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Evaluation of Single Tooth Dental Implants Ten Years Survival Rate. A Clinical and Radiolographic study

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ABSTRACT

Aim: The aim of the study is to compare early loaded versus delayed loaded implants after ten years of placement.

Materials and Methods: Among 14 patients who underwent implant placement three patients from delayed loaded category and three patients from early loaded category were available for evaluation of dental implants after ten years. The parameters like plaque index, gingival index, thickness of peri-implant mucosa, probing pocket depth and radiographic bone loss was measured around the dental implants. These readings were compared with baseline and after ten years in both delayed loaded implants and early loaded implants.

Results: In both early loaded category and delayed loaded category the parameters like plaque index, gingival index, implant mobility and radiographic bone loss increased from baseline to 10 years but was not significant. Thickness of peri- implant mucosa increased in early loaded category only. Probing pocket depth increased significantly in both early and delayed loaded category.

Conclusion: The study showed that both delayed loaded implants and early loaded implants did not show any significant difference in their durability and function even after 10 years of implant placement.

Keywords: *Early loaded implants, delayed loaded implants, dental implants, plaque index, gingival index, peri-implant mucosa.*

1. INTRODUCTION

The teeth in oral cavity are important for various reasons like chewing, speech and good appearance. Tooth loss can affect an individual's oral hygiene, function and self confidence. Many studies have shown that dental caries and periodontal diseases are the most common reason for tooth loss1.

Missing teeth are replaced by removable partial denture (RPD), fixed partial denture (FPD) and complete denture (CD)2. But dental implants are the closest to replacement of missing natural teeth3

The development in research of dental implants has shown that the replacement of missing teeth with dental implant supported prosthesis is the most acceptable treatment option. But the results are not always successful leading to implant failure. At present the success rate of dental implant is around 90% to 95%. The dental implant success depends on absence of implant mobility, absence of radiolucency around implant and absence of peri implantitis[4].

The success of implants depends upon the osseointegration of titanium implants to surrounding bone. Improvement in osseointegration can be done by change in surface chemistry and topography of dental implants. Not only biological but also technical complications may cause dental implant failure. Studies have shown better survival rate for mandibular implants than maxillary implants. Periodontitis patients had lower survival rate of dental implants[5].

This following study is about patients who had undergone single tooth implant placement using delayed loading (crown placed after 3 months of implant placement) and early loading (crown placed after 6 weeks of implant placement) protocol[6,7] and review of these implants after 10 years.

2. MATERIALS AND METHOD

The study was conducted in the department of periodontics, JKKN dental college and hospital, Komarapalayam, Tamilnadu, India. The study was approved by the institutional ethical committee of JKKN dental college, Komarapalayam, Tamilnadu with approval number JKKNIEC24B.

Study –Design:

The study was a randomized, prospective clinical trial to evaluate the clinical and radiological parameters of delayed and early loading of single tooth placement was conducted ten years back. Initially the dental implants were placed in healed sockets . 14 patients of either sexes with an age limit of 20-50 years were selected from outpatient department on the following criteria.

Inclusion criteria

1.Partially edentulous single tooth space.

2 Intact adjacent teeth, restored with good restorations; restored with prosthesis before the addition of missing teeth,

3. Reluctance of patient for preparation of adjacent teeth.

4. Patient reluctance to wear a removable partial denture

Exclusion criteria

1.Patient unable to undergo a minor surgical procedure

2.Patients with history of substance abuse

3.Patients with systemic conditions

4.Psychoses patient

5.Presence of important anatomic structure in close to a proposed implant site.

6.Insufficient bone quality

7.Inadequate opening of mouth

8 Insufficient vertical inter arch space to place the prostheses

9 Incomplete facial growth and eruption of teeth.

10.Pregnant and lactating women.

Criteria for grouping:

The single tooth implant sites were selected randomly in the mandibular posterior tooth region.The selected patients were categorized into two groups based on delayed and early loading protocols.

Surgical Procedure:

The intraoral, panoramic radiograph were taken for preoperative evaluation of bone quality, implant position and orientation. The diagnostic template was made with a 5 mm ball bearing, incorporated around the curvature of dental arch. This was worn by the patient at the time of radiographic examination. This enabled the operator to determine the amount of magnification seen in the radiographs. Based on the analysis, the appropriate implants diameter and the platform size were selected. All the patients underwent scaling and oral hygiene instructions were given. All the 14 patients were prepared surgically with routine blood investigation. Local anesthesia was induced by infiltration with 2% lignocaine and adrenaline (1:80000) .

After achieving good anesthesia, the mucoperiosteal flap was elevated using a crestal incision. The position of implant placement was determined by the morphology of alveolus. Then the implant was placed with the help of physiodispenser and surgical kit for Hi-tech implants. Osteotomy was done using three drills pilot, intermediate and final drill. The implant was placed in such a way that the cover screw corresponded to the level of adjacent bone . The primary closure of flap was achieved with simple interrupted suture 3-0 silk thread.(Figure 1-5)

Figure 1: Physiodispenser and surgical kit

Figure 2: Edentulous site for dental implant placement

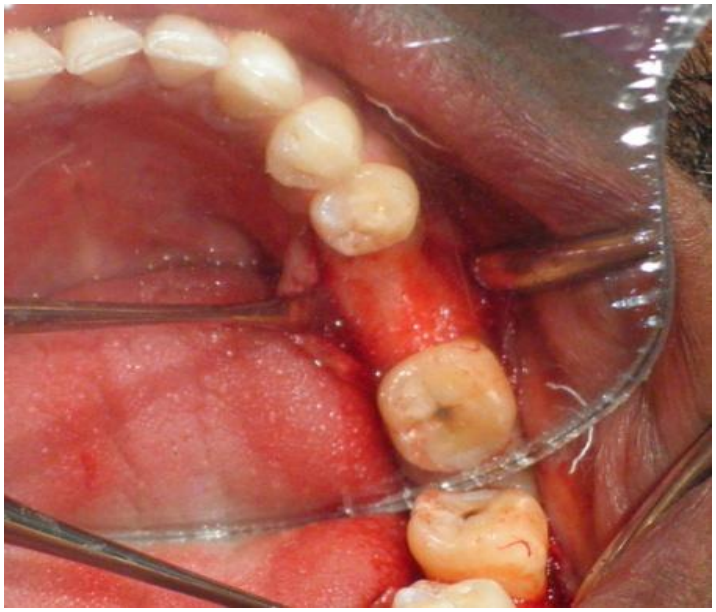


Figure 3: Flap elevation

Figure 4:Osteotomy at implant site

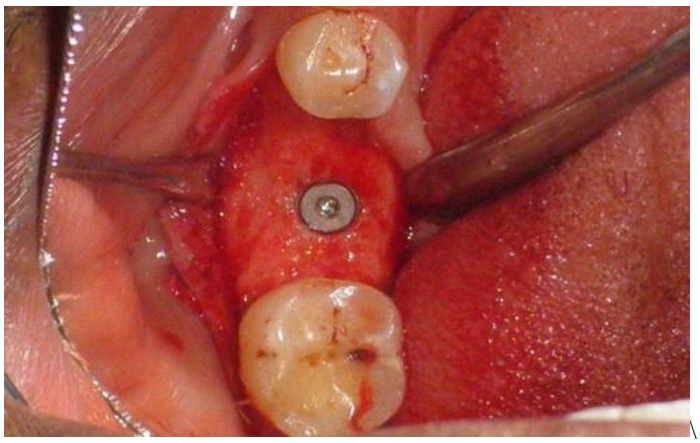


Figure 5: Implant placement

After 3 months of implant placement, the patient were subjected to a second surgical procedure in delayed loading protocol. After 6 weeks of implant placement, the patient were subjected to second surgical procedure in early loading protocol.Healing abutment were placed on to the implants to condition the peri- implant soft tissue (Figure 6) . Later final abutment placed at 35 Ncm by using torque wrench .

Figure 6: Abutment placement

The prosthetic crown was prepared and cemented with type II GIC cement (Figure 7 and 8). The baseline data was recorded using the following parameters.

Figure 7: Cement retained crown preparation

Figure 8: Cement retained crown placement

Plaque index .

Gingival index .

Thickness of peri- implant mucosa (Figure 9) .

Probing pocket depth (Figure 10).

Radiographic assessment (Figure 11).

Figure 9: Peri-implant mucosal thickness measurement

Figure 10: Probing pocket depth measurement

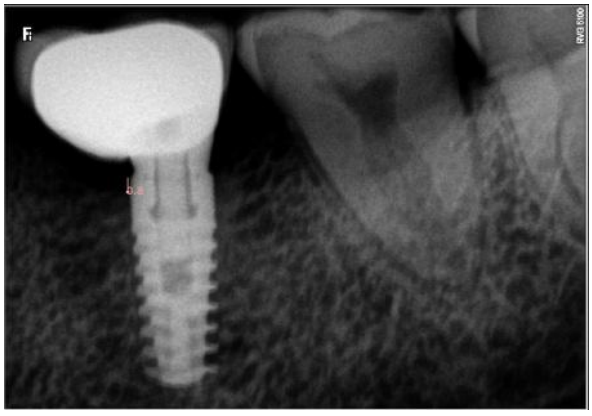


Figure 11: RVG taken at implant site

Later the patients were recalled at 3rd month and 6th month and a study was conducted to compare early versus delayed loading group. The study showed that there was no significant difference between early and delayed loading protocols at 3 months and 6 months.

Among the 14 patients 6 patients responded for recall visitis after 10 years of dental implant placement . The remaining patients could not be contacted. Among the 6 patieints 3 were delayed loaded and 3 were early loaded. These patients were examined to determine the status of the implants placed.

On clinical examination , in early loading category among the three dental implants ,in one implant no mobility was seen and was perfectly in function, in one implant grade II mobility was seen and in one implant the crown was lost and boneloss was seen.

On clinical examination ,in delayed loading category among the three dental implants, in two implants no mobility was seen and perfectly in function, the third implant had grade I mobility. No crown was lost in any of the implants.

The parameters like plaque index, gingival index, thickness of peri- implant mucosa, probing pocket depth and radiographic bone loss was measured around the dental implants. These readings were compared with baseline and after ten years in both delayed loaded implants and early loaded implants.

3. RESULTS

Statistical Analysis

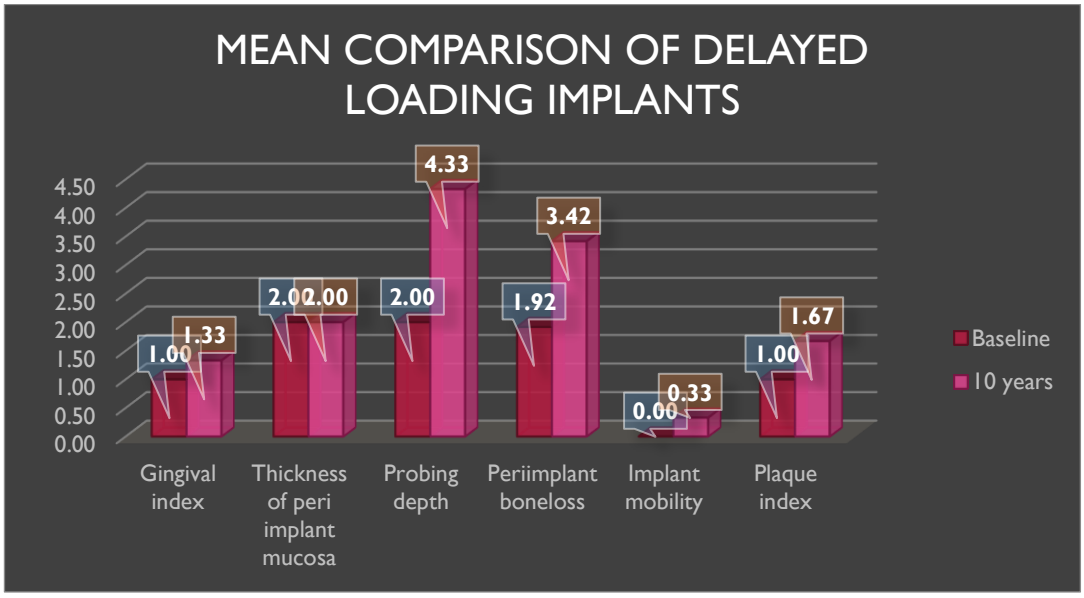
The data was compiled in Microsoft excel sheet and transferred to version 22 SPSS software. Descriptive statistics and inferential statistics are applied. The data did not show a normal distribution therefore Non parametric analysis was used. The following data values are mentioned as in Table 1.

Table 01: Mean comparison between groups (baseline and 10 years) based on loading period.

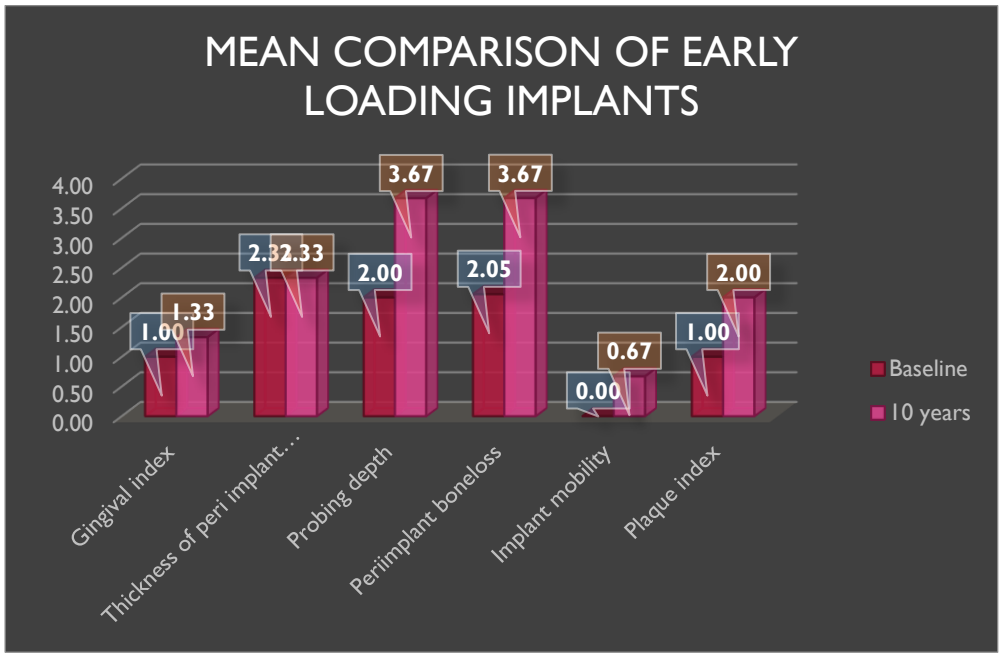
Loading period			Mean	Std. D.	Minimum	Maximum	Mean Rank	Z value	p value
Delayed	**Gingival index**	Baseline	1.00	0.00	1.00	1.00	3	-1	0.317
		10 years	1.33	0.58	1.00	2.00	4		
	Thickness of peri implant mucosa	Baseline	2.00	0.00	2.00	2.00	3.5	0	1
		10 years	2.00	0.00	2.00	2.00	3.5		
	Probing depth	Baseline	2.00	0.00	2.00	2.00	2	-2.087	0.037*
		10 years	4.33	1.53	3.00	6.00	5		
	Peri implant boneloss	Baseline	1.92	0.79	1.14	2.71	2.33	-1.528	0.127
		10 years	3.42	1.67	2.11	5.30	4.67		
	Implant mobility	Baseline	0.00	0.00	0.00	0.00	3	-1	0.317
		10 years	0.33	0.58	0.00	1.00	4		
	Plaque index	Baseline	1.00	0.00	1.00	1.00	3	-1	0.317
		10 years	1.67	1.16	1.00	3.00	4		
Early	**Gingival index**	Baseline	1.00	1.00	1.00	0.00	3	-1	0.317
		10 years	1.00	2.00	1.33	0.58	4		
	Thickness of peri implant mucosa	Baseline	2.00	3.00	2.33	0.58	3.5	0	1
		10 years	2.00	3.00	2.33	0.58	3.5		
	Probing	Baseline	2.00	2.00	2.00	0.00	2	-2.121	0.034*

	depth	10 years	3.00	5.00	3.67	1.16	5		
	Peri implant boneloss	Baseline	1.24	2.52	2.05	0.71	2.67	-1.091	0.275
		10 years	1.35	7.07	3.67	3.01	4.33		
	Implant mobility	Baseline	0.00	0.00	0.00	0.00	2.5	-1.581	0.114
		10 years	0.00	1.00	0.67	0.58	4.5		
	Plaque index	Baseline	1.00	1.00	1.00	0.00	2.5	-1.549	0.121
		10 years	1.00	3.00	2.00	1.00	4.5		

Graph 01: Mean comparison of delayed loading implants



Graph 2: Mean comparison of early loading implants



The results according to Table.1 and Graph.1, showed that in delayed loaded category there was increase in the scores from baseline to 10 years in gingival index, plaque index, probing depth, peri- implant bone loss and implant mobility but was not significant. Thickness of peri-implant mucosa remained the same. Probing pocket depth increased significantly.

The results according to Table.1 and Graph.2, showed that in early loaded implant category there was increase in the scores from baseline to 10 years in gingival index, plaque index, probing depth, peri- implant bone loss ,implant mobility and thickness of peri-implant mucosa but was not significant. Probing pocket depth increased significantly.

4. DISCUSSION

According to Baumann et al plaque is the main cause for peri- implant destruction[8]. Maintanence of good oral hygiene is important to prevent peri-implantitis. According to Donati et al[9] increase in gingival score can be due to increase in plaque score. Increase in plaque score threatens the health of peri-implant tissue and can cause peri-implant mucositis and peri-implantisis[10].Monitoring oral hygiene is important to prevent peri-implantitis[11]. The importance of proper maintanence phase should be stressed for long time survival of the dental implants.

There was no reduction of peri-implant mucosa thickness in both the categories. In early loaded category the peri-implant mucosa thickness increased by 1mm. This was in accordance in the study of Jung et al[12]. A thickness of 2mm and more of peri-implant mucosa was seen. This is thick bio type and it can resist recession and bone loss. Since the peri-implant mucosa is same both the categories its effect on other indices can be excluded.A study done by Ignus Arnold Apse et al showed that peri- mucosal thickness did not have any effect on peri-implant bone loss[13].

Peri-implant bone loss had increased by 1.528 mm in delayed loaded category and 1.091mm in early loaded category. There was no statistically difference between baseline and 10 years in both the categories. This was similar to meta analysis done by Yanfei et al[14] who stated that there was no difference between early loaded and delayed loaded category in peri-implant bone loss after 5 years followup. According to Ioannis et al[15] modest amount of bone loss around dental implants is acceptable by professionals. Bone loss can be due to remodeling in order to adapt for increased pocket depth[15].

Implant mobility had increased in early and delayed loading category from baseline to 10 years. This mobility was due to abutment screw loosening. The Implant body remained stable. This was similar to the complication mentioned in the study conducted by Yanfei et al[14].The implants placed in our study were cement retained so tightening of abutment screw at regular intervals was not possible. This problem can be solved by shifting to screw retained implants.

Probing pocket depth had increased by 2.087 mm in delayed loaded group and by 2.121mm in early loaded group. In both the groups the increase was statistically significant. According to the study conducted by Baumann et al[8] this increase in pocket depth could be due subgingival plaque accumulation. According to Koutouzis[16] et all this increase in pocket depth can be due to remodeling of peri-implant soft tissue for maintanence of biological width.

5. LIMITATIONS

However, the present study had limitations like small sample size. In order to generalize the result and overcome the limitations of the study, larger sample size are needed.

6. CONCLUSION

The study showed that both delayed loaded implants and early loaded implants did not show any significant difference in their durability and function even after 10 years of implant placement. But most of all the indices increased in value. This shows the importance of regular maintanence therapy to prevent peri-implant diseases and screw tightening at regular intervals to prevent prosthetic failure.

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