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INTRA GROUP COMPARISON OF ESTHETIC SCORE IN IMPLANTS WITH LASER LOK ABUTMENT AT DIFFERENT TIME PERIOD- A RANDOMISED CONTROLLED TRIAL

Snehkiran Raghuvanshi*[1], Lakshya Yadav[2], Ramashanker[3], Kaushal Kishore Agrawal[4], Mayank Yadav[5]

[1]MDS, EX-SR, KGMU.
[2]Jr grade Professor, KGMU.
[3]Professor, KGMU.
[4,5]Associate Professor, KGMU.

***Corresponding Author: Snehkiran Raghuvanshi**
MDS, EX-SR, KGMU.

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INTRODUCTION

The success of an implant restoration is based on integration of hard and soft tissue with the implant abutment surface. It has been established that soft tissue maintenance has a direct effect on the hard tissue around the implant further adding on to the esthetics of the implant prosthesis. When a prosthetic abutment is connected to an implant body, a microgap is created between the components. Microorganisms may grow into this implant-abutment interface microgap (IAI).[1,2] and establishes a bacterial reservoir resulting in an area of inflamed soft tissue facing the IAI.[3] The presence of this microgap in close relation to bone may thus have a role in the development of peri-implant inflammation and bone loss.[4,5] Therefore a major challenge is to minimize inflammatory reactions and percolation into this IAI thus maximizing the implant stability which inturn enhances the esthetics. It has been established that treating the implant surface can reduce this microgap,[6] but fewer studies have been conducted on the effect of a treated abutment surface. The Laser lok implant technology aims to address to this need. This implant abutment system is specially designed to reduce the microgap and create a tight lock between implant and soft tissue hence leading to better esthetics. This study aimed to establish the effect of Laser Lok abutment on maintaining the soft and hard tissue around implant hence leading to better esthetics. In the study implants were restored with Laser Lok abutment and esthetic score was compared at 3, 6 months. Pink and white esthetic score used as a measuring aid.

MATERIALS AND METHOD

A study was conducted in Department of Prosthodontics, Crown and Bridge, Faculty of Dental Sciences, K.G.M.U. UP, Lucknow. A sample size of 40 was selected according to predefined inclusion and exclusion criteria. Written informed consent and ethical committee clearance was obtained. It was a single centre, non-stratified with balanced randomization (1:1), double blind, parallel group study. All selected patients received a thorough explanation of the procedures and signed a written informed consent form before the enrolment in RCT. Partially edentulous patients who had missing maxillary anterior teeth were randomized to have standard or Laser Lok abutment. Thus patients were divided into two identical groups based on type of abutment placed: standard (20 patients) and Laser Lok (20 patients). A computer assisted simple randomization procedure was followed to assign the subjects to both groups. Preliminary screening was performed using intra oral periapical radiographs as well as panoramic radiographs. Finally, the edentulous spaces to be restored were assessed for sufficient bone height and width on preoperative dental CT scan. Case group subjects were randomized in two groups i.e. Implants with Laser Lok abutment and implants with standard abutment. A skilled surgeon performed all of the surgical procedures, while another experienced Prosthodontist performed all prosthetic procedures. Only one of the investigators, who was not directly involved in the selection and treatment of the patients, was aware of the randomization procedure and could have access to the randomization record stored on his personal password protected computer. The information on how to treat the particular patient was enclosed sequentially numbered, identical, sealed, opaque envelopes. Envelopes were opened one after the other after implant placement and the patients were treated according to the allocated treatment procedure (standard or Laser Lok abutment). Thus, treatment allocation was concealed to the investigator treating the patient. A blinded clinician, who was unaware of patient allocation, assessed all outcome measures. The surgical procedure was similar for both

study groups. Implants were kept load free for 4 months, thereafter second stage surgeries were performed to expose the submerged implants. Stability of the exposed implants was evaluated manually with a reverse torque of 20 Ncm, and then, gingival formers/ healing abutments were placed for 15 days to allow complete healing of the soft tissues around implants. Four months after implants placement, the prosthetic procedure was started for both the groups. Standard abutment was placed in control group and Laser Lok. Abutment was placed in case group.

Group 1: Abutment was placed and transfer copings were attached to the implant bodies after 15 days and closed-tray impressions were made with rubber base impression material. Definitive casts were mounted in articulators with casts of opposing arch by using interocclusal records. Definitive single crowns were fabricated and luted on prepared abutments that were screw-tightened at 30 Ncm.

Group 2: Laser lok Abutment was placed in position and prepared intraorally, impressions were made with rubber base material. Definitive casts were mounted in articulators with casts of opposing arch by using interocclusal records. Definitive single crowns were fabricated and luted on prepared abutment that were screw-tightened at 30 Ncm.

Follow up examination

The implants were examined for hard and soft tissue parameters at frequent intervals. The implants were also checked for persistent or irreversible pain, inflammation of peri-implant soft tissues, peri-implant infection and radiographic radiolucency at each visit. Follow up examination were made at baseline (at the time of definitive prosthesis placement), 3 months and 6 months' interval. On each visit esthetic evaluation was done by the pink and white esthetic score.

DISCUSSION

Implant success is based on the amalgamation between hard and soft tissues around the implant and it has been established that implant esthetics is a principal indicator of the same. (forna et al) Factors governing the peri-implant esthetics are the peri-implant marginal bone and the peri-implant papilla. The peri-implant marginal bone is inturn governed by the Biologic width, the concept of platform switching, implant design in the cervical region, thread geometry, insertion depth and the microlesions produced by the second-stage prosthetic intervention.[9] A stable bone level around the implant neck is a prerequisite for achieving the support and hence long-term optimal and stable gingival contour. Hence biological width plays a salient role in the success of an implant.[10] The term biologic width denotes the dimensions of the periodontal and peri-implant tissues, which comprise of: Gingival sulcus, junctional epithelium and supracrestal connective tissue.[11] The dimension of the peri-implant mucosa has been demonstrated to resemble that of the gingiva at teeth and included a 2-mm-long epithelial portion and a connective tissue portion about 1–1.5 mm long.[12] The entire contact length between the implant and the epithelial and the connective tissue portions is defined as "the biological width." Experimental studies have demonstrated that a minimum width of the peri-implant mucosa was required. If the thickness of the peri-implant mucosa was reduced, bone resorption occurred to re-establish the mucosal dimension that was required for protection of the underlying tissues.[13] The long-term preservation of the healthy peri-implant tissues is of primary importance for ensuring the function and esthetics. Numerous studies have revealed that the bone resorption around the implant neck does not start until the implant neck is uncovered and exposed to the oral cavity, which leads to bacterial contamination of the gap between the implant and the super structure.[7-10] This eventually leads to the bone remodelling that follows till the biologic width has been created. Tarnow.[7,11] had stated that apart from the vertical component of re-establishing this width, there exists a horizontal component approximating 1–1.5 mm that maintains the health of the interproximal bone and, in turn, the papilla.[9] The Implant-tissue interface mainly begins to breakdown initially at the crestal region. Approximately 1.2 mm of marginal bone loss occurs from the first thread in the first year of loading as reported by Adell et al and thereafter only 0.1mm of bone loss occurs.[16] Hence, alveolar bone is discerning for the establishment of the biological width,[17] Therefore, if crestal bone resorption occurs around the implant, it may result in a more apical position of the gingival margin which may lead to poor plaque control and pocket formation along with colonization of bacteria and a potential o compromise stability of implant.[18] Studies have also demonstrated that implants that are uncovered after 3 months with subsequent abutment connection and creation of a microgap develop alveolar bone loss. Hence the implant abutment interface or microgap influences the peri- implant tissues leading to crestal bone loss and leads to compromised esthetics. A stable bone level around the implant neck is a prerequisite for achieving the support and hence long-term optimal and stable gingival contour. it has been established that surface treatment of implant reduces this microgap and leads to better implant success but fewer studies have been conducted on the effect of treated abutment surface. Laser Lok abutments that are a patent of the Biohorizon company are treated with excimer laser that produce microchannels around the surface of an abutment and provide attachment to both osteoblasts and fibroblasts.[19] They have a unique body that includes a repeating nanostructure to maximize the surface area and enables cell pseudopodia and collagen micro fibrils to interlink with the Laser-Lok surface. Amongst all surface treatments only the Laser Lok has shown to be effective for soft tissue attachment using and scanning electron microscopy, light microscopy and polarized light microscopy. These unique Laser Lok abutments provide

a biologic seal for proper osseointegration.[20] They can be placed with or without Laser Lok implants, inhbit epithelial down growth and physically attach CT to maintain crestal bone. 18 Using these abutments cement retained single or multiple unit prosthesis can be created in highly esthetic zone like maxillary anteriors. They should be seated at the time of implant placement or cover screw placement and should remain in place till the final restoration is placed because if they are removed once, it can hamper the epithelial attachment. The peri implant connective tissue that is established following implant surgery with a Laser Lok implant acts as an effective obstacle to the apical migration of epithelial attachment. The use of Laser Lok micro channels resulted in a perpendicular physical attachment that helps to stabilize the bone level and decline the loss of crestal bone level. The pink esthetic score (PES), which evaluates soft tissue esthetics around an implant, was introduced by Furhauser et al.[21] This effort was followed by Belser et al who introduced the White Esthetic Score (WES) that reflects the esthetic outcome with regard to the quality of the implant crown.[22] These evaluation methods have since been used by researchers who aim to more objectively evaluate and report esthetic outcomes of implant restorations particularly in the anterior maxilla single tooth implant restorations can be successfully analysed for implant esthetics using this score. Intragroup comparison of esthetuc score was made at baseline, 3 and 6 months. It was revealed that esthetic score (bith pink and white) increased from baseline to 6 months indicating that Laser Lok abutment plays a positive role in maintaining good esthetics .Also the mean was maximum at 6 months as compared to baseline and and 3 months. This is because the laser treated abutment surface binds to the soft tissues effectively with time reducing the scope of creation of a microgap and hence bacterial percolation leading to a tight interface thus improving overall esthetics of the final prosthesis.

CHART 1

PES	Group	N	MEAN(SD)	RANGE	MEDIAN9Q1-Q3)	FRIEDMAN TEST CHI SQUARE TEST	P VALUE
	Baseline	20	6.8 (0.89)	5-8	7(6 - 7.75)	19.16	<0.001
	3 months	20	7.35(0.81)	6-9	7(7 - 8)		
	6 months	20	7.65(0.88)	6-9	8(7 - 8)		

CHART2

WES	Group	N	MEAN(SD)	RANGE	MEDIAN9Q1-Q3)	FRIEDMAN TEST CHI SQUARE TEST	P VALUE
	Baseline	20	6.8 (0.70)	6-8	7 (6 – 7)	28.11	<0.001
	3 months	20	7.45(0.83)	7-9	8 (7 - 8)		
	6 months	20	7.9 (0.64)	7-9	8 (7.25 - 8)		

RESULTS

Pink esthetic score was evaluated at base line (at the time of definitive prosthesis placement) 3 months recall and 6 months recall. Mean at base line was 6.8 ±0.89, 7.35 ± 0.81 at 3 months and at 6 months it was7.65 ± 0.88 at 95% CI. Friedman test revealed P value to be <0.001 which was statistically significant.(CHART1).

White esthtic score was evaluated at baseline 3 and 6 months recall. Mean was evaluated to be 6.8 ±0.7, 7.45 ±0.83, 7.9 ±0.64 at 95% CI. Freidman test revealed <0.001 which was statistically significant.(CHART2).

CONCLUSION

With the advent of immediate implant restoration, the esthetics in implant supported prosthesis has a positive effect on the acceptance for the above said treatment modality. For the immediate implant restorations, we have to consider three dimension principles of implant placement. When the implant sites are already healed, the prosthesis has a major role on execution of opted modality. As the prosthesis is placed, esthetic failures are bound to happen and are detrimental to implant success. So, to give considerations to esthetics: Laser Lok technology has been developed and marketed and the use of this technology in abutments has statistically significant effect on the outcome measures. Preliminary investigation show positive response of Laser Lok technology in abutments for maintenance of soft tissue, which in turn maintains the crestal bone. Further investigations and long term studies are required to prove the same.

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