RESEARCH PAPER

Comparison of different medications delivery systems in peri implantitis treatment

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ABSTRACT
This paper compared minocycline microspheres, Metronidazole and 2.5mg of Chlorhexidine gluconate as drug delivery systems in the management of peri-implantitis. The experiment was made up of 45 people split into 3 equal categories as; Group I- Minocycline, Group II- Metronidazole and Group III- Chlorhexidine gluconate. At Baseline, 1, 3 and 6 months, clinical evaluation of bleeding on probing (BOP), probing pocket depth (PPD), clinical attachment level (CAL). Minocycline microspheres were done. There was significant improvements at follow-up using Minocycline followed by chlorhexidine and metranidazonein in POB, PPD, CAL at 1- 6 months of recall.
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INTRODUCTION

Dental implants are also used to replace missing teeth mostly using Osseointegrated type of dental implants. [1-5] Osseointegrated implants have been extensively used since Brånemark treated the first patient in 1965.[6] Osseointegration represents the creation of a direct, structural and functional interface among the recently formed bone and the implant. [7,8] The success rate of the dental implant is 96% after a 20-years follow-up. [7] The absence of systemic illness and the absence of local inflammation of peri-implantitis area is necessary for implant success. Periodontal disease refers to an immune inflammatory disease of the soft tissues and alveolar bone as well as tissues around periodontal area. Bacterial infection and microbial plaque initiate the inflammatory process in the periodontal tissues.[9] This periodontitis can be triggered in an untreated form leading to apical periodontitis, and peri implantitis. Peri-implantitis has been described as a form of inflammatory tissue surrounding an osseointegrated implant that occurs concomitant with loss of the supporting marginal bone. [10] Numerous studies have shown that peri-implantitis is very common. [9,10]

The indications of peri-implantitis include elevated pocket probing depth (PD), progressive supporting bone loss, and blleding on probing (BOP). Peri-implantitis in people with dental implants occurs in twenty percent of patients, and the rate of occurrence increases with the length of time. [11]Hence, there should be an effective modality towards managing peri-implantitis, as the life of dentists implant increases.

The fundamental goal in the treatment of peri-implantitis is to control infection, decrease inflammation as well as to promote tissue regeneration of dental implants. [12] Traditional management of this pathology is based on the mechanical debridement of the implant surface in order to eliminate biofilm. Treatment of peri-implantitis using local delivery systems can be in the form of, Fibers, strips, films, gels, Microparticle, and Vesicular System. [13]

The main conditions of local drug delivery are that there should be an appropriate carrier material, the

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concentration of the drug to be delivere and the release profile should be matched to the necessity of the implant geometry and the severity of the infection. It should be biocompatible, have few systemic side effects, be simple to give, and be precisely positioned around the implant site. [14] Air abrasion, guided bone regeneration with or without bone transplants, laser-assisted debridement, open flap debridement, non-surgical debridement, antibiotic therapy, and photodynamic therapy are among the treatments for peri-implantitis. [15]

In a peri-implant bone defect, local administration of agents has the benefit of efficiently and quickly delivering the antibacterial agent at a higher concentration to the gingival sulcus as opposed to systemic distribution. Additionally, a number of antibiotics have been studied for local application as soluble, nondegradable, or biodegradable polymers. [16]

Evidence on the use of supplemental antimicrobial medication in the management of peri-implantitis is insufficient to support its use. Thus, the comparison of minocycline microspheres, Metronidazole and Chlorhexidine gluconate as a drug delivery system in the treatment of peri-implantitis is of interest.

MATERIALS AND METHOD

This cross sectional study was conducted in Oral implantology department after the approval from institutional ethics committee and informed consent of the participants was obtained.

They were a total 45 patients with peri implantitis who were grouped in 3 with 15 samples each. Group I- Minocycline (Dentamycin, Dentamycin, Tokyo, Japan) in syringe as Biodegradable mix, Group II- Metronidazole (Elyzol, Dumex Corp.Co Denmark) in syringe as Biodegradable mix and Group III- Periochip (2.5mg of Chlorhexidine gluconate). The study excluded patients with medically compromised, taking antibiotic treatment, pregnant women and those allergic to medication. The study revealed that patient with peri implantitis in age group of 30-55 years in both genders were included.

In unit-dosage of minocycline hydrochloride microspheres in a unit dosage in syringe in form of a Biodegradable mix in group I. The unit-dosage cartridge of minocycline hydrochloride encodes 1mg of minocycline in form of microspheres. The patients in the metronidazole gel group were applied with 1ml of metrogyl sub gingivally until the pocket bottom. Periochip (2.5mg of Chlorhexidine gluconate) Biodegradable device was used in group III. All selected medicaments were placed straight into the periodontal pocket's base of respective groups.

Clinical parameters were used including, bleeding on probing (BOP), probing pocket depth (PPD), and clinical level of ttachement (CAL) at 1,3, and 6 months post operatively.

Statistically, the data obtained was statistically tested with the SPSS statistical softwares version 25.0 of IBM USA by use of ANOVA test with $P < .05$.

RESULT

Table 1: Mean inter group comparisons for bleeding on probing

Duration	Intergroup comparison	Mean +_ SD	P
Baseline	Group I	91±04	0.765
	Group II	90±05	
	Group III	91±07	
1 month	Group I	62±26	0.624
	Group II	76±31	
	Group III	74±41	
3 months	Group I	47±43	0.543
	Group II	48±37	
	Group III	50±34	
6 months	Group I	38±20	0.011
	Group II	42±36	
	Group III	44±51	

Table 2: Mean inter group comparisons for periodontal pocket depth (mm)

Duration	Intergroup comparison	Mean +_ SD	P
Baseline	Group I	5.4457 ±0.1174	0.845
	Group II	5.3453 ±0.1456	
	Group III	5.3421 ±0.1244	
1 month	Group I	4.3535± 0.2435	0.643
	Group II	4.5435± 0.2154	
	Group III	4.8324± 0.2245	
3 months	Group I	3.1345 ±0.1355	0.543
	Group II	3.5257 ±0.1864	
	Group III	3.6467 ±0.1536	
6 months	Group I	2.1524 ±0.1035	0.013
	Group II	3.0456 ±0.1043	

	Group III	3.1214 ±0.1213	

Table 3: Mean inter group comparisons for clinical attachment level (mm)

Duration	Intergroup comparison	Mean +_ SD	P
Baseline	Group I	2.71± 0.45	0.775
	Group II	2.68± 0.56	
	Group III	2.67± 0.64	
1 month	Group I	2.62 ± 0.68	0.664
	Group II	2.65 ± 0.63	
	Group III	2.64 ± 0.75	
3 months	Group I	2.59 ± 0.64	0.534
	Group II	2.62 ± 0.67	
	Group III	2.63 ± 0.54	
6 months	Group I	2.45 ± 0.47	0.013
	Group II	2.52 ± 0.43	
	Group III	2.61 ± 0.32	

statistically significant change from baseline to 6 months.

DISCUSSION

Peri-implantitis can be thought of as an inflammatory process of tissues surrounding a functioning osseointegrated implant, which can result in supporting bone destruction. This may result in an inflammatory process of the soft tissues around the implant in a gradual loss of the marginal bone that has been osseointegrated. Whereas, peri-implant mucositis is the inflammation of the soft tissues around the implant, and little loss of supporting bone.[17]

Peri-implant mucositis are usually clinically diagnosed in the absence of radiographic bone loss, when the sensation of probing the peri-implant sulcus is succeeded by the bleeding of the sulcus. When there is a bleeding on probing (BOP) and loss of bone surrounding an implant, the diagnosis can be made as to peri-implantitis can be made.

Treatment of periodontal disease may be done by both non-surgical and surgical therapy. It is also possible that there is a reason why non-surgical therapy leads to failure by bacteria virulent factors and also the depth of periodontal pocket is such that it is more than the instrumentation available, drug concentration is low in the GCF as well as in saliva. In order to counter this issue, a treatment regimen that would involve short-term use of systemic and/or local antimicrobial agents is being experimented as an adjunctive agent to mechanical therapy in the management of periodontal diseases. [18]

The effectiveness of 3 different methods of local drugs delivery, which included chlorhexidine chip, tetracycline (TC) fibers placement, and minocycline microspheres, was studied by Sahee et al in the context of the treatment of peri-implantitis. They concluded that, TC fibers group as a local drug delivery method was better in GI, PI and PD score improvement and effective in peri-implantitis control compared to chlorhexidine microspheres chip and minocycline microspheres group. [7]

Khare et al. examined 0.2% chlorhexidine gel, 0.2% chlorhexidine chip, minocycline microspheres, slow-release doxycycline gel, and tetracycline fibers as drug delivery devices as alternatives to peri-implantitis treatment. After six months, they concluded that using minocycline microspheres and 0.2% chlorhexidine gel greatly improved probing depths. [19]

Himaja et al concluded that, better outcomes are achieved by using adjunctive therapy of the local metronidazole gel and tetracycline fibers instead of scaling and root planning procedure. [9] Schar et al compared the non-surgical treatment of the periimplantitis with adjunctive therapy of local metronidazole gel and tetracycline fibers with local drug delivery (LDD) or photodynamic therapy (PDT). They made a conclusion that, Adjunctive PDT can be another treatment modality in the non-surgery management of primary peri-implantitis. [12]

In the future use of peri-implantitis treatment using microand nanoparticles, implants, and injectable hydrogels among others needs to be considered, as combining 1% (w/v) of melatonin gel with Non-Surgical Periodontal Therapy (NSPT) proved to have significant benefits compared to NSPT only. [7] Pratap et al assessed the efficacy of 1% (w/v) melatonin gel as an adjunctive application with Non-Surgical Periodontal Therapy (NSPT) The melatonin gel applied to the eyes using the SRP expressed better antioxidant properties and clinical effects in patients with stage II periodontitis.[20]

We have discovered that periodontal clinical improvement was achieved when antibacterial local drug delivery procedures are used. The improvement of clinical conditions was greater in minocycline group and then chlorhexidine and metranidazole. The results should be further verified through research.

CONCLUSION

The use of minocycline microspheres resulted in significant improvements in peri implantitis followed by and chlorhexidine and metranidazone for POB, PPD, CAL at 1 to 6 months of recall.

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