Efficacy of Metronidazole in Combination with Amoxicillin and Doxycycline in Adult Periodontitis

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Abstract: *Objective*: Periodontal diseases are amongst most prevalent diseases in the world. They are caused by poor oral hygiene, accumulation of dental plaque and virulent putative pathogens on the teeth and gums Systemic antibiotics are used as adjuncts for the treatment of this infective disease. The objective of this study was to compare the efficacy of two antibiotic drug combinations i.e., Metronidazole with Amoxicillin and Metronidazole with Doxycycline in patients with adult periodontitis.

Method: 50 patients were divided in two groups. They were given fixed doses for 7 days to patients with Adult Periodontitis. Readings were taken before treatment and two weeks prior to the treatment. The result was evaluated on the basis of periodontal Pocket depth, Bleeding Index and Mobility Index. The readings were taken using Periodontal Probe, dental Mirror and dental Explorer.

Result: There was significant reduction ($p<0.01$) observed in periodontal pocket depth and Bleeding Index incase of Doxycycline, Metronidazole combination in comparison to Amoxicillin, Metronidazole combination. There was slight change observed on Mobility Index.

Conclusion: The study suggested that Doxycycline and Metronidazole should be preferably given for Adult Periodontitis.

Keywords: Adult periodontitis, putative pathogens, pocket depth, bleeding index, mobility index.

Chronic Periodontitis is an infective disease of bacterial origin [1]. According to WHO 2003 report it affects people throughout the world with high prevalence rate. It causes damage by evasion of host defense [18]. Clinically it is characterized by plaque accumulation, calculus and pocket formation, inflammation of periodontium and loss of alveolar bone. Gingival bleeding and suppuration occurs spontaneously or when subjected to probing. All this is accompanied with halitosis. The putative pathogens cause inflammatory response and destruction of the gingiva and periodontium. The inflammatory response leads to bleeding, pocket formation, clinical attachment, recession and bone loss. If not treated Periodontitis causes tooth loss [2].

Chronic periodontitis is caused by pathogens such as *A. actinomycetocomitans, P. gingivalis, B. forsythus, P. intermedia, C. rectus, T. denticola, F. nucleatum and E. corredens*. Therefore treatment is scaling along with antibacterial agent. This would eliminate or control the growth of pathogenic bacteria. The choice of antibiotics should be done depending on the spectrum of antibiotics and its pharmacokinetics [3].

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In view of above information study was conducted to investigate and compare the efficacy of two antibiotic combinations for the treatment of chronic periodontitis. The result was based on the knowledge of the mode of action of each drug and their synergistic effects when used in combination. The effects of each combination was determined by recording data before and after treatment with the help of Dental indices such as Pocket depth (PD), Bleeding index (BI), Mobility index (MI). All readings were recorded with the help of periodontal probe, explorer and dental mirror.

SUBJECTS AND METHOD

A study was carried out on 50 subjects of either sex having chronic periodontitis aged between 30-60years with no systemic disorder.

The study group was divided into two groups A & B. Subjects of Group A were prescribed Amoxicillin 500mg along with Metronidazole 400mg for 7days, whereas subjects of Group B were given 200mg of Doxycycline on first day and 100mg for next 6days along with Metronidazole 400mg three times a day. All subjects were subjected to history taking, oral examination and initial readings before treatment. The same method was followed after two weeks of treatment and readings were again recorded for both groups.

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Table 1: Variation in Pocket Depth

Drugs	Treatment	No. of Patients	Pocket Depth		
			Mean ± SEM	Min- Max	Range
Group A	Before	25	3.88±0.105	3 – 5	2
	After	25	2.84±0.095**	2 – 4	2
Group B	Before	25	3.88±0.088	3 – 5	2
	After	25	1.80±0.082**	1 – 2	1

**P< 0.01 is highly significant.

The measurement criteria used in the study included bleeding, pocket formation, mobility and extent of plaque leading to recession. The clinical indices used were Pocket depth (PD), Bleeding Index (BI), Mobility (MI). All readings are taken using Periodontal probe, Dental mirror & Dental explorer.

Periodontitis is confirmed when pocket depth is more than 3mm. Bleeding index measures infected inflamed periodontal pockets showing bleeding on probing. Mobility index will measure mobility ranging from Grade 1-3 being 1mm, 2mm & 3mm respectively.

ETHICS

The study was conducted in compliance with Declaration on the rights of Patient.

RESULT

The data was entered and analyzed in the statistical package for social sciences (SPSS) version 17. The two groups with different combination of medicines were compared. Mean and standard error to the mean of variables like pocket depth were calculated. Frequencies and percentages were calculated for variables like mobility and bleeding index. The effect was analyzed (using t-test) with mean differences in measurement readings observed before and after treatment.

The value for PD for Group A was 3.88±0.10 before treatment and 2.84±0.09 after treatment. Group B showed 3.88±0.88 before treatment and 1.80±0.082 after treatment.

It was observed that mean pocket depth after treatment reduced to ≤ 4 mm in the patients treated by amoxicillin with metronidazole this was ≤ 5 mm before treatment, out of 25 patients 19(76.0%) had pocket depth 3 mm. In the patients treated by doxycycline with metronidazole it was observed that mean pocket depth after treatment reduced to ≤ 2 mm this was ≤ 5 mm

Table 2:

Medicines	Treatment	Mean of Pocket Depth	Frequency	Percentage
Amoxicillin with Metronidazole	Before	3	5	20%
		4	18	72%
		5	2	8%
	After	1	-	0%
		2	5	20%
		3	19	76%
		4	1	4%
Doxycycline with Metronidazole	Before	3	4	16%
		4	20	80%
		5	1	4%
	After	1	5	20%
		2	20	80%
		3	-	0%
		4	-	0%

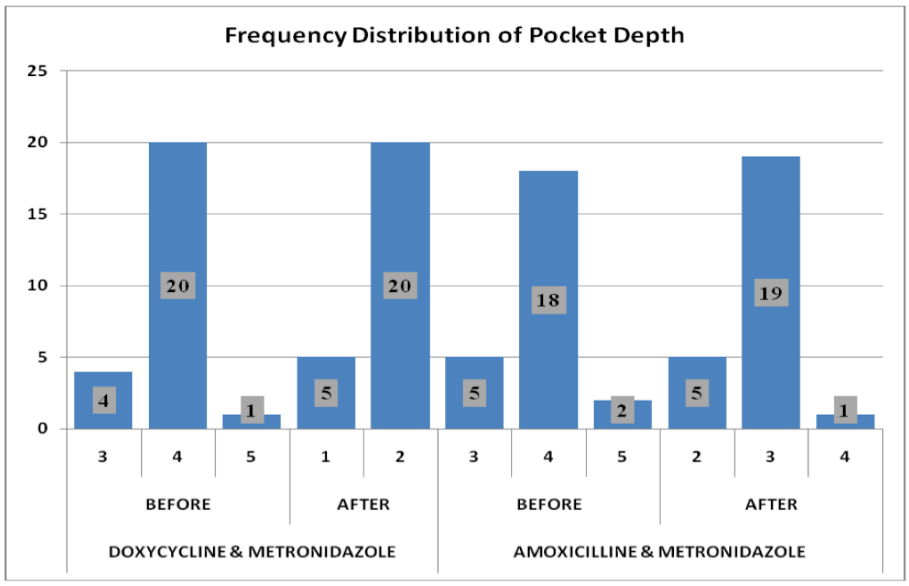

Figure 1:

before treatment, out of 25 patients of this group, 20(80.0%) had pocket depth 2 mm. Results are shown in Table **2** and Figure **1**.

The Bleeding Index (BI) values were observed in Group A patients and it was seen that before treatment 8% subjects had mild, 84% had moderate and 8% had severe inflammation. After treatment it was reduced to 60% having no inflammation and 36% with mild inflammation and 4% with moderate inflammation and bleeding. Group B subjects showed subjects before treatment had 24%mild inflammation and 76% had moderate inflammation. After treatment all 25 patients showed no bleeding or inflammation and were cured. Results are shown in Table **3** and Figure **2**.

Mobility was observed before and after treatment in Group A patients it was observed only 1(4%) patient had no mobility, 14(56%) patients had mobility <1 mm, and 10(40%) patients had mobility between 1-2 mm. After treatment of the patients with said combination of medicines, it is found that the mobility reduced and 4(16%) patients had no mobility, 20(80%) patients had mobility <1 mm, and only 1(4%) patient had mobility between 1-2 mm. In group B patients it was observed that before treatment 9(36%) patients had no mobility, 16(64%) patients had mobility <1 mm. After having treatment with the said combination of the medicines the mobility reduced and it was observed that 14(56%) patients had no mobility and 11(44%) patients had

Table 3:

Medicines	Treatment	Bleeding Index	Frequency	Percentage
Amoxicillin with Metronidazole	Before	Mild Inflammation	2	8%
		Moderate Inflammation	21	84%
		Sever inflammation & Marked Redness	2	8%
	After	Normal	15	60%
		Mild inflammation	9	36%
		Moderate Inflammation	1	4%
Doxycycline with Metronidazole	Before	Mild Inflammation	6	24%
		Moderate Inflammation	19	76%
		Severe inflammation & Marked Redness	-	0%
	After	Normal	25	100%
		Mild inflammation	-	0%
		Moderate Inflammation	-	0%

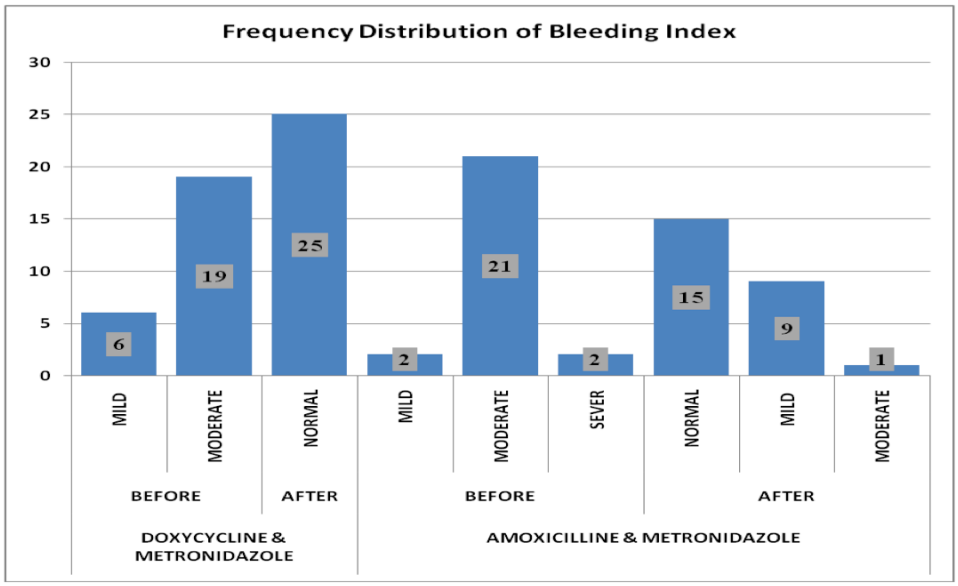

Figure 2:

Table 4:

Medicines	Treatment	Mobility Index	Frequency	Percentage
Amoxicillin with Metronidazole	Before	No Mobility	1	4%
		Mobility <1 mm Bucolingually	14	56%
		Mobility Between 1-2 mm Bucolingually	10	40%
	After	No Mobility	4	16%
		Mobility <1 mm Bucolingually	20	80%
		Mobility Between 1-2 mm Bucolingually	1	4%
Doxycycline with Metronidazole	Before	No Mobility	9	36%
		Mobility <1 mm Bucolingually	16	64%
		Mobility Between 1-2 mm Bucolingually	-	0%
	After	No Mobility	14	56%
		Mobility <1 mm Bucolingually	11	44%
		Mobility Between 1-2mm Bucolingually	-	0%

mobility <1 mm. These results are also shown in Table **4** and Figure **3**.

DISCUSSION

Periodontal diseases are treated by periodontal therapy that includes scaling and the use of adjunctive antibiotics [2]. The effects of periodontal antibiotic drug therapy depend on the spectrum of antibiotics and its pharmacokinetics. It also depends on some factors like drug binding to tissues ,consumption or degradation of the drug by non-target microorganisms; subgingival plaque, biofilm protecting the pathogens, total bacterial load withrespect to the maximum antibiotic concentration and its effect and of the host defenses. The site of action for antibiotic treatment in periodontal disease is periodontal pocket [4, 5].

This study was conducted in order to compare the efficacy between two combination drugs i.e., Amoxicillin with Metronidazole and Doxycycline with Metronidazole in two given groups from a population

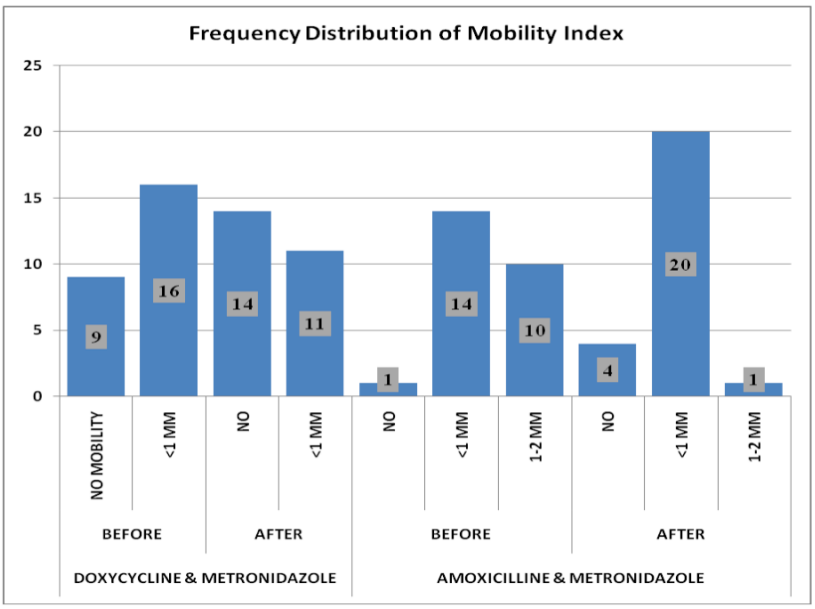

Figure 3:

having Adult Periodontitis. The results were based on the knowledge of the mode of action of each drug and their synergistic effects when used in combination.

Doxycyclines are inhibitors of tissue-destructive Matrix Metalloproteinase (MMPs) in crevicular fluid and tissues, independent of their antimicrobial activity [6-12].

Metalloproteinases are peptidases that are degrading agents of connective tissue proteins including collagen. Increased levels of activated MMPs gradually destroys the collagenous matrix, degrade the gingiva, the periodontal ligament and alveolar bone in the infected periodontium. This gives the clinical signs and symptoms of periodontal disease [13, 14].

Metronidazole reaches effective antibacterial concentrations in gingival tissue and crevicular fluid and reduces the growth of anaerobic flora and decreases the histopathologic signs of Periodontitis [15, 16].

The effect of systemic administration of amoxicillin and metronidazole as an adjunct to mechanical therapy in patients with advanced periodontal disease resulted in an improvement of the periodontal conditions, elimination/suppression of putative periodontal pathogens such as A. actinomycetemcomitans, P. gingivalis, P. intermedia and reduction of the size of the inflammatory lesion [17].

The results of this study were evaluated on the basis of periodontal pocket depth, bleeding index and mobility. There was significant reduction in pocket depth and bleeding index following administration of doxycycline and metronidazole combination than in comparison to amoxicillin and metronidazole combination while mobility was only slightly changed.

CONCLUSION

Results suggest that doxycycline and metronidazole should be preferably given for the treatment of adult periodontitis.

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