. A value of $p \leq 0.05$ was considered statistically significant.

III. Results:

All 291 patients (with 2093 immediately loaded implants) were followed for up to 90 months. In this study, patients who had missed one or several control appointments were not excluded. All patients were at least interviewed until the end of the observation period.

Survival rate of implants and success rate of prosthetic work

Success rate and implant length

Statistically significant differences in survival success rate (radiological follow up, clinical follow up and patient report as follow up), were not observed between male and female, table 2. Patient without hypertension had statistically significant better implant survival rate (radiological follow up, clinical follow up and patient report as follow up), table 2. Implant survival rate (radiological follow up, clinical follow up and patient report as follow up), between patient with and without diabetes mellitus were statistically significant different, table 2 There was no statistically significant correlation in survival rate between smoker and non-smoker, table 2. Statistically significant differences in survival success rate were not observed between different type of implants, table 3. No statistical significances were found in the success rate of different lengths and diameters of implants. All the implants, BECES, KOS, KOS plus and BOI demonstrated equal success rates (Tables 5). There was no significant difference in the radiographic, clinical and patient assessment between the various KOS implant lengths (Table 6 and 7). Survival and succes rate, implants with lenght 10mm were statistically significant less successful(Table 6.3 and 6.4). There was no statistical significant between the various implant diameters at the end of the follow up periods with regard to the various parameters (Table 7). Moreover, there was no statistical difference in the various implants at the various follow ups including the radiographic, clinical and patient assessment which was at nearly 100% (Table 8). End-points of observation are shown in Table 10. In this study, it was found that implants which had been placed in the area of the first molars in the upper and lower jaw show a slightly lower survival rate compared to implants on other locations. All differences found regarding these questions, where not significant however. Overall implant survival rate is described in Table 9. All the implants survival rate was greater than 90% except BOI which was at 71.42%, however there was no statistical significance between the groups. To allow nonparallel placement of single-piece implants and to equip them with fixed cemented prosthetic constructions, the necks of these implants must be bent, unless the treatment provider decides to equip the implant heads with angulation adapters. The process of bending not only imposes stresses on the bone structures even up to the point where they might fracture but also influences the mechanical properties of the implant material (and could lead immediately or later to fractures of the implant body). The survival rate for implants whose necks were bent did not differ significantly from the unbent implants (21 implants out of 967) in this study. In the observation period, three decementations, five metal frame fractures, and one case with massive damage of the ceramic veneer on distal surfaces (requiring the fabrication of a new prosthetic workpiece) were observed. All prosthetic constructions (even if they were planned for short‑ .or medium‑ term temporary use) were cemented with Fuji Plus (obtained from GC EUROPE N. V, Leuven; Handmix variant; EWT‑ powder) definitive cement. This procedure is necessary to establish secure and stable splinting between the implants and the bridges as they are required according to the principles of therapy in traumatology and orthopedic surgery (AO Principles). On an average, only less than 2% implants reported postoperative symptoms. Post-operative implant symptoms such as pain, discomfort, mobility and soft tissue infection are described in Table 10. Between different bone lossexiststatistically significant differences in implant survival and success rate, table 11, 12 and 13. Implants without bone loss reported better survival and success rate.Statistically significant differences in survival and success rate were observed between BCS implants with different length, table 9. Results comparison between different size of BCS implants were show in table 9.There were statistically significant difference in implant survival rate (radiological, clinical and patient report) between implants with and without use of protocol, table 14. Statistically significant difference was observed in implant survival rate (radiological, clinical and patient report) between implants with different protocol mistake, table 14 and 15. The worst survival rate was observed in group of patients who refused comprehensive treatment plan, table 15.

Tables:

Table 1. General characteristics

Observed parameters	**n (%)/(X±SD; (Med; min-max))**
Number of patients	291
Number of implants	2093
Number of implants in full function (before correction)	2046 (97.8%)
Number of implants in full function (after correction)	2083 (99.5%)
Age	52.79±16.77 (55.0; 21-97)
Gender: Male Female	 155(53.26) 136 (46.73)
Hypertension Yes No	 144 (49.48) 177 (50.51)
Diabetes mellitus Yes No	 136 (46.73) 155 (53.27)
Smokers Yes No	 32 (10.99) 259 (89.01)

Table 2: Location and usage of implants

Type of implant	N (%)
BECES/BCS (Strategic Implant®) (screwable cortical implant)	808(38.60)
KOS (compression screws)	1057(50.50)
KOS plus(combinationimplant)	157(7.50)
BOI (lateral basal implant)	7(0.33)
BBBS	14(0.66)
Tpg-uno	40(1.91)
Tpg	9(0.43)
ZDI	1(0.047)
Implant shafts bent after placement for parallelization Yes/no	1126/967

Table 3: Place of insertion and type of anchorage for all implants within this study
Place of insertion in second cortical n(%)

Floor of nose	746 (35.64)
Sinus floor	85 (4.06)
Palatal	0
Tuberopterygoid	210 (10.03)
Mandible interforaminal anchorage	459 (21.93)
Distal mandible anchorage without cortical engagement	349 (16.67)
Cortical distal mandible	199(9.50)
Lingual nerve bypass	0
Buccal nerve bypass	34 (1.62)
Buccal palatal	8(0.38)
Zygomatic cortical bone	3 (0.14)

Table 4: Type of prosthetic constructions on all implants

Construction Fullbridgeupper	74
Fullbridgelower	85
Segmentupper	61
Segmentlower	75
Singleteeth	49
Single teeth several implants	31
Overdenture	11

Table 5: Implants characteristics and implant placement

Observed parameters	Radiological follow- up (%)	Clinical inspection as follow- up (%)	Patient report as follow- up (%)
Preoperative periodontal involvement			
No	86.59	86.59	86.59
In upper jaw	3.78	3.78	3.78
Lower jaw	1.03	1.03	1.03
In both jaws	8.59	8.59	8.59
Significance (P)	0.001*	0.001*	0.001*
Periodontal involvement			
Yes/no	13.14/86.59	13.14/86.59	13.14/86.59
Significance (P)	<0.01*	<0.01*	<0.01*
Socket later filled with bone Uneventfully			
Yes/no	99.72/0.27	99.72/0.27	99.72/0.27
Significance (P)	<0.01*	<0.01*	<0.01*
Placed in extraction sockets			
Yes/no	60.30/39.7	60.30/39.7	60.30/39.7
Significance (P)	<0.01*	<0.01*	<0.01*
Bent			
Yes/no	46.20/53.79	46.20/53.79	46.20/53.79
Significance (P)	>0.01(ns)	>0.01(ns)	>0.01(ns)

Table 5.1 Implants survival rate and implants type

Type of implants	n (%)	Radiological follow up	Clinical inspection as follow up	Patient report as follow up
BCS	808 (38.6%)	99.2%	85.2%	85.2%
KOS	1057 (50.5%)	99.0%	80.1%	80.1%
KOS+	157 (7.5%)	99.4%	54.5%	54.5%
BOI	7 (0.3%)	100%	60.0%	60.0%
BBBS	14 (0.7%)	100%	50.0%	50.0%
TPG uno	40 (1.9%)	100%	95.7%	95.7%
TPG	9 (0.4%)	100%	100%	100%
Significance		p=0.999	p=0.999	p=0.999

*statisically significant; [a]Log Rank

Table 5. 2 Implants survival rate

Implant type	Follow up period (in month/year)	No of implants with this follow up	Cumulative No of failure	Cumulativ survival rate
BCS	**8-months**	807	0	100%
	12-months/1-year	797	1	99.9%
	21-months	767	4	99.5%
	24-months/2-years	763	4	99.5%
	36-months/3 years	646	4	99.5%
	40-months	487	4	99.5%
	46-months	430	4	99.5%
	48-months/4 years	429	4	99.5%
	52-months	306	5	99.2%
	60-months/5 years	270	5	99.2%
	68-months	100	5	99.2%
	70-months	90	5	99.2%

	72-months/6 years	71	5	99.2%
	80-months	26	5	99.2%
	84-months/7 years	15	5	99.2%
	89-months	10	5	99.2%
KOS	**8-month**	1056	2	99.8%
	12-months/1-year	1030	2	99.8%
	18-months	986	2	99.8%
	21-months	949	3	99.7%
	24-months/2-years	941	3	99.7%
	36-months/3 years	570	3	99.7%
	48-months/4 years	273	3	99.7%
	52-months	147	4	99.0%
	58-months	118	4	99.0%
	60-months/5 years	115	4	99.0%
	72-months/6 years	37	4	99.0%
	82-months	5	4	99.0%
KOS+	**8-month**	156	1	99.4%
	12-months/1-year	155	1	99.4%
	18-months	153	1	99.4%
	24-months/2-years	149	1	99.4%
	36-months/3 years	114	1	99.4%
	48-months/4 years	77	1	99.4%
	52-months	53	1	99.4%
	60-months/5 years	42	1	99.4%
	64-months	15	1	99.4%
	72-months/6 years	9	1	99.4%
	78-months	2	1	99.4%
BOI	**72-months/6 years**	6	0	100%
	84-months/7-year	2	0	100%
	90-months	1	0	100%
BBBS	**36-months/3 years**	13	0	100%
	40-months	7	0	100%
	75-months/7-year	1	0	100%
TPG uno	**28-months**	39	0	100%
	36-months/3 years	33	0	100%
	48-months/4 years	20	0	100%
	60-months/5 years	7	0	100%
	72-months/6 years	2	0	100%
TPG	**36-months/3 years**	36	0	100%
	55-months	1	0	100%

Table 6: Implant lengths and success for KOS implants				
KOS: Implant lengths (mm)	Frequency (percentage of all implants)	Radiological follow- up (%)	Clinical inspection as follow- up (%)	Patient report as follow- up (%)
10	117 (10)	100	100	100
12	573(48.97)	100	100	100
15	480(41.02)	100	100	100
Significance (P)		>0.01(ns)	>0.01(ns)	>0.01(ns)

Table 6.1: Pairwise comparison for KOS implant: Implant lengths
10 mm/KOS, P 12 mm/KOS, P

KOS: Implant length radiological follow-up
12 mm/KOS > 0.01(ns)
15 mm/KOS > 0.01(ns) >0.01(ns)

KOS: Implant length clinical inspection as follow-up
12 mm/KOS >0.01(ns)
15 mm/KOS >0.01(ns) >0.01(ns)

KOS: Implant length patient report as follow-up
12 mm/KOS >0.01(ns)
15 mm/KOS >0.01(ns) >0.01(ns)

Table 6.3
Implantlenghts: BCS and implant success

Implant length (mm)/Type	Frequency (% of all implants)	Radiological follow up	Clinical inspection as follow up	Patient report as follow up
10 /BCS	5 (0.6%)	75.0%	75.0%	75.0%
12 / BCS	80 (9.9%)	100%	100%	100%
14 / BCS	205 (25.3%)	98.5%	98.5%	98.5%
17 / BCS	184 (22.8%)	99.4%	99.4%	99.4%
20 / BCS	179 (22.2%)	100%	100%	100%
23 / BCS	151 (18.7%)	100%	100%	100%
26 / BCS	4 (0.5%)	100%	100%	100%
Significans		p=0.000*	p=0.000*	p=0.000*

*statisically significant; [a]Log Rank

Table 6.4
[a]Parwisecomparasion: Implant lenghts

	Implant length (mm)/	*10 /BCS*	*12 / BCS*	*14 / BCS*	*17 / BCS*	*20 / BCS*	*23 / BCS*
Radiological, Clinical inspection and Patient report as follow up	*12 / BCS*	p=0.005*					
	14 / BCS	p=0.009*	p=0.269				
	17 / BCS	p=0.001*	p=0.505	p=0.355			
	20 / BCS	p=0.000*	/	p=0.105	p=0.334		
	23 / BCS	p=0.001*	/	p=0.135	p=0.370	/	
	26 / BCS	p=0.386	/	p=0.820	p=0.897	/	/

*statisically significant; [a]Log Rank

Table 7: Implant diameter, type of implants, and implant success				
Implant diameter/type	Frequency (% of all implants)	Radiological follow- up (%)	Clinical inspection as follow- up (%)	Patient report as follow- up (%)
2.6	1 (0.047)	100	100	100
3.2	59 (2.82)	100	100	100
3.5	1(0.047)	100	100	100
3.6	734 (35.10)	100	100	100
3.7	730 (34.91)	100	100	100
4.1	473 (22.62)	100	100	100
4.6	75 (3.58)	100	100	100
5	5 (0.23)	100	100	100
5.5	2(0.095)	100	100	100
7	2 (0.095)	100	100	100
10	8(0.38)	100	100	100
10.5	1 (0.047)	100	100	100
Significance (P)		>0.01 (ns)	>0.01 (ns)	>0.01 (ns)

Table 8: Types of end- points for measuring the success rate for the implants followed in this study		
Type of follow- up	Number of implants, n (%)	Duration of follow- up (X±SD; [median; minimum- maximum])
Radiological follow-up	2091 (100)	41.49 (8-90)
Clinical inspection as follow-up	2091 (100)	41.40 (8-90)
Patient interview as follow-up	2091 (100)	41.40 (8-90)

Table 9: Implant survival rate for different implant types				
Implant type	Follow up period	Number of implants with this follow up	Cumulative number of failure	Cumulative survival rate (%)
BECES/BCS	> 40 months, up to 90 months	808	21	97.40
KOS	> 40 months, up to 90 months	1057	16	98.48
KOS Plus	> 40 months, up to 90 months	157	6	96.17
BOI	> 40 months, up to 90 months	7	2	71.42
BBBS	> 40 months, up to 90 months	14	1	92.85
Tpg -uno	> 40 months, up to 90 months	40	1	97.5

Table 10: Symptoms of problems around single implants for all implants which had placed and observed in this study

Symptoms of problems around single implants		N (%)
Mobility	Yes/no	45/2048 (2.15/97.84) <0.01*
Local soft-tissue infection	Yes/no	12/2081 (0.57/99.42) <0.01*
Pain	Yes/no	15/2078 (0.71/99.28) <0.01*
Discomfort	Yes/no	8/2085 (0.38/99.61) <0.01*

*significant

Table 11
Implantdiameter and type of implants and implant success

Implant diameter/Type	Frequency n(%)	Radiological follow up	Clinical inspection as follow up	Patient report as follow up
3.6 /BCS	726 (89.9%)	99.4%	99.4%	99.4%
3.7 /BCS	2 (0.2%)	100%	100%	100%
4.6 /BCS	73 (9.05%)	100%	100%	100%
5.0 /BCS	2 (0.2%)	100%	100%	100%
5.5 /BCS	2 (0.2%)	100%	100%	100%
7.0/BCS	2 (0.2%)	50.0%	50.0%	50.0%
Significance		p=0.000*	p=0.000*	p=0.000*

Table 12
Bone loss

Observed parameters		n (%)
Bone loss	**No**	799 (98.9%)
	General vertical	9 (0.9%)
	Crater like	1 (0.1%)
	Retrograde	1 (0.1%)

Table 13
Implants survival rate and bone loss

Observed parameters		Radiological follow up	Clinical inspection as follow up	Patient report as follow up
Bone loss	**No**	99.7%	99.7%	99.7%
	General vertical	42.9%	42.9%	42.9%
	Crater like	100%	100%	100%
	Retrograde	100%	100%	100%
Significance		p=0.000*	p=0.000*	p=0.000*

Table 14
Implants survival rate and complication and use of protocol

Observed parameters		Radiological follow up	Clinical inspection as follow up	Patient report as follow up
Protocol	**Yes/No**	99.9%/92.0%	99.9%/92.0%	99.9%/92.0%
Significance		p=0.000*	p=0.000*	p=0.000*
Protocol mistake	**Use protocol**	99.9%	99.9%	99.9%
	Prosthetic mistake	100%	100%	100%
	Dental technical mistake	100%	100%	100%
	Patient refuses comprehensive treatment plan	63.6%	63.6%	63.6%
	Case out of control	100%	100%	100%
Significance		p=0.000*	p=0.000*	p=0.000*
Prosthetic complication	**Yes/No**	100%/99.0%	100%/99.0%	100%/99.0%
Significance		p=0.321	p=0.321	p=0.321
Prosthetic complication	**No**	99.0%	99.0%	99.0%
	Metal fracture	100%	100%	100%
	Decementation	100%	100%	100%
	Acrylic teeth fracture	100%	100%	100%
Significance		p=0.805	p=0.805	p=0.805

*statisically significant; [a]Log Rank

Table 15
[a]Parwisecomparasion: Protocol mistake

	Implant length (mm)/	*Use protocol*	*Prosthetic mistake*	*Dental tehnical mistake*	*Patient refuses comprehensive treatment plan*
Radiological, Clinical inspection and Patient report as follow up	*Prosthetic mistake*	p=0.917			
	Dental tehnical mistake	p=0.868	/		
	Patient refuses comprehensive treatment plan	p=0.000*	p=0. 112	p=0.016*	

Case out of control	p=0.842	/	/	p=0.001*

*statisically significant; [a]Log Rank

IV. Discussion:

Studies in literature have reported the success of immediate loading in implants via randomized controlled trials in two-stage implantology. However, it has been wrongly advocated that randomized controlled trials are the only pertinent method in reporting of implant success. Randomized controlled trials involving the comparison between conventional dental implants(two system) versus basal implants (strategic implants)[9-11] would be impossible, since many subjects would be unsuitable to receive conventional implants or they may require bone augmentation procedures prior to implant placement, thus leaving out prospective or retrospective cohort studies as the only appropriate study design option.

In this prospective cohort study, we treated 291 patients with 2093 strategic implants, which is one of the greatest advantages of the study owing to the large sample size[9]. Very few studies, present in the current literature report such a large sample size as well as number of implants since large scale studies in the field of dental implantology often pose a challenge to research owing to poor patient compliance and unwillingness of the patient to follow-up. Dental implant success is often attributed to the ability of the dental implant to osseointerate into the cortical bone which can take upto 6 months depending on various factors. Moreover, implants that have beendesignedfor immediate loading “specific” implant surface characteristics is of very little value with regard to accelerated osseointegration.

Strategic Implant® was hence designed with the very purpose towards acquiring anchorage and support into the cortical bone without having to wait for osseointegrationthat can be credited to its ability to be osseofixated into the stable cortical bone thus, mimicking the concept of thedevicesintraumatologyandorthopedicsurgery[11]. The primary advantage of Strategic Implant®, as reported in our studies is the ability for 100% patients to receive it in comparison to conventional implantology. Generally, implants cannot be placed in smokers and diabetic individuals owing to the high failure rate reported in literature. However, our study placed implants in diabetic individuals and smokers and still reported a very high success and survival rate long term at 90 months.

Despite a past study in literature of basal implants with a follow up of more than 11 years and a past study of greater than 54 months demonstrating success with these implants, Strategic implants® have however failed to catch up with the current market owing to the opposition that is generally faced by conventional dental implants and lack of current literature. Our study did not report loss in the mean bone levels over the period of 90 months post functional loading which is in conjunction with previous studies in literature. Furthermore, periimplantitis[12] is a common occurrence with conventional implants and is characterized by bone loss and inflammation of the mucosa surrounding the implant. However, in our study, this was not observed in any of the cases suggesting that periimplantitis does not occur in regard to strategic implants.

Studies in literature have always mentioned that from the mechanical aspect, it is always advisable to avoid cantilevers and the results that we have reported here in our study is in alignment with the results reported by studies on “All-on-4” treatment. We did not exclude any malocclusion cases from this study although establishment of “regular” (Class 1) overjet and overbite using prosthetic treatment was difficult. Somepatientswhoseemedtohave an Angle Class 1 tooth relationship revealed after extraction theirtrueAngle Class2 skeletal jawrelationship:attheendof the treatment and after the joints had repositioned themselves in “joint-centric” position, the occlusal centric was arranged while atrue“jointcentric”wasmaintained. To accomplishimmediatefunctionalloading,ametal-ceramic prosthesiswasplacedwithinamaximum3daysafterimplant placement.

The use of immediate/early implant loading procedures have been well documented in cases of the edentulous mandible and the maxilla[10, 13-17]. In this case, the abutmentsofthedistalimplantsareanchored in thetuberopterygoidregionin both jaws into the mesial direction. In the distal mandible, the lingual cortical undercuts of mandible were target (second/third) corticals. Bending the necks of dental implants often induces internalstresses intheareaoftheimplantshaft, thus channeling it directly into the bone[18]. Studies in literature have demonstrated a more even stress distribution along the vertical implant region than identically shaped implantswith amachine-angulatedarea for basal implants thus allowing them to resist masticatory forces better than preangulated, machined implants, and even better than unbent implants which provide a thin region in the vertical implantarea.

V. Conclusion:

Within the limitations of the study, the following conclusions can be drawn:

1. Bent implants in the neck of tilted posterior implants in the tuberopterygoid region did not affect the high survival rate and caused no clinically relevant bone fractures in comparison to non bent tilted implants.
2. The cumulative survival rate for cortically anchored screw implants after 4 years was > 90%.

3. The survival rate of screwableimplants did not depend on the presence of healed alveolar bone along the vertical shafts of the implants. However, implants placed into fresh extraction sockets reported a higher success rate.

4. Within the observation period of totally 8-90months and when observing 2193 implants placed in this period itcanbereportedthatofsigns“Peri-Implantitis”werenot foundaroundBECES/BCSimplantsatall, which makes theStrategic Implant® appear to be resistant to thisdisease.

5. Thehighcumulativeimplantsurvivalrateforthedevicesand the technology of the Strategic Implant® indicates (within the limitations of this study) that the immediate functional loading concept with cortically anchored implants or implants providing mineralization of spongybone for the rehabilitationofcompletelyedentulousmandiblesandmaxillae

References:

[1]. Polychronakis N, Sotiriou M, Zissis A. A Survey of Removable Partial Denture (RPD) Retentive Elements in Relation to the Type of Edentulism and Abutment Teeth Found in Commercial Laboratories, Athens, Greece. Acta stomatologica Croatica 2014;48:199-207.

[2]. Kailembo A, Preet R, Stewart Williams J. Common risk factors and edentulism in adults, aged 50 years and over, in China, Ghana, India and South Africa: results from the WHO Study on global AGEing and adult health (SAGE). BMC oral health 2016;17:29.

[3]. Vadavadagi SV, Srinivasa H, Goutham GB, Hajira N, Lahari M, Reddy GT. Partial Edentulism and its Association with Socio-Demographic Variables among Subjects Attending Dental Teaching Institutions, India. Journal of international oral health : JIOH 2015;7:60-63.

[4]. Peltzer K, Hewlett S, Yawson AE, et al. Prevalence of loss of all teeth (edentulism) and associated factors in older adults in China, Ghana, India, Mexico, Russia and South Africa. International journal of environmental research and public health 2014;11:11308-11324.

[5]. Insua A, Monje A, Wang HL, Miron RJ. Basis of bone metabolism around dental implants during osseointegration and peri-implant bone loss. Journal of biomedical materials research Part A 2017;105:2075-2089.

[6]. Becker W, Hujoel P, Becker BE, Wohrle P. Dental Implants in an Aged Population: Evaluation of Periodontal Health, Bone Loss, Implant Survival, and Quality of Life. Clinical implant dentistry and related research 2016;18:473-479.

[7]. Ihde S, Goldmann T, Himmlova L, Aleksic Z. The use of finite element analysis to model bone-implant contact with basal implants. Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics 2008;106:39-48.

[8]. Ihde S, Palka L, Gaur V, Ihde A. Critical Appraisal Regarding the Publication "Implant Survival between Endo-Osseous Dental Implants in Immediate Loading, Delayed Loading, and Basal Immediate Loading Dental Implants: A 3-Year Follow-Up" as Published in Ann Maxillofac Surg 2017;7; 237-44, by the Authors R. Gharg (Corresponding Author), Neha Mishra, Mohan Alexander, Sunil K. Gupta. Annals of maxillofacial surgery 2018;8:101-107.

[9]. Lazarov A. Immediate Functional Loading: Results for the Concept of the Strategic Implant((R)). Annals of maxillofacial surgery 2019;9:78-88.

[10]. Ihde S, Sipic O. Dental Implant Treatment and Immediate Functional Loading (1). Case Report and Considerations: Extended Treatment Options Using the Strategic Implant(R) and Indications and Objectives for Comprehensive Dental Implant Treatment. Annals of maxillofacial surgery 2019;9:465-469.

[11]. Ihde S, Palka L. Anchorage possibilities in case of a unilateral maxillary defect using the concept of Strategic Implant((R)). National journal of maxillofacial surgery 2018;9:235-239.

[12]. Sequeira V TM, Abhyankar V, Fernandes G. Prevention of Peri-Implantitis: A Narrative Review. Journal of Dentistry and Oral Care Medicine 2018;4:106.

[13]. Ihde S, Sipic O. Functional and Esthetic Indication for Dental Implant Treatment and Immediate Loading (2) Case Report and Considerations: Typical Attitudes of Dentists (and their Unions) toward Tooth Extractions and the Prevention of Early, Effective, and Helpful Dental Implant Treatment in the European Union. Annals of maxillofacial surgery 2019;9:470-474.

[14]. Esposito M, Trullenque-Eriksson A, Blasone R, et al. Clinical evaluation of a novel dental implant system as single implants under immediate loading conditions - 4-month post-loading results from a multicentre randomised controlled trial. European journal of oral implantology 2016;9:367-379.

[15]. Al-Juboori MJ. Progressive immediate loading of a perforated maxillary sinus dental implant: a case report. Clinical, cosmetic and investigational dentistry 2015;7:25-31.

[16]. Santagata M, Guariniello L, Rauso R, Tartaro G. Immediate loading of dental implant after sinus floor elevation with osteotome technique: a clinical report and preliminary radiographic results. The Journal of oral implantology 2010;36:485-489.

[17]. Villa R, Crespi R, Cappare P, Gherlone E. Immediate loading of a dental implant placed in fresh socket with acute dehiscence-type defect: a clinical case report. Journal of periodontology 2010;81:953-957.

[18]. Goldmann T, Ihde S, Kuzelka J, Himmlova L. Bendable vs. angulated dental implants: consideration of elastic and plastic material properties based on experimental implant material data and FEA. Biomedical papers of the Medical Faculty of the University Palacky, Olomouc, Czechoslovakia 2008;152:309-316.

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