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Research Article

STUDY OF PHOTODYNAMIC THERAPY ON OSSEOINTEGRATION OF IMMEDIATE IMPLANTS PLACED IN INFECTED SOCKETS

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ABSTRACT

Background- Chlorohexidine is commonly used to disinfect tooth sockets. No study is available on efficacy of photodynamic therapy as a disinfectant of implants placed in infected sockets in this region. **Aim-** To study effect of photodynamic therapy on osseointegration of immediate implants placed in infected sockets. **Methods-** The socket in Group A was debrided by Chlorohexidine. The other socket in Group B was disinfected by a photodynamic therapy. Postoperative assessment was done by microbial assessment, clinical assessment and radiographic assessment. Clinically, each patient returned for postoperative assessment after 7 days and after 6 months. Subjects were assessed for pain, oedema, implant stability and probing depth. **Results-** Regarding bacterial counts reduction, Group B showed significantly greater reduction (82%) in bacterial counts than Group A (54%). Study group (1.9) showed statistically significantly lower mean pain score than control group (4.6). Group B showed significantly lower mean edema score (2) as compared to Group A (4.1). Regarding implant stability (mean Osstell score), immediately post-operative, there was no significant difference between mean values in the two groups but after 6 months; study group (173) showed significantly higher mean value than control group (118). **Conclusion-** In the group of patients receiving photodynamic therapy, significant higher mean percentage of bone density, decrease in probing depth and significant more stability of implant was observed.

INTRODUCTION

While doing any surgical procedure, disinfection of the oral cavity is done by using a variety of chemical solutions such as chlorhexidine, in order to prevent, or minimize the risk of wound infections or bacteremia after the surgery. The placement of implant immediately after tooth extraction with periapical lesion is still a debate and no consensus has been achieved till today.[1] Various authors have reportrd certain pre and post-operative measures including antibiotic administration, meticulous cleaning and alveolar debridement for the same.[2,3]

Photodynamic therapy (PDT) has emerged in recent years as a non-invasive therapeutic modality for the treatment of various infections by bacteria, fungi, and viruses.[4] The most important property of PDT is that the bacteria present in root canal system do not develop resistance to PDT.[5] Heat production during the exposure is less, no side effects. PDT can be applied topically into a periodontal pocket avoiding overdoses and side effects associated with the systemic antimicrobial agent administration.[3] It also minimizes the occurrence of bacterial resistance.[6]

Chlorohexidine is commonly used to disinfect tooth sockets. No study is available on efficacy of photodynamic therapy as a disinfectant of implants placed in infected sockets in this region. Thus, this study was planned with an objective to test the effectiveness of photo activated disinfection on osseointegration of immediate implants placed in infected sockets.

METHODS

This investigation was conducted at the Department of Oral and Maxillofacial surgery of a tertiary care dental teaching hospital located in the region of Jammu and Kashmir. Convenient sampling technique was adopted. Study population was thirty immediate implants in patients needing extraction of minimum two teeth that are non-restorable with periapical infection.

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Study subjects aged 20-50 years; having teeth with normal alignment in dental arch with proper inter-arch relationship; teeth having intact surrounding alveolar bone and have at least 2 mm of sound bone beyond the root apices; implants placed in maxilla and/or mandible bilaterally; free of any chronic systemic disease that may contraindicate the surgery or negatively affect the healing after surgery; free of any severe psychological or mental problems, were included for this study.

Study subjects having teeth adjacent to each other to ensure debridement of each group alone; receiving irradiation therapy recently; having dehiscence or fenestration of the bony walls; pregnant females; smokers or any kind of drug abusers were excluded from this investigation.

After selection of study subjects, they were randomly divided into two groups.

Group A (Controls): The socket in Group A debrided by Chlorohexidine.
Group B (Study group): The other socket in study group disinfected by a photodynamic therapy.

Photodynamic therapy: This therapy was given by a photo-activated device. Lit600 is a LED lamp that emits light in the red spectrum with a wavelength at 635 nm.

A watery solution of toluidine blue O (TBO) was prepared to concentrations 10 μg/ml and stored in the dark container at 4°C until using .5 ml as photosensitizers in the experiments.

Postoperative assessment was done by microbial assessment, clinical assessment and radiographic assessment. In microbial assessment, the specimens are sent to microbiology lab within 1 hour which incubated for one day in blood agar diluted to 1:10000 which is non selective highly nutritive and indicator medium for subculture and counting which composed of nutrient broth oxide with 5% sterile blood. Four Specimens were collected two from Group A after extraction and after debridement by chlorohexidine, and two from Group B one after extraction and one after photodynamic therapy. Clinically, each patient returned for postoperative assessment after 7 days and after 6 months. Subjects were assessed for pain, oedema, implant stability and probing depth. Radiologically assessment of osseointegration following implant placement was done through sequential indirect digital panoramic radiographs taken in predetermined time intervals immediately postoperatively and after 6 months.

Written and informed consent was obtained from study subjects. Permission of ethical committee was obtained from the Institutional Ethics Committee. All the questionnaires were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 21 (IBM, Chicago, USA). The results were expressed using appropriate statistical variables.

RESULTS

Regarding bacterial counts reduction, Group B showed significantly greater reduction (82%) in bacterial counts than Group A (54%). Study group (1.9) showed statistically significantly lower mean pain score than control group (4.6). Group B showed significantly lower mean edema score (2) as compared to Group A (4.1).

Regarding implant stability (mean Osstell score), immediately post-operative, there was no significant difference between mean values in the two groups but after 6 months; study group (173) showed significantly higher mean value than control group (118).

Regarding mean probing depth Immediately post-operative as well as after 6 months, there was no much difference between mean values in the two groups.

Bone density was measured in terms of Grey scale. Immediately post-operative, there was no much difference between mean Grey scale values in the two groups. After 6 months; Group B (1369) showed significantly higher mean Grey scale value than Group A (946).

Table 1 Comparision of outcomes in study and control groups

Variables		Group A (Controls)	Group B (Study group)
Bacterial counts reduction		54%	82%
Mean pain score		4.6	1.9
Edema score		4.1	2.0
Mean Osstell score	Immediate	36	38
	After 6 months	118	173
Mean Probing depth	Immediate	4.3 mm	4.2 mm
	After 6 months	2.4 mm	2.1 mm
Mean Grey scale value	Immediate	235	246
	After 6 months	946	1369

DISCUSSION

The presence of active infection in the extraction site is considered one of the main contraindications to immediate implant insertion in the socket because of the increased possibility of infection spreading to peri-implant tissues during the healing period. Photodynamic therapy is based on the idea that nontoxic photosensitive agent called photosensitizer, preferentially localizes in premalignant and malignant tissues.[8] The PS is then activated by light with susceptible wavelength and produces singlet oxygen and free radicals, which are cytotoxic for the target cells. This technique helps to reduce periapical infection and provides more success rate for immediate implant in infected sockets.[9] The disadvantage of the placement of implants into the sockets of teeth with periapical lesions is the potential for implant contamination during the initial healing period because of remnants of the infection.[10]

PAD is effective against different types of microorganisms for root canals as (Enterococcus faecalis, streptococcus intermedius, Fusobacterium nucleatum, Peptostreptococcus micros, Prevotella intermedia), Perio pockets and mucosal diseases as (Porphyromonas gingivalis, Actinobacillus actinomycetemcomitans, Fusobacterium nucleatum, Streptococcus sanguinis, Bacteroides forsythus and Eikenella corrodens), Sites of peri-implantitis, Deep carious lesions as (Streptococcus mutans, Streptococcus sobrinus, Lactobacillus casei and Actinomyces viscosus) and viral and fungal diseases like oral herpes and candidosis.[11]

We observed that Regarding bacterial counts reduction, Group B showed significantly greater reduction (82%) in bacterial counts than Group A (54%). Study group (1.9) showed

statistically significantly lower mean pain score than control group (4.6). Group B showed significantly lower mean edema score (2) as compared to Group A (4.1) Another study from Switzerland[12] observed that after 12 months, the number of BoP-positive sites decreased statistically significantly ($P < 0.05$) from baseline in both groups (PDT: 4.03 ± 1.66-1.74 ± 1.37, LDD: 4.41 ± 1.47-1.55 ± 1.26). A statistically significant ($P < 0.05$) decrease in PPD from baseline was observed at PDT-treated sites up to 9 months (4.19 ± 0.55 mm to 3.89 ± 0.68 mm) and up to 12 months at LDD-treated sites (4.39 ± 0.77 mm to 3.83 ± 0.85 mm).

Another study from Iran[13] observed the effectiveness of photodynamic therapy with low-level diode laser in nonsurgical treatment of peri-implantitis and observed that both groups showed statistically significant improvements in terms of bleeding on probing ($P < 0.001$), probing pocket depth (PPD) and modified plaque index, with no significant differences between the 2 groups.

We observed that, regarding implant stability (mean Osstell score), immediately post-operative, there was no significant difference between mean values in the two groups but after 6 months; study group (173) showed significantly higher mean value than control group (118). Regarding mean probing depth Immediately post-operative as well as after 6 months, there was no much difference between mean values in the two groups. Another study from Egypt[14] has shown similar results. The results showed significant higher mean percentage of bone density, decrease in probing depth and significant more stability of implant using Osstell in the side of photodynamic therapy.

CONCLUSION

This study observed that the group of patients receiving photodynamic therapy, significant higher mean percentage of bone density, decrease in probing depth and significant more stability of implant was observed. This proves photodynamic therapy as a better alternative compated to traditional methods of disinfection.

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