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Should Antibiotic be used as an Accessory Treatment in Periodontology? A Review

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Abstract:- Treatment of periodontal disease aims at achieving a healthy periodontium and preventing the risk of recurrence / disease progression. Both Surgical and Non-surgical therapy are equally effective in improving periodontal disease. The use of antibiotics in conjugation with periodontal therapy has always been perplexing. This review aims at discussing the rationale behind prescribing the antibiotics with periodontal procedures.

I. INTRODUCTION

Periodontitis has been prevailing in developed as well as developing countries, which affects 20-50% of global population with higher prevalence seen among the adolescents, adults, and older individuals, thus arising as a public health concern. (Nazir, 2017). Periodontal disease has substituted dental caries , being the primary cause of tooth loss. It is strongly associated with a number of other disorders such as low birth weight, heart disease ,and stroke.(Sedlacek and Walker,2007) Periodontal disease is considered to be an infectious disease, with complex microbial aetiology. The existence of virulent microorganisms in the dental plaque biofilm, gives an inflammatory response, which results in tooth loss and destruction of supporting periodontium. (Barça, *et al.*, 2015) Host response involves innate, inflammatory, and adaptive immune responses. (Silva *et al.*, 2015) Several systemic risk factors related to periodontal disease involve, poor oral habits such as smoking, poor oral hygiene, drug abuse tobacco chewing , systemic factors involving diabetes, puberty , stress maternal infection, preterm birth low birth weight, and preeclampsia. Periodontal disease also increases the risk of cardiovascular disease, and this increase in relative risk reaches to 44% among individuals aged 65 years and over.(Nazir, 2017). Periodontal therapy has seen to improve glycemic control in type 2 diabetic subjects. (Mahuli *et al*., 2020) Treatment of periodontal disease involves the surgical and non-surgical approaches. (Barça, *et al.*, 2015). Non-surgical treatment involves plaque control with mechanical debridement and periodontal maintenance care, whereas surgical treatment involves resective and regenerative procedures. (Manas D *et al.*, 2009, Graziani *et al.*, 2017) However the mechanical debridement alone, may not be effective in all the cases, thus systemic antibiotics remains the treatment of choice. Considering the periodontal surgical procedures, by their nature carry with them a consequent risk of developing infections, thus adjunctive use of antibiotics gains the attention here. Thus this article focuses on the need of antibiotics to be given with both surgical and non-surgical procedures in periodontology. Fig 1.Use of Antibiotics in adjunction to Non-Surgical therapy (Scaling and Root planing)

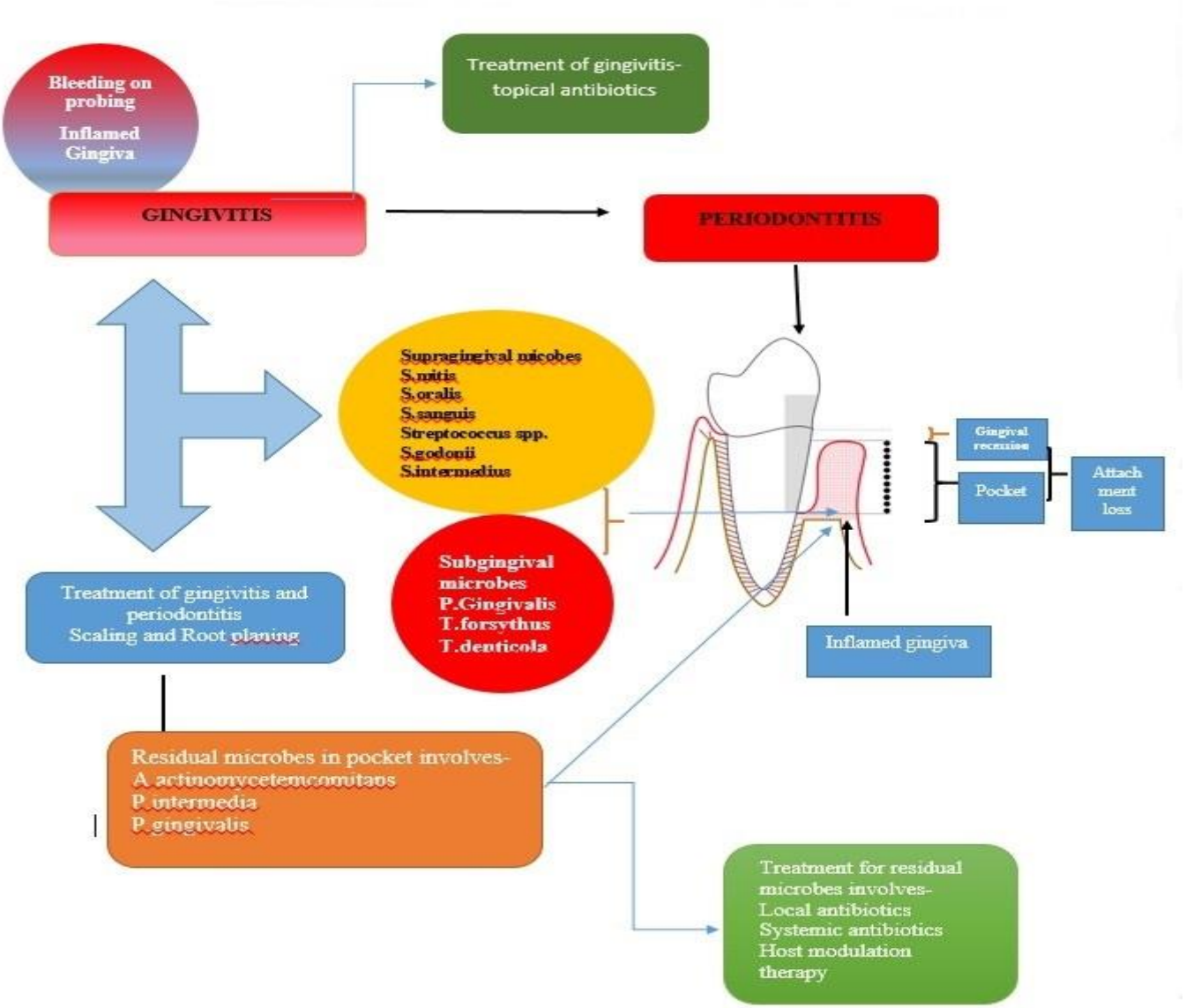

Fig1. Antibiotic treatment in Gingivitis and Periodontitis, (Caranza 9th edi, Antibiotic/antimicrobial use in Dental Practice).

- ***Antibiotics as Adjunctive to Non-Surgical Periodontal Therapy***

Periodontal inflammation occurs as a result of microbes and host microbial interaction. (Manas D *et al*., 2009) Biofilm formed on tooth surfaces has been implicated as chief culprit in the etiopathogenesis of dental caries and periodontal disease. Continuous and regular disruption of these biofilms is essential for prevention and management of periodontal diseases. (Chandki *et al*., 2011) Scaling and root planing will always remain a gold standard treatment for the disruption of supragingival as well as subgingival biofilm and calculus. (Feres *et al*, 2015) However SRP is not always successful in reducing the subgingival microbial load completely due to the presence of deep and narrow pockets, due the irregular course of pocket in an individual teeth leading to an irregular base of pockets or due anatomic disturbances such as the presence of furcation mainly in multirooted tooth , grooves and depression onto root surface, or due to "line angles", i.e., the area where a change would be made from one curette blade to another during the root planing process.(Pluss EM, *et al.,1992*)The results of various studies, being conducted for the evaluation of clinical effects of SRP suggest that SRP doesn't show major improvement in all subjects, especially in cases with severe periodontal disease which included deep periodontal pockets and in patients with systemic diesease . (Feres *et al*, 2015) This is probably because of the persistent infections caused by P.gingivalis, A.actinomycetemcomitans and P.intermedia, which have the tendency to invade the soft tissue wall of periodontal pocket and are difficult to eliminate with SRP.(John Walters and Pin-Chuang Lai, 2015) In such case, antibiotics may be required to control the microbial load causing infections along with mechanical debridement as to further 'eliminate or markedly suppress the specific microorganisms which can cause breakdown of periodontal attachment in susceptible patients' (fig 2). (Mombelli, 2017) Hererre *et al*., at the fourth European Workshop, in a systemic review elaborated that systemic antibiotics can offer an additional benefit when used in conjunction with scaling and root planing, similar results were presented by Haffajee *et al*. (Heitz-Mayfield, 2009) Thus the inability of SRP in removal of microbial aetiology

of the infectious periodontal disease, provides the rationale for the use of antibiotics as an adjunctive to periodontal therapy. (Barça, *et al.*, 2015)

Systemic periodontal antibiotic therapy along with mechanical periodontal treatment aims to support the host defense system in overcoming the infection by killing subgingival pathogens that get left after conventional mechanical periodontal therapy. Result of several studies describe that SRP along with proper oral hygiene measures ,are efficient in preventing periodontal breakdown in most of the individuals by supressing total supra-subgingival microbes. (Graziani *et al.*, 2017, Wolf, 2004) However, despite smart dental therapy, some individuals continue to experience periodontal breakdown, as major periodontal pathogens like *Porphyromonas gingivalis*, Aggregatibacter actinomycetemcomitans, *Fusobacterium-nucleatum*, Treponemadenticola, *bacteroids*, intent to invade periodontal tissues or reside in deep pockets or root furcation defects or root concavities or grooves, the sites which are difficult to reach with periodontal instruments, or due to poor host defense mechanisms.(Wolf ,2004, Guzeldemir-Akcakanat,2019)

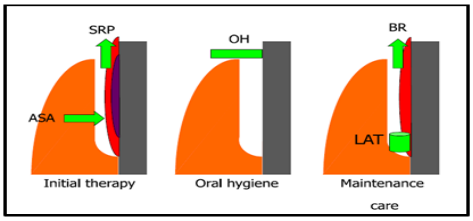

Fig. 2. Diagrammatic represents the clinical significance of microbial colonization in pocket for initial cause-related periodontal therapy (left), immediately thereafter (middle) and during maintenance (right). ASA, adjunctive systemic antibiotics; BR, biofilm removal; OH, oral hygiene to interfere with recolonization; LAT: local antimicrobial treatment; SRP, scaling and root planing to remove calculus (purple) and biofilm (red).(Mombelli, 2017)

Antibiotics used to treat periodontal disease (listed in table 1), are selected based on the patient's medical and dental status, current medications, and results of microbial analysis, if performed. The prime candidates for systemic antimicrobial therapy are those patients exhibiting attachment loss or having residual pockets even after adequate conventional therapy, or patients with active periodontal disease or associated with predisposing medical conditions. (Graziani *et al.*, 2017, Kapoor *et al.*, 2012, Slots, 2004)

Table 1: Common Systemic Antibiotics in Periodontal therapy (Michael G, 1990, Tripathi, K D, 7th edi)

Systemic Antibiotics	Route	Primary Excretion	Doses and Duration
Penicillin group			
Ampicillin	Oral	Renal	250mg-500mg/6h/5-7 days
Amoxicillin	Oral	Renal	500mg/8h/8 days
Augmentin	Oral	Renal	250-500mg/6h/5-7 days
Penicillinase – resistant penicillin Group			
Cloxacillin	Oral	Renal	500mg/6h/
Dicloxacillin	Oral	Renal	500mg/6h/
Cephalosporins			
Cephalexin	Oral	Renal	250-500mg/6h/5-7days
Tetracycline group			
Tetracycline HCL	Oral	1ºRenal 2ºBilary	250mg/6h/2-7 years
Minocycline	Oral	1ºRenal 2ºBilary	200mg 1st day then, 100mg/12h/ 21 days
Doxyclinie	Oral	1ºRenal 2ºBilary	200mg 1st day then, 100mg/12h/21 days
Erythromicin group			
Clindamycin	Oral	Hepatic	300mg 1st day, then 150mg/8h/8days
Metronidazole	Oral	Renal	500mg/8h/8days
Azithromycin	Oral	Hepatic	500 mg/qid./3-7 days

Combination therapy of antibiotics (synergism)	Dosage
Metronidazole + amoxicillin	250mg/t.i.d./8 days of each drug
Metronidazole+ciprofloxacin	500 mg/b.i.d./8 days of each drug

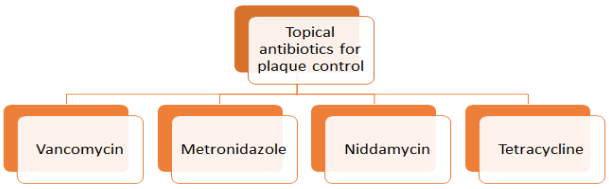

Chart 1: Topical antibiotics for plaque control, Michael G, 1990)

Patients with acute periodontal infections (periodontal abscess, acute necrotizing gingivitis/periodontitis and acute necrotising somatitis) may also require antibiotic therapy. However patients having gingivitis or mild-moderate periodontitis usually respond well to mechanical debridement and need not require additional benefit from systemic antibiotic therapy, if required topical antibiotics can be used (Slots, 2004) Moreover microbial samples can

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be obtained from individual active pockets or from subgingival sites, which will provide a better representation for the range of periodontal pathogens to be targeted with antibiotic therapy. (Kapoor *et al*., 2012). However systemic antimicrobials are more effective when the biofilm has already been reduced with proper debridement. which should be carried out in the shortest possible time span (approximately 1 week) to achieve effective drug serum levels on the day of debridement completion. Thus mechanical biofilm disruption must always be combined with proper oral hygiene measures performed by patient. (Barca *et al*., 2015)

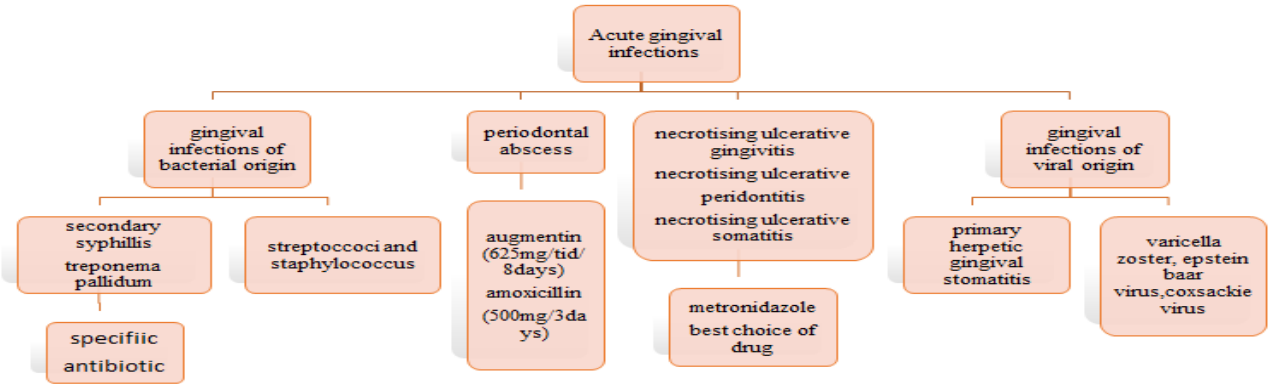

Chart 3– Acute gingival infections requiring Antibiotics (Herrera et al, 2014)

➢ ***Antibiotics as Adjunctive to Periodontal Surgery***

When periodontal surgery is performed, post-surgery is often at risk of developing complications including infection, pain, reduced mouth opening, reduced masticatory capability ,swelling of variable degree and delayed wound healing. (H.R et al., 2006, Rajpal et al., 2015) However the prevention of infections after the periodontal surgery, by prescribing antibiotics have always been controversial. (H.R et al., 2006) Various meta-analysis studies, show that the used of systemic antimicrobials did not show any statistically significant results in relation to the improvement in periodontal parameters. However many studies suggest that antibiotics prescribed postoperatively are effective in reducing the postoperative inflammation, infection and improving wound healing . (H.R et al., 2006, Trivedi, 2014)

Chart 4: Complications after periodontal sugery (Askar.H et al., 2019)

As postoperative infection can have a significant effect on the surgical outcome, preventive measures like strict aseptic protocol, anti-infective measures like proper sterilization, disinfection, barrier techniques need to be taken. If such measures are taken, low rate of postoperative infection following periodontal surgery can be seen, thereby avoiding the need for using antibiotics as a postoperative care. (Monica and Biir, 2019) But in an Indian setting attaining an aseptic environment for a clinical study, in every patient is a goal we dream to achieve. (Trivedi, 2014) Thus antibiotic prophylaxis are to be prescribed post operatively mostly in patients who present with a high risk of infection or when traumatic surgical procedures have been performed. (Rajpal et al., 2015).

II. CONCLUSION

Periodontal therapy involves both nonsurgical and surgical to treat periodontal disease. However, no periodontal treatment has shown clear superiority over any other periodontal treatment. Treatment of periodontitis involves a fine balance of skilled techniques and a better access to the treatment site, which together decrease the risk of disease progression. (Manas et al, 2009, Graziani et al., 2017) In particular instrumentation, typically performed using root debridement with sonic/ultrasonic instruments and the finishing phases of root planing with manual curettes may not always be effective in complete removal of subgingival bacteria. Thus antibiotics can be used as an adjunctive, in the patients who do not respond to mechanical treatment, patients with acute or severe periodontal

infection, and patients who are systematically compromised. (Barça, et al.,2015, Graziani et al., 2017). Additionally systemic antibiotics may be associated with significant adverse effects and increased bacterial resistance, thus should be prescribed only for indicated patients and with caution in patients on long-term medication for cardiovascular disease, asthma, seizures, or diabetes, as there can be drug interactions. (Barça, et al.,2015), Graziani et al., 2017] As antibiotic resistance constitutes an increasing problem, anti-microbial susceptibility testing of isolated pathogens is important, if unavailable, combination therapy is preferred against the mixture of pathogenic bacteria, in the periodontal lesions. (Barça, et al., 2015) Although local delivery of antimicrobials into a periodontal pocket can also improve the periodontal health. However these drug systems do not provide a superior result when compared to scaling and root planing and should be used as an adjunctive to SRP. (Rajpoot AS et al.,2017) .However, prophylactic antibiotic therapy, as recommended by the American heart Association, is mandatory for patients with specific medical problems such as immunodeficiency, metabolic diseases, irradiated in the head and neck area, those at high and moderate risk for endocarditis and for extensive or prolonged surgery.

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