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INTERDISCIPLINARY PERIODONTICS: A REVIEW

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ABSTRACT

Interdisciplinary dentistry can be described as the mutual consideration of various dental specialties accompanied by expansion of the scope of each. Interdisciplinary dentistry is marked by the application of perspectives, concepts and methods that go beyond the limits of individual specialties. it may either be interpreted in a very narrow sense as the actual fusion of specialties, or in a wider sense as a multidisciplinary phenomenon in which independent specialties work jointly to resolve a problem, each from its own conceptual viewpoint. The real art of dentistry is to co-ordinate and interface these perspectives and provide the best quality of care to the patient.

KEYWORDS: Periodontics, Endodontics, Prosthodontics, Orthodontics.

INTRODUCTION

Interdisciplinary dentistry can be described as the mutual permeation of various dental specialties accompanied by expansion of the scope of each. The term synergy refers to two or more distinct influences or agents acting together to create an effect greater than that predicted by knowing only the separate effects of the individual agents. This definition is applicable to the classic relationship between various disciplines in the dentistry that should go hand in hand for the complete well-being of the patient.

Within modern dentistry, periodontics share an intimate and inseparable relationship with endodontics, orthodontics and prosthodontic dentistry in multiple aspects, including treatment plan, procedures execution, outcome achievement and maintenance.

Periodontic - Endodontic Interrelationships

There is an intimate inter-relationship of the dental pulp and the periodontium. Anatomically there is a pathway between the pulp and the periodontium, via the apical foramina, dentinal tubules, and lateral or accessory canals. Because of the inter-relationship pulpal inflammation cause inflammatory changes in the periodontal ligament even before the pulp becomes totally necrotic. Infective organism and their toxins, tissue debris, and products of tissue necrosis from the pulp reach the periapical area through the various foramina of the root canals and give rise to inflammatory and immunologic reactions.[1]

The close inter-relationship between pulp and the periodontium has caused much confusion and controversy. Although other pathways exist, such as open dentinal tubules, root perforations or exposed apical foramina, the uncovered lateral canal may be a likely cause of periodontal disease progressing into pulpo-periodontal disease. In addition, it has been found that an endodontic infection promotes the formation of a long junctional epithelium. Thus, studies carried out so far indicate that an endodontic infection may aggravate a marginal periodontal inflammation resulting in the proliferation of marginal epithelium with the infected root canal serving as a reservoir of bacteria.[2,3,4,5]

Predisposing factors leading to combined lesions.[1]

A. Atypical anatomic factors
B. Trauma
C. Miscellaneous factors
i. Iatrogenic errors
ii. Possibly, systemic factors.

Classification of Endo Perio Lesion[6,7]

They classified these lesions into 5 categories.
1. Primary endodontic lesion
2. Primary endodontic lesion with secondary periodontal involvement
3. Primary periodontal lesion
4. Primary periodontal lesion with secondary endodontic involvement
5. True - combined lesions

Diagnosis

A perio-endo lesion will be defined-by the following criteria.

1. The tooth involved must be pulpless
2. There must be destruction of the periodontal attachment apparatus from the crevices to either periapical area or the area of an involved lateral/accessory canal.
3. Both endodontic and periodontic therapy must be required in order to resolve the lesion.

Management[8,9,10]

When the pulpal periodontal lesion is from periodontal disease of long duration, endodontic therapy, while necessary, will not correct the periodontal lesion. In such cases, periodontal management usually requires surgical correction in addition to controlling the cause of the disease. While periodontal furcation lesions of short duration secondary to pulpal disease may be successfully managed by endodontic therapy, most often the cause is periodontal disease and the management is difficult.

In general, when primary disease of one tissue (pulp or peridontium) is present and secondary disease is just starting in the other, treatment of the primary disease will cure the secondary. When the secondary disease is established and chronic, both primary and secondary disease must be treated.

When in doubt as to whether the lesion is endodontic or periodontal in origin, endodontic therapy should generally be performed first because of its significantly better prognosis and minimal post – treatment squeal.

Treatment sequence[11]

Treatment of primary endodontic lesion

In this condition, only endodontic treatment is indicated. Complete resolution is usually anticipated after routine endodontic treatment. A fistulous tract usually heals following instrumentation and irrigation of root canals. No root planning should be done when the fistulous tract is along the periodontal ligament. It is important to preserve these fibres so that reattachment can occur.

Treatment of primary endodontic lesion with secondary periodontal involvement

Endodontic therapy should be performed before the periodontal therapy. Prognosis of the lesion depends on the periodontal therapy. One can expect the healing of bone loss due to endodontic lesion following conventional root canal therapy. Periodontal therapy should not be initiated until complete debridement of root canal system has been performed to allow for maximum reattachment

Treatment of primary periodontal lesion

Only periodontal therapy is indicated since the pulpal tissue is vital. Prognosis of these lesions depends entirely on the efficacy of periodontal therapy that is based on the duration of the disease process and extent of bone loss. The prognosis of the pulp is usually good, unless lateral canals are exposed to oral environment.[12]

Treatment of primary periodontal lesion with secondary endodontic involvement[13]

Frequently this is the endodontic problem which must be then followed by periodontal therapy. Prognosis of such lesion depends mainly on the extent of the periodontal condition and the outcome of periodontal therapy

Treatment of combined endo-perio lesion[14,15,16]

Both endodontic and periodontal treatment must be coordinated for optimal results. Periodontal treatment may be done prior to, during or after the endodontic therapy, depending on the lesion. But usually endodontic treatment should be provided first. The use of intracanal calcium hydroxide has been advocated in pulpo-periodontal problem for many reasons.

Prognosis of true combined lesions[17,18]

Prognosis of a combined endo-perio lesion is usually moderate to poor.

Periodontic-Orthodontic Interrelationships

Orthodontic treatment involves an application of a continuous controlled force (by a fixed appliance) or intermittent forces (by removable appliance) which induces cellular changes in the periodontal ligament resulting in tooth movement. A sound periodontium is essential for maintaining the integrity of the dentition. During the course of orthodontic treatment the role that the healthy or diseased periodontium plays is often not understood or emphasized upon.

Periodontal Response To External Forces

The tooth in the oral cavity is subjected to a variety of forces differing in magnitude, direction, duration and frequency. The healthy periodontium is able to adapt itself to these forces by altering the number and width of the ligament fibers.[19]

Type of orthodontic movement

Intrusion and extrusion

Essentially, intrusion alters the cemento-enamel junction and angular crestal relationship thereby creating only epithelial root attachment. In effective control of inflammation may result in deepening of the periodontal pocket.[22] Root resorption along with transient apical displacement resulting in reduced pulpal blood flow has also been demonstrated.[20,21,22] Extrusion of teeth with advanced periodontal disease may have a positive result both clinically and histologically.[23]

Rotation

Teeth treated by rotational movement demonstrate a higher tendency for relapse due to a faulty tissue arrangement during the retention phase,[24] The supracrestal fibres have been shown to be responsible for this relapse.[25,26,27]

Retraction and protraction
When force is applied to protrude the retracted teeth, the sequences of events that take place are just the opposite to those mentioned in the previous condition.

Periodontal factors that influence orthodontic treatment
The following mucogingival issues play an important role during orthodontic movement gingival recession, abnormal frenal and muscle attachments, dehiscence and fenestration, pathological migration.

Gingival recession
orthodontic treatment only further deteriorates gingival health.[28] In 28.6% of the cases undergoing tooth movement, gingival clefting occur.[29]

Abnormal frenal and muscle attachments
Across sectional investigation disregarded renal attachment as the only etiological factor of recession.[30]

Dehiscences and fenestrations
Orthodontic treatment may be considered an etiological factor as well as a treatment option for management of these defects.[31]

Pathological migration
Uprighting of molars, intrusion and rotation of teeth are the treatment options. It has been shown that these treatment options decreased the pocket depth.[32,33] improves alveoloar bone defects,[34] gingival aesthetics and the crown root ratio.[35]

Preventive program for orthodontic patients
- Prior to start of treatment: Active control of periodontal disease, by proper oral prophylaxsis.
- During treatment: Emphasis on maintenance of oral hygiene with proper brushing techniques and other interdental aids, periodic evaluation by dentist.
- At the end of the treatment: Patients to be motivated to maintain good oral hygiene and follow proper dental follow ups.

Surgical methods twining orthodontics and periodontics
Treatment done prior to start of the orthodontic treatment are- frenectomy, gingivectomy, pocket elimination procedures, operculectomy (to facilitate forced eruption procedure). Circumferential supracrestal fibrotomy, gingival augmentations are usually done during the course of the treatment to facilitate tooth movement. At the end of the treatment, aesthetic treatments such as gingival sculpting, mucogingival surgery for root coverage are done. Apart from these, circumferential supracrestal fibrotomy, frenectomy are done as relapse preventive measures.

The orthodontic extrusion, eruption and uprighting
Extrusion, or eruption, of a tooth or several teeth, has been reported to reduce infrabony defects and decrease pocket depth.[36,37] Eruption or uprighting of molars without scaling and root planning in human patients has been shown to reduce the number of pathogenic bacteria.

Bodily orthodontic movement into a bony defect
It has been suggested that orthodontic tooth movement into infra-bony defects can result in healing and regeneration of the tooth attachment apparatus. In addition, periodontists have believed that if a wide osseous defect is adjacent to a tooth and the tooth were moved to narrow the defect, better healing potential may be possible. On the other side, few studies had shown that bodily tooth movement may increase the rate of destruction of the connective tissue attachment of teeth with inflamed infrabony defects.[38]

Clinical Considerations
Indications and Contraindications
Following the first reports by Wilcko,[39] brothers, alveolar corticotomies in combination with mechanic forces have been used for various clinical indications,

Which are grouped in three main categories?
(1) To accelerate corrective orthodontic treatment, as a whole.
(2) To facilitate the implantation of mechanically challenging orthodontic movements.
(3) To enhance the correction of moderate to severe skeletal malocclusions.

On the other hand, although referred by a few studies, there are certain clinical conditions where PAOO is contraindicated
(1) Patients with any sign of active periodontal disease,
(2) Inadequately performed or prognostic poor endodontic treatment,
(3) History of prolonged corticosteroid usage,
(4) Current medication interfering bone metabolism such as bisphosphonates or non-steroidal anti-inflammatory drugs (NSAID).

Case Selection and Treatment Planning
Identify the teeth to provide anchorage and arch segments to be expanded or contracted while the surgeon considers the clinical periodontal status, mucogingival structure, options for minimally invasive surgery and incorporation of aesthetic needs of the patient into the treatment plan.[40,41]

As in all types of fixed orthodontic treatment, maintenance of proper oral hygiene measures with appropriate motivation techniques is essential. Another issue to consider is that, a detailed mucogingival consideration might enhance the outcome of PAOO™ and complex mucogingival surgeries are easier to be accomplished before bracketing

Surgical Technique
The flap design should provide full access to corticotomy site, gain tissue coverage for the graft material, maintain

interdental tissue dimensions and enhance the gingival aesthetics where necessary.[43] As coronal aspect of the flap is full-thickness, a split-thickness approach in apical portions might be preferred to provide closure with minimal tension.

Decortication is performed on both labial and palatal (lingual) aspects of the alveolar bone to initiate the RAP, without creating movable segments of bone. Typically, vertical corticotomies in mid-interdental areas are connected with circular corticotomies. Bone grafting is commonly required in corticotomy areas. Predicted direction and amount of OTM and architecture of the existing alveolar bone in regard to buccolingual dimension and the need for labial support dictates the volume of the material to be used.

Periodontic - Prosthodontic Interrelationships

Defective prostheses may contribute to progression of periodontal diseases. To achieve successful treatment outcomes, periodontists and prosthodontist should cooperate in treatment plan, performance and maintenance.

Rationale for therapy

For the periodontium to remain healthy, restoration must be critically managed in several areas so that they are in harmony with their surrounding periodontal tissues.

1) Periodontal treatment should be undertaken to ensure the establishment of stable gingival margins before tooth preparation for restoration.[42,43] In addition, tissues that do not bleed during restorative manipulation allow for a more accessibility and aesthetic result.[44,45]
2) Certain periodontal procedure are designed to enhance adequate tooth length for retention, impression making, tooth preparation and finishing of restorative margin.[46,48] Failure to complete these procedure before restoration can add to the complexity of treatment along with unnecessary risk of failure.[46]
3) Periodontal therapy should follow restorative procedure because the resolution of inflammation may result in the repositioning of teeth or in soft tissue and mucosal changes.[49]
4) Orthodontic tooth movement and restorations completed without considering the importance of periodontal treatment designed for this purpose may be subject to complicate construction and future maintenance.[50]

Periodontal Considerations

It includes

- ❖ Phase 1 therapy/initial therapy
- ❖ Periodontal surgery
- ❖ Crown lengthening

Phase 1 Therapy

Control of periodontal inflammation during phase I therapy results in restorative procedures of a much higher quality than those carried out in an environment of gingival inflammation.

Periodontal Surgery

In some patients, periodontal surgery like crownlengthening is necessary. These periodontal surgical procedures should be carried out with due regard for the restorative needs of the patient i.e. need to be modified because of the restorative or prosthetic needs of the patient.

Crown Lengthening

In situations in which a tooth has a short clinical crowndeemed inadequate for retention of a required castrestoration, it is necessary to increase the size of theclinical crown using periodontal surgical procedures. These crown lengthening procedures enable the dentistperforming the restoration to develop an adequatearea for crown retention without extending the crownmargins deep into the periodontal tissues, referred to as the biologic width.

Biologic considerations

it is necessary to keep gingival biological width unaltered during restorative procedures. If there are less than 2 mm from restoration's margin to marginal bone clinical crown lengthening should be considered in treatment plan. The line of treatment depends on relationship of crown-root- alveolar bone and patient's esthetical expectations. In order to keep margins of restoration supra-gingivally the distance from marginal bone to margins of restoration should not be less than at least 3 mm. The margins of restoration ideally considered either supra or equiv-gingival. When the margins of restoration are prepared sub-gingivally, the distance from marginal gingiva to margins of restoration should not be more than 0.7 mm. To continue treatment in operated area is recommended not before 4 weeks, and making restorations not before 6 weeks.[51]

Biological width

The dimension of space that the healthy gingival tissue occupies coronal to the alveolar bone is defined as the biologic width. The biologic width (is essential for preservation of periodontal health. *Gargiulo et al (1961),* reported the following mean dimensions: a sulcus depth of 0.69mm, an epithelial attachment of 0.97mm, and a connective tissue attachment of 1.07mm. Based on this work, the biologic width is commonly stated to be 2.04mm, which represents the sum of the epithelial and connective tissue measurements. Radiographic interpretations can identify interproximal violations of biologic width.

Biologic Width Violations

Direct or indirect restorations of tooth crown defects with margins located in the gingival biological width area can potentially induce gingival inflammation, loss of periodontal tissue attachment and unpredictable bone loss. Clinically it could be manifested as.

- Gingival bleeding,
- Periodontal pocket formation,
- Gingival recession.

Correcting Biologic Width Violations

Surgical removal of bone

To remove alveolar bone the modified widman technique is applied. The bone should be moved away from the margin by the measured distance of the ideal biologic width for that particular individual with an additional 0.5 mm of bone removed for a safety zone.

Orthodontic Extrusion

If the biologic width violation has occurred across the facial surface and the gingival tissue level is correct. By applying low orthodontic extrusion force, the tooth will erupt slowly, bringing the alveolar bone and gingival tissue along with it.[101] The tooth is extruded until the bone level has been carried coronal to the ideal level as recommended in that individual. Another option is to perform rapid orthodontic extrusion where the tooth is erupted to the desired amount within several weeks. During this period, a super-crestal fibrotomy is performed weekly in an effort to prevent the tissue and bone from following the tooth during its orthodontic eruption. The tooth is then stabilized for at least 12 week to confirm the position of the tissue and bone so that it does not return to previous undesired position.[53]

Margin Placement and Biologic Width

Role of biologic width in preserving healthy gingival tissues and controlling the gingival form around restorations is very important. Practitioner must also apply this information in the positioning of restoration margins, especially in the anterior esthetic zone, where a primary treatment is to mask the junction of the margin with the tooth.[52]

Margin Placement Guidelines or Restorative Margin Location

The first step in using sulcus depth as a guide in margin placement is to manage gingival health. Once the tissue is healthy, the following three rules can be used to place intra-crevicular margins.

Rule I

If the sulcus probes 1.5 mm or less, place the restoration margin 0.5 mm below the gingival tissue crest. This is especially important on the facial aspect and prevents a biologic width violation in a patient who is at high-risk in that regard.

Rule II

If the sulcus probes >1.5 mm, place the margin one half the depth of the sulcus below the tissue crest. This places the margin for enough below tissue so that it is still covered if the patient is at higher risk of recession.

Rule III

If a sulcus >2 mm is found, especially on the facial aspect of the tooth, then evaluate to see whether a gingivectomy could be performed to lengthen the teeth and create a 1.5 mm sulcus. Then the patient can be treated as mentioned in Rule-I.

Pontic design

Pontics should both esthetically and functionally replace lost teeth, and at the same time be non-irritating to the underlying mucosa and allow effective plaque control and periodontal health mantenance.[44-48]

Classically, four options should be considered in evaluating pontic design: Sanitary, ridge lap, modified ridge lap and ovate designs. The restorative material used for all four designs can be either glazed porcelain, polished gold or polished resin. There is no difference in biologic response of the tissue on contact with the restoration, regardless of the material chosen, as long as it has a smooth surface finish.[49] The sanitary and ovate pontics have convex under surfaces and considered better design because it facilitate cleaning of area beneath it. The ridge lap and modified ridge lap designs have concave surfaces that are more difficult to access for maintenance of periodontal tissue beneath it even with dental floss.

A modified ridge lap design can be given where there is an inadequate ridge to place an ovate pontic design. Whereas the facial aspect of the undersurface has a concave shape, which facilitates an adequate access for oral hygiene by the more open lingual form.[50]

Crown Contour

When the gingiva contacts a non-contoured flat tooth surface, there is a tendency to develop a thick free gingival margin around the tooth. Over-contouring of restorations or faulty placement of contour is a much greater hazard to periodontal health than is lack of contour, since both supra- and sub-gingival plaque accumulation will be enhanced and retained by over-contoured margins. The greater the convexity, the more difficult it is to remove the plaque.[61] The facial or lingual surface of a restoration should not have more than 0.5 mm bulge adjacent to the gingival margin because this may interfere with adequate plaque removal.[56] It has been hence opinioned that buccal and lingual crown contours should be ‘flat’, not ‘fat’ usually less than 0.5 mm wider than the cement-enamel junction, and those furcation areas should be ‘fluted’ or ‘barreled out’ to accommodate oral hygiene aids in these areas.

Overhanging dental restoration and periodontal disease

An overhanging dental restoration is defined as an extension of restoration margin or restorative material beyond the confines of a cavity preparation. They have been strongly implicated as an aetiology factors in initiation and progression of periodontal diseases and are

alarmingly prevalent. In addition to promoting plaque accumulation and provide retention for it. There is good documentation that bleeding on probing, gingivitis and alveolar bone loss has been found to be increased in tissues adjacent to overhanging dental restoration as compared to homologous teeth. Removal of overhanging dental restoration enhances the effectiveness of hygiene phase after periodontal therapy. Many overhanging dental restoration however are not detected on radiographs and are evident only clinically by use of an explorer directed sub-gingivally. In the study of pathogenesis and causality of periodontal disease processes, lesions of endodontic origin are significant as they frequently extend and manifest themselves in the attachment apparatus. These lesions do not only produce signs and symptoms of inflammation in apical areas of teeth, but they may also induce periodontal tissue destruction along the lateral aspects of roots and in furcations of two- and multi-rooted teeth.

A highly significant reduction in alveolar bone height was reported relative to metal restoration with marginal excess equal to or greater than 0.2 mm .posterior teeth were associated with more sever periodontal disease than similar teeth without overhanging restoration. *Michael A. Brunsvold, James* J. *Lane* revealed that overhanging dental restoration is major dental health problem.

Tissue Retraction

Very often, the gingival margin of the restoration is intra-crevicular. To enhance access, so that damage to the soft tissues is prevented during cavity preparation and impression making, it may be desirable to carry out some degree of gingival retraction.

Retraction Cord

Tissue management is achieved with gingival retraction cords, using the appropriate size to achieve the displacement required. Thin, fragile gingival tissues and shallow sulcus situations usually dictate that smaller diameter cords be chosen to achieve the desired tissue displacement.

For a Rule 1 margin, the cord should be placed in such a way that the top of the cord is located in the sulcus at the level where the final margin will be established, which will be 0.5 mm below the previously prepared margin.

On the inter-proximal aspects of the tooth, the cord will usually be 1-1.5 mm below the tissue height because the inter-proximal sulcus is often 2.5-3 mm in depth. With this initial cord in place, the preparation is extended to the top of the cord, with the bur angled to the tooth so that it will not abrade the tissue. This process protects the tissue, creates the correct axial reduction and establishes the margin at the desired sub-gingival level.

Second retraction cord is required to create space for final impression. The second cord is pushed so that it displaces the first cord apically and sites between the margin and the tissue. For the final impression, the top cord is removed, leaving the margins visible and accessible to be recorded with the impression material. The initial cord remains in place in the sulcus, until the provisional restoration is completed.

For Rule 2 situations, where the sulcus is deeper, two larger diameter cords are used to deflect the tissue prior to extending the margin apically. The top of the second cord is placed to identify the final margin location at the correct distance below the previously prepared margin, which was at the gingival tissue crest level. The margin is lowered to the top of the second cord and then a third cord is placed in preparation for the impression.

Various chemicals used for the treatment of chords include:

- 0.1% and 8% recemic epinephrine
- 100% aluminum solution (potassium aluminumsulfate)
- 5% and 25% aluminum chloride solution
- Ferric subsulfate (Monsel's solution)
- 13.3% ferric sulfate solution
- 8% and 40% zinc chloride solution
- 20% and 100% tannic acid solution

These drugs diffuse in blood circulation through crevicular epithelium, which is non keratinized and semi-permeable and cause vasoconstriction which results in transient gingival shrinkage, cause transient ischemia and help to control seepage of blood or gingival fluid.[57]

CONCLUSION

All phases of clinical dentistry are intimately related to a common objective: The preservation and maintenance of the natural dentition in health in an integrated multidisciplinary approach to dental care, it is logical that periodontal treatment precede final restorative procedures.

Hence for successful oral rehabilitation of the patient the multi-disciplinary approach is required where ideas can be exchanged for sake of sound oral health.

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