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EXPLORING THE ROLE OF SYSTEMIC ANTIBIOTICS IN PERIODONTAL SURGICAL THERAPY: WEIGHING BENEFITS AGAINST RISKS – A COMPREHENSIVE LITERATURE BASED NARRATIVE REVIEW

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ABSTRACT

Antibiotics play a significant role in both non-surgical and surgical periodontal therapy. However, with the rise of antimicrobial resistance, the necessity of prescribing antibiotics has become a topic of debate among many clinicians. This literature-based narrative review aims to assess the necessity of systemic antibiotics in periodontal surgical therapy. Administration of antibiotics in the prevention of postoperative infection in periodontal surgery is not justified in systemically healthy patients. Similarly, the role of antibiotics in improving clinical and radiographic outcomes in regenerative periodontal therapy is also not justified in systemically healthy patients. Thus, the usage of systemic antibiotics in periodontal surgical therapy cannot be universally justified. The clinicians must consider the available literature evidence, factors related to the patient's systemic health, and the complexity of the surgery before prescribing antibiotics to prevent antimicrobial resistance.

INTRODUCTION

"Periodontitis is an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms or group of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with increased probing depth formation, recession or both"[1]

It is a multifactorial inflammatory disease that occurs as a result of complex interplay between microorganisms and the host immune response. Management of periodontal disease includes a multitude of therapeutic procedures which could be broadly categorized as non-surgical and surgical periodontal therapy. European Federation of Periodontology proposed a stepwise therapeutic approach for the management of periodontitis according to the staging of periodontal disease as follows, Step 1: Motivational and Behavioral therapy, Step 2: Non surgical periodontal therapy, Step 3: Surgical periodontal therapy. Step 4: Supportive care.[2]

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Scaling and root planing are considered to be effective periodontal therapy as they can result in a marked reduction in the clinical signs and symptoms of periodontal disease.[3] Apart from mechanical therapy, various medications are also used as an adjunct to non-surgical and surgical periodontal therapy in the management of periodontitis. Keestra et al. (2014) stated that the administration of antibiotics as an adjunct to mechanical therapy in aggressive periodontitis would improve clinical outcomes.[4]

Surgical management of oral diseases and conditions especially periodontitis, in the field of dentistry, is limited due to anxiety, fear of pain, bleeding, swelling, and post-operative infections. Thus, to get rid of these, medications such as antibiotics and analgesics are commonly prescribed by clinicians at different time intervals in surgical therapy.

The evidence-based role of medications especially antibiotics in the prospect of surgical periodontal therapy has wide lacunae in the literature and it is considered as a grey zone in the field of periodontology. Periodontists and general dentists have different schools of thought about prescribing antibiotics in surgical periodontal therapy at different time intervals. This might lead clinicians to prescribe medications unnecessarily and empirically without any strong evidence.

This review article pivots mainly on the need for antibiotics in surgical periodontal therapy and also presents the final verdict based on the evidence from the literature and can be the eye opener for periodontists and general dentists to have a successful evidence-based clinical practice.

METHODOLOGY

A thorough literature search was done in the online database PubMed / Medline only for systematic review/meta-analysis articles, published in the duration 2010-2024 related to the use of antibiotics in periodontal surgery. Backward searching was also done using the references of each article.

Inclusion criteria: Articles published in English language only, human systematic reviews, and meta-analysis articles related to the use of systemic antibiotics in periodontal surgery.

Exclusion criteria: Articles published in languages other than English, case reports, case series, cross-sectional studies, randomized controlled trials, animal studies, conference abstracts, letters to editors, use of antibiotics in nonsurgical periodontal therapy, use of medications other than systemic antimicrobials in periodontal surgery.

The mesh terms, search strategy, and number of articles included are mentioned in the annexure file.

Antibiotics In Surgical Periodontal Therapy

Periodontal surgery is considered a third phase of therapy next to cause-related therapy according to the guidelines of the European Federation of Periodontology when the endpoints of cause-related therapy have not been achieved. [2] Antibiotics are commonly advised in surgery to maintain their adequate concentration in the tissues before and during the surgical therapy which in turn prevents post-operative complications. However, the most commonly encountered problem globally as stated by the CDC is the development of antibacterial resistance, hypersensitivity reactions, superinfections, etc. following surgery. The National Center for Disease Control & Prevention stated that one in three patients is prescribed antibiotics unnecessarily. Thus, in 2016 WHO recommended the evidence-based administration of antimicrobials during surgical therapy due to, a lack of treatment guidelines related to periodontology per se, failure to adopt the treatment guidelines, varied clinical experience of the dentists, and compulsion from the patients.[5]

Systemic Antibiotics In Periodontal Surgery

Systemic antibiotics are commonly prescribed in surgical periodontal therapy for the prevention of postoperative infection and also to improve clinical and radiographic outcomes.

Systemic Antibiotics In The Prevention Of Postoperative Infection In Periodontal Surgery

Surgical site infection occurs at the site of incision or in the deeper organs / underlying tissue spaces within 30 days of surgery or 90 days if an implant is left in place.[7] It is considered to be the one of the frequent complications following periodontal surgery by most of the dentists. However, the incidence of postoperative infection in the literature evidence is found to be low ranging less than 1% to 4.4% even without administration of antibiotics. Thus, Powell et al. have stated that antibiotics provide no benefit in the prevention of post-operative infection.[7]

However, the American College of Surgeon's Committee on Control of Surgical Infections classified surgeries based on the incidence and risk of infection from class I (clean surgery) to class IV (Highly contaminated surgery). Implant surgeries and regenerative surgeries using bone grafts are categorized as class II clean contaminated surgery with a 10-16% risk of postoperative infection. It can be reduced to 1% by maintaining proper surgical protocol and administration of prophylactic antimicrobial therapy.[8]

Systemic Antibiotics In The Prevention Of Postoperative Infection In Periodontal Regenerative Procedures

The regenerative therapy includes the use of bone grafts and guided tissue membranes in which wound infection, and soft tissue dehiscence with or without membrane exposure are considered to be the common complications. The success of this surgical procedure depends upon the absence of post-operative infection. The guidelines for prescribing antibiotics for the prevention of postoperative infection in head and neck surgeries (clean & contaminated) including bone grafts were given by Bratzler et al. 2020. [9] However, this evidence-based guideline of antibiotic use is still lacking in the field of periodontal regenerative procedures.

Khouly et al. stated that there is inappropriate evidence for the administration of antibiotics in the prevention of postoperative infection in intra-oral regenerative procedures using bone grafts in systemically healthy patients.[10]

Chiou et al. found that antibiotics did not improve clinical and radiographic parameters in the surgical management of intrabony and furcation defects.[11] On the contrary, Nibali et al. found improvement in clinical and radiographic parameters only in the intrabony defects rather than in the furcation defects.[12]

Klinge et al. stated that there is limited evidence of antibiotic use in the prevention of postoperative infection in bone augmentation surgery along with simultaneous implant placement.[13]

Thus, adjunctive administration of systemic antimicrobial therapy in regenerative periodontal therapy is not justified. Moreover, the standard regimen including the ideal dose and duration of antibiotics to be used is also not justified which might lead the clinicians to prolong the antibiotic use postoperatively. Khalil et al. has stated that even the single dose of amoxicillin induce resistance in the oral microbial flora.[14]. Thus, studies in the future should justify the need of systemic antibiotics along with appropriate regimen to be followed in regenerative procedures to prevent the emergence of this global burden.

Systemic Antibiotics In The Prevention Of Postoperative Infection In Implant Placement

Implant surgery is associated with a 10-15% risk of post-operative infection which is considered to be one of the important reasons for implant failure. Administration of antibiotics either pre-operatively or perioperatively in implant placement maintains a favorable aseptic environment and

thus results in optimal wound healing and osseointegration.

On the contrary, Tan et al. on behalf of the International Team of Implantology antibiotic study group stated that implant failure could be due to many other reasons rather than the post-operative infection. [15] Different schools of opinion exist in the literature on whether / not to prescribe antibiotics to prevent early implant failure. Thus the role of antibiotics in the prevention of post-operative infection and to reduce implant failure is still a topic of debate among clinicians.

Khouly et al. evaluated the efficacy of antibiotic prophylaxis in the prevention of postoperative infection in implant placement in healthy patients and suggested that it may not be needed routinely and clinicians can decide depending upon the general health of the individual and, the complexity of the implant surgery.[16]

Torof et al. stated that the use of antibiotics in systemically healthy patients undergoing implant placement can prevent post-operative infection but not post-operative complications such as implant failure. [17] Thus, its clinical use is not justified and further studies are needed to assess the need for antibiotics in patients with comorbid conditions.

Esposito et al. stated that antibiotic prophylaxis decreases implant failure and also suggested that 2gm of amoxicillin can be administered one hour before implant placement as the appropriate antibiotic protocol in implant surgery. [18] Similarly, Ata Ali et al. concluded that antibiotic administration in implant placement can reduce the rate of implant failure.[19]Caiazzo et al. in the consensus report stated that a single dose of antibiotics is necessary to prevent early implant failure in straightforward cases in systemically healthy patients.[20]Canulla et al. also found the same in healthy patients, but there was no significant evidence related to peri-implant infection.[21]

Lund et al. in the Osseointegration consensus conference in 2015, found only a 2% reduction in the risk of implant loss and stated that antibiotic prophylaxis in healthy patients especially in cases of uncomplicated implant surgery is unnecessary.[22] Similarly, Park et al. and Momand et al. also stated the same as it did not result in significant differences in the reduction of implant failure, prosthetic failure, and post-operative infection.[23,24]

Few studies in the literature focused on the appropriate antibiotic regimen to be followed especially antibiotic compound, dose, and dosing schedule. Braun et al. found a reduction in both implant and prosthetic failure rates following administration of antibiotics at all time intervals in implant placement i.e., pre-operative alone or pre and post-operatively or post-operative alone. However, they could not conclude the appropriate antibiotic regimen because of the heterogeneity of the studies included and confounding variables such as the use of chlorhexidine mouth rinse, smoking, and anatomical location of implant placement.[25]

Rodriguez et al. found that pre-operative administration of antibiotics especially 1, 2, or 3gm of amoxicillin is highly effective in preventing implant failure. [26] This finding is similar to the studies conducted by Kim et al.,[27] Millan et al.,[28]Romandini et al.,[29] Mira et al.[30], Tan et al. [31] and thereby single dose of pre-operative antibiotics, most commonly amoxicillin in the dosages of 1gm / 2gm / 3gm) is sufficient rather than prolonging the dose of antibiotics post-operatively.

However, Salgado-Peralvo recommended both pre and post-operative administration of antibiotics, commonly 2-3gm of amoxicillin one hour before placing an implant followed by 500 mg of amoxicillin per 8 hours for five to seven days postoperatively in immediate implant placement with or without infection to prevent early implant failure.[32]

Chen et al.[33] stated that there is no difference between a single dose of preoperative antibiotics and a combination of pre and postoperative antibiotics. Thus, pre-operative or post-operative administration or a combination of pre and post-operative administration of antibiotics is not necessary as it can increase the rate of adverse events.

DISCUSSION

The adjunctive use of antibiotics in the field of periodontics is based on the evidence from the systematic review in the European workshop by Herrera et al. (2002)[34] and the World Workshop by Haffajee et al. (2003).[35] They proposed the rationale for its use as an adjuvant to surgery in the following conditions 1) Refractory cases of periodontitis 2) prevention of post-operative infection 3) regenerative therapy using bone grafts and membranes. This has paved the way for many studies in the literature focusing on the use of antibiotics in surgical periodontal therapy. However, the evidence from the studies failed to frame the proper guidelines or consensus for the clinicians.

Bhuvaraghan et al. [36] have stated that Indian dentists are overprescribing antibiotics in the management of oral diseases both therapeutically and prophylactically. Moreover, the misuse of antibiotics among patients by self-medication is also common in India. Thus, we found interest in bringing forth strong evidence whether to prescribe or not to prescribe local or systemic antibiotics in different surgeries from the existing high level of evidence in the current scientific literature as follows,

Khouly et al.[10], Chiou et al.,[11] Nibali et al.,[12]&Klinge et al.[13] stated that the administration of antibiotics in intraoral bone grafting procedures, especially in healthy patients is not justified. Further studies are thus needed to set a standard guideline in different cases of regenerative procedures with appropriate regimens to avoid empirical administration of antibiotics.

The role of antibiotics in the prevention of postoperative infection in straightforward implant surgery in healthy patients is not justified as reported by Khouly et al. [16] and Torof et al.[17]

Studies by Lund et al., [22] Park et al. [23], and Momand et al.[24] does not favor routine administration of antibiotics in healthy patients to prevent implant failure.

Based on the studies conducted by Rodriguez et al., [26] Kim et al., [27]Romandini et al.,[29] Mira et al.[30] and Tan et al.[31], the most appropriate drug was found to be amoxicillin in the doses of 1gm, 2gm, and 3gm followed by clindamycin.

Moreover, studies by Kim et al., [27] Millan et al.,[28], and

Romandini et al.[29] supported only preoperative single-dose administration of antibiotics. Thus, prolonging the duration of antibiotics by post-operative administration of antibiotics is not justified during implant placement.

Chen et al. on the contrary concluded that antibiotic use either preoperative single-dose or a combination of pre and postoperative administration of antibiotics is not justified to prevent implant failure.[33]

LIMITATIONS

Antibiotics are commonly overused by most clinicians even in simple periodontal surgeries such as access flap surgery without use of any regenerative materials&mucogingival surgeries, etc. Systematic reviews and meta-analysis studies related to the above-mentioned surgeries are still lacking in the literature and thus, they are not highlighted in this review which can be considered as a major limitation.

The heterogeneity of studies, presence of many confounding variables, and differences in the case definitions e.g. post-operative infection, and implant failure are probably major roadblocks for the researchers to frame the guidelines or consensus.

Thus, further studies in the future should focus on the use of systemic antibiotics in various drug combinations in patients with comorbid conditions, in simple as well as complex periodontal surgeries following the case definition of the 2017 classification of periodontal and peri-implant diseases and conditions, are needed to justify the use of systemic antibioticsand thereby to frame proper guidelines for renowned as well as budding clinicians to have a successful evidence-based clinical practice.

CONCLUSION

No standard guidelines or consensus exist in the literature to justify the use of systemic antibiotics in periodontal surgery. Based on the evidence mentioned, it is not recommended to prescribe antibiotics in routine periodontal surgeries at any time interval. So, it's time to march towards "Precision in Periodontology" in which periodontal or peri-implant diagnosis and management are customized according to the individual. It should be recommended and tailored sensibly based on the evidence stated in the literature, the patient's systemic status, periodontal status, and the factors related to surgery to avoid possible side effects. Thus, the benefits vs adverse events of antibiotics should be weighed properly by the clinicians before their use in surgical therapy. Every clinician must monitor and prevent the overuse or misuse of antimicrobials to prevent the global threat in terms of antimicrobial resistance.

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