Chapter

An Insight into Classification, Diagnosis and Comprehensive Management of Food Impaction

Renganath Murugan Jeyasree and Thamilselvan Muthuraj

Abstract

Food impaction is a commonly occurring entity evidenced in day-to-day dental practice. Various factors, such as improperly built proximal restoration, improperly fabricated crown with interdental spacing, opposing plunger cusps, ill-fitting prosthesis and proximal space created after orthodontic treatment by placement of molar bands, act as a reason for food getting impacted in the proximal space of the dentition. But at the same time, it is neglected without knowing the course of pathogenesis of the same, which could eventually lead to formation of localized periodontitis and further progression even leads to loss of dentition. Hence, this chapter gives an in-depth insight to aetiology, clinical and radiographic diagnosis and various means of management of food impaction from a periodontist perspective.

Keywords: food impaction, food lodgement, periodontitis, proximal contact, bone loss

1. Introduction

Food impaction around natural or artificial teeth has become a commonly occurring problem in dentistry. Food impaction occurs when food was forcefully wedged into the periodontium. It is defined as 'the forceful wedging of food into the interproximal space by masticatory pressure (vertical impaction) or the forcing of food interproximally by tongue or cheek pressure (horizontal impaction) defined by glossary of periodontal terms' [1].

Food impaction may be due to anatomical causes or iatrogenic. There was a direct relationship between the contact, contour and shape of the teeth that creates the interproximal space to access path for food to get impacted in between the interproximal spaces.

Food impaction may be vertical or horizontal. Most vertical food impaction is anatomic or clinician induced during fabrication of restoration, whereas horizontal food impaction may be secondary to periodontal disease. It is vertical impaction in which improper pre-operative care, overlooking of certain details and lack of specific knowledge that attributed the problem. Though not entirely surmountable, this

chapter gives an insight into sequel of events occurring because of food impaction and may help in mitigating this problem to a small extent.

2. Classification

Hirschfeld [2] has documented several conditions and factors responsible for food impaction and gave a classification of factors causing food impaction, which are as follows:

2.1 Classification of factors causing food impaction (Dr khairnar revised classification of Food impaction)[3]

Class I: Occlusal wear
Class II: Loss of proximal contact
Class III: Extrusion beyond the occlusal plane
Class IV: Congenital morphological abnormality
Class V: Improperly constructed restorations

2.1.1 Class I: occlusal wear

2.1.1.1 Type A

Wedging action is produced by the transformation of occlusal convexities into oblique facets, exaggerating the action of plunger cusp (**Figure 1**) [3].

2.1.1.2 Type B

The distal portion of the maxillary molars exhibits obliquely worn-off structure, which overhangs the distal surface of its functional antagonist. When the cusp of

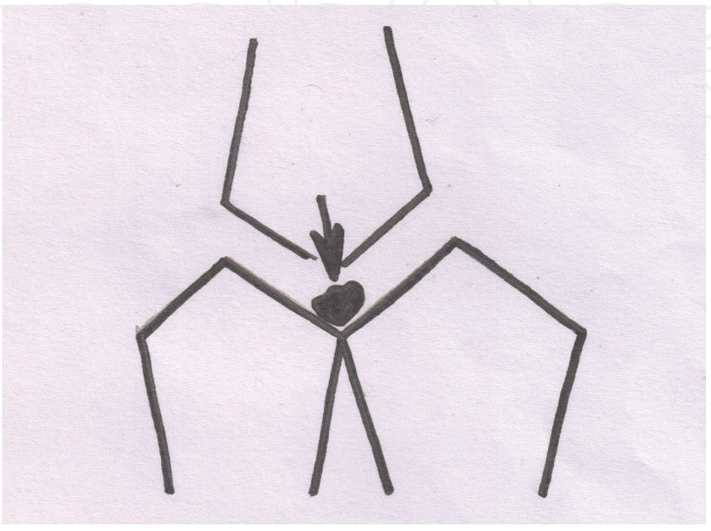


Figure 1.
Wedging action of food by plunger cusp.

maxillary tooth is overhanging the distal surface of mandibular tooth, in such case, the maxillary tooth is forced distally by occlusal forces and bolus of the food, destroying the mesial proximal contact and favours food impaction (**Figure 2**).

2.1.1.3 Type C

Mandibular molars overlap the distal surface of functional antagonist due to obliquely worn tooth structure. When there is attrition on the mesial portion of the crown of the mandibular molar and it is overlapping the distal surface of maxillary molar, due to functional relationship, mandibular molar is forced distally, thus creating open contact at mesial aspect that favours food impaction mesial to mandibular molar (**Figure 3**).

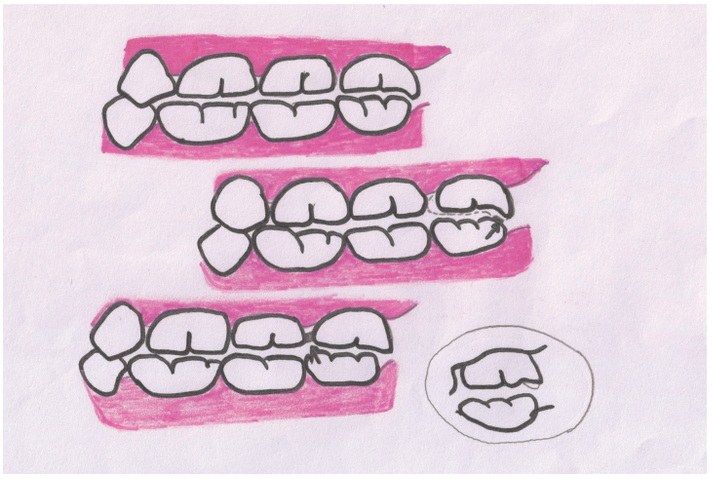


Figure 2.
Maxillary overhanging cusp forcing food in mandibular proximal contact.

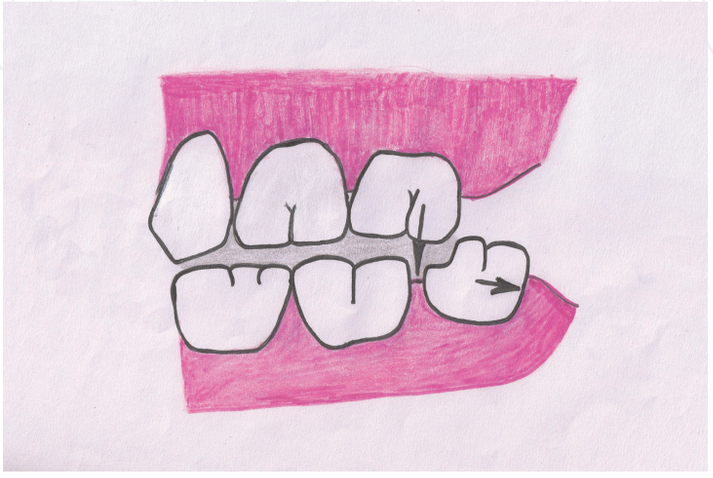


Figure 3.
Obliquely worn mandibular mesial portion favouring food impaction.

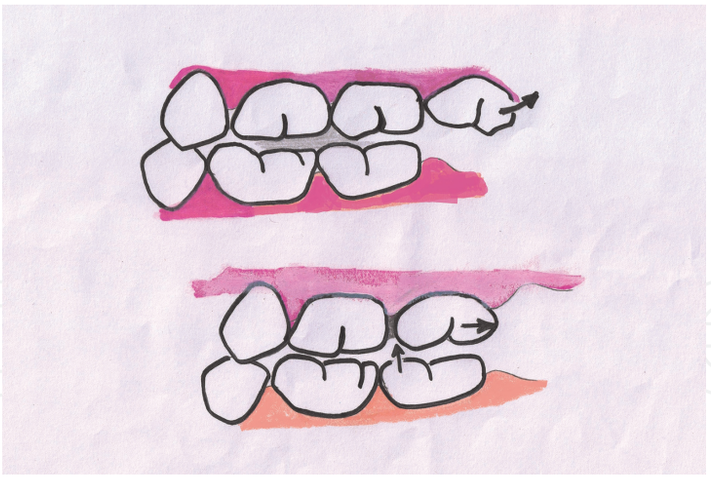


Figure 4.
Open proximal contact mesial to distal tooth and distal to mesial tooth.

2.1.2 Class II: loss of proximal support

2.1.2.1 Type A

Loss of distal support because of the removal of a distal adjacent tooth. Extraction of molar results in loss of proximal support that leads to gradual shifting of adjacent teeth into edentulous space, thus creating open proximal contact mesial to distal tooth and distal to mesial tooth. (**Figure 4**).

2.1.2.2 Type B

Loss of mesial support due to the extraction of mesial tooth.

2.1.2.3 Type C

Oblique drifting due to non-replacement of a missing tooth leads to loss of space by drifting of mesial and distal tooth and extrusion of opposing tooth into the edentulous space. This opens up to proximal contact relationship and favours food impaction (**Figure 5**).

2.1.2.4 Type D

Permanent occlusal openings to interdental spaces (**Figure 6**).

i. Drifting after extraction.

ii. Habits forcing teeth out of position.

iii. Periodontal disease.

iv. Caries.

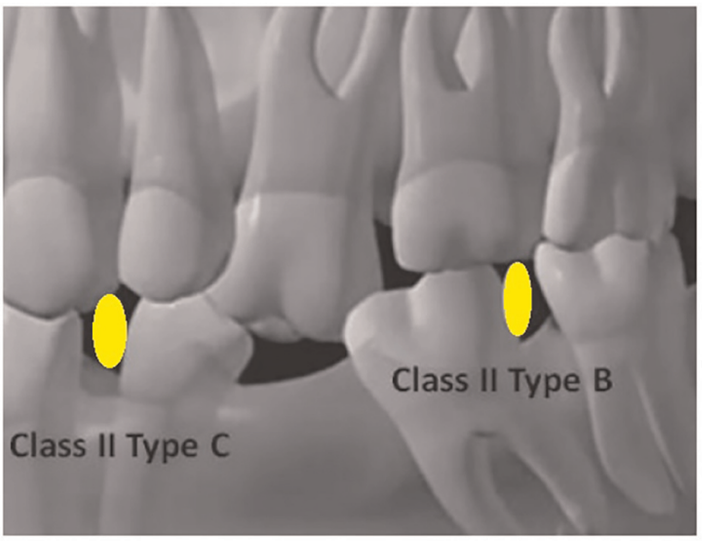


Figure 5.
Teeth drifting due to non-replaced missing tooth.

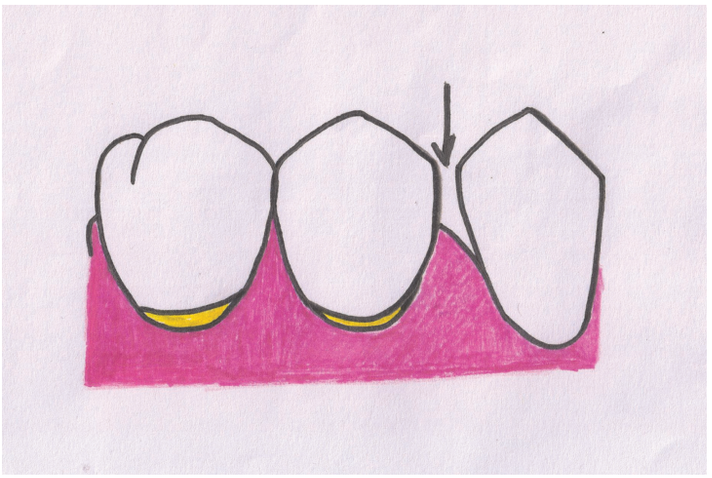


Figure 6.
Permanent occlusal openings to interdental spaces.

2.1.3 Class III: extrusion beyond the occlusal plane

Extrusion of a tooth, which was previously retaining contiguity with the adjacent mesial and distal teeth, results in occlusal step deformity between marginal ridges of extruded and non-extruded teeth. Thus, disturbing proximal contact relationship and favouring food impaction (**Figure 7**).

2.1.4 Class IV: congenital morphologic abnormalities

Any congenital morphologic abnormalities in size, shape, form and position of the tooth leading to open proximal contact were conducive to food impaction.

2.1.4.1 Type A

Position of rotated tooth. Position of tooth with buccal rotation, most commonly premolars with buccal surface facing mesial and lingual surface distally. In such

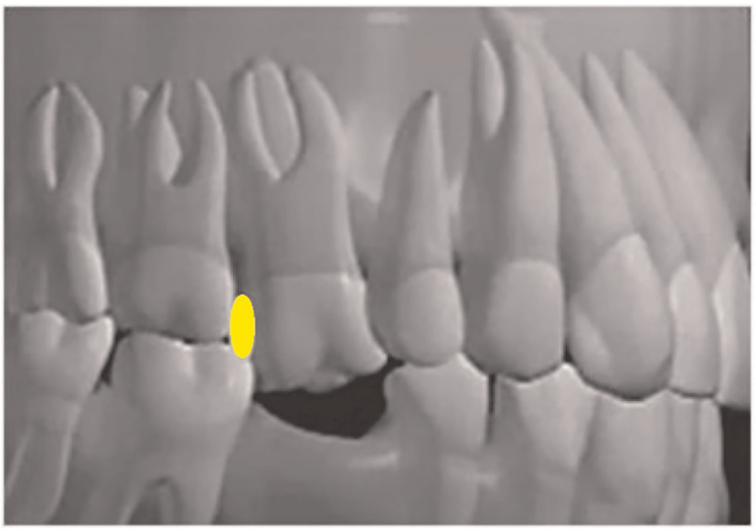


Figure 7.
Extrusion beyond the occlusal plane.

situations, where occlusal surface of premolar was inclined, food gets directed into the distal interproximal space.

2.1.4.2 Type B

Emphasized embrasure between teeth with bulbous neck.

2.1.4.3 Type C

Facio-lingual tilting of the tooth either can modify the interproximal contact with adjacent teeth, allowing food impaction.

2.1.4.4 Type D

Lingual or buccal position of the tooth. Malpositioning of the tooth either more buccally or lingually, especially anterior with a crossbite, can also cause food impaction.

2.1.5 Class V: improperly constructed restoration

2.1.5.1 Type A

Loss of contact point in any restoration or prosthesis permits passage of food into interproximal areas forced by plunger cusp causing further periodontal destruction.

2.1.5.2 Type B

Improper location of contact point. Establishing contact too occlusally will create a smaller occlusal embrasure space. This will prevent food from escaping interproximal

region and action of plunger cusp will force the food into interproximal periodontium. Establishment of a contact point too gingivally will induce an inflammatory response in interdental papilla region leading to bone loss.

2.1.5.3 Type C

Improper occlusal contour due to faulty restoration design with establishment of improper flat interproximal contour leads to inappropriate proximal contact and later will progress into food lodgement.

2.1.5.4 Type D

Improperly constructed cantilever restorations.

2.1.5.5 Type E

Tissue-borne areas of prosthetic restorations giving scalloped cervical bevels, that is, the finishing line of the restorations are over contoured at mesial and distal aspects, it may induce periodontitis, leading to loss of interdental bone [3]. Scalloped cervical bevels on finishing margins of prosthetic crowns can be evaluated by running an explorer along the margins of the crown.

3. Occurrence

Jung et al. [4] in a clinical study on the occurrence of food impaction evaluated the following results:

- Teeth without distal support were found to be the most frequent site of food impaction (41.6%).
- Food impaction was found to be more frequent in the upper teeth (66.2%) than in the lower teeth (33.8%).
- Food impaction was found in tight contact cases (71.4%). Alveolar bone loss was not found in the early stage of food impaction (83.1%).
- The distance between the marginal ridges of food impaction sites (mean=0.48 mm) was shorter than that of the control group.
- In 18.2% of the cases, proximal caries were found at the food impaction site.
- Food impaction affected patient's occlusion with the following frequencies: cusp to marginal ridge relationship (72.7%), cusp to fossa relationship (3.9%) and stepped relationship (23.4%).

4. Factors that contribute to food impaction

1. Prosthodontics-periodontal insight
    - Poorly fabricated crown
    - Poorly fabricated partial dentures
    - Improperly constructed implant crowns
2. Conservative dentistry-periodontal insight
    - Unpolished restorations
    - Broken class II restorations
    - Loss of proximal contact restorations
3. Orthodontics-periodontal insight
    - Post-orthodontic treatment induced periodontitis
    - Malocclusion as a factor for food impaction

4.1 Poorly fabricated crown

When the margin of restoration was not properly blended with tooth surface, it gives a space for bacterial accumulation. The proximal finish line preparation should also move along the contour of interdental papilla. But it was commonly prepared as a straight line or a flat margin, thus invading the papillary space, which leads to irritation of the interdental papilla and later may undergo atrophy. In both conditions, it gives rise to food impaction. The under surface of pontic should have passive contact with mucosa. If not, then oral hygiene measures are hindered, causing plaque accumulation and development of periodontal pocket in adjacent tooth, which further leads to horizontal food impaction in that area [5].

4.2 Poorly fabricated partial dentures

Patients wearing removable partial dentures had minor difficulties with the problem of food accumulation in between the partial denture and teeth, most commonly in mandibular removable partial dentures. It was also noted that patients wearing older dentures were more prone to get food accumulation between the denture and teeth interface when compared with patients wearing newer removable partial dentures. It was central to find that removable partial denture wearers got greater degree of plaque index, gingival index and probing depth [6].

4.3 Improperly constructed implant crowns

Proximal contact loss between implant-supported fixed dental prostheses (FDPs) and adjacent teeth has been suggested as a predisposing factor causing food impaction, which in turn leads to an adverse effect on peri-implant tissues [7–9]. Food impaction between implant-supported fixed dental prosthesis and adjacent teeth occurred more frequently when proximal contact was lost and the embrasure surface area (ESA) was greater. Dimensions of the embrasure also influenced the peri-implant mucosal conditions and bone level around the implant [10].

4.4 Unpolished restorations

Rough surfaces of unpolished restoration act as scaffold for plaque accumulation, which later colonizes and becomes a mineralised form of calculus. This, in turn, deepens the gingival sulcus, thus creating inter proximal pocket and attachment, which leads to creation of space for food impaction.

4.5 Broken Class II restorations

It was noted that the problem regarding posterior resin composite restorations was the difficulty in achieving ideal proximal contours and contacts in Class II cavities. Open contacts lead to food impaction and then periodontal disease [11–13].

4.6 Loss of proximal contact

Studies compared periodontal status adjacent to unilateral open contacts and contralateral closed contacts in which food impaction and occlusal interference were significantly more prevalent at open contacts. In addition, 60.6% of patients had greater clinical attachment loss (CAL) and 49% had deeper probing depths (PD) at open contact sites compared to 17.3% CAL and 22.1% deeper PD at closed contact sites [8].

4.7 Post-orthodontic treatment-induced periodontitis

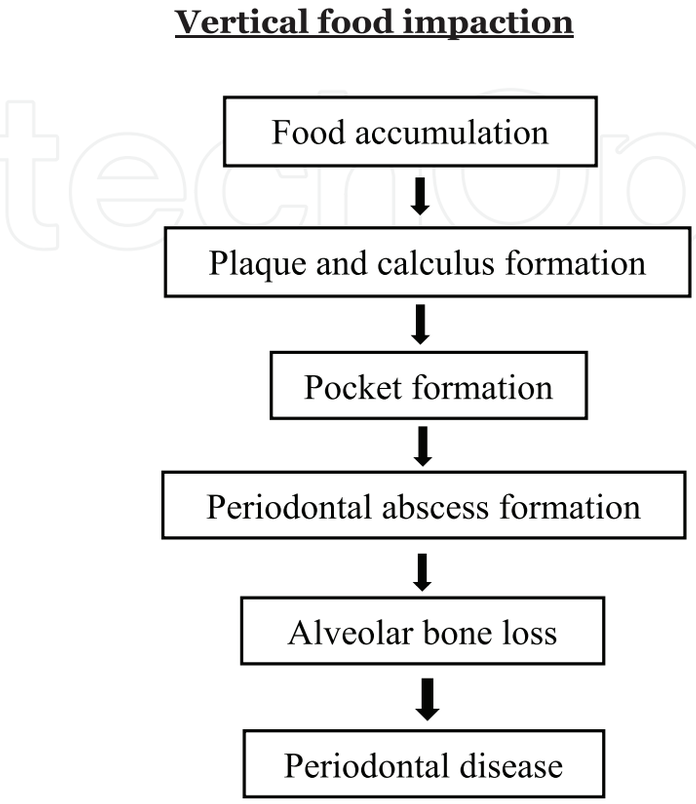
Studies have shown that in the early stages of fixed orthodontic treatment, molar bands are associated with greater periodontal inflammation, exhibiting more bleeding on probing and an increase in periodontal pocket depth when compared with molar bonds [14].

4.8 Malocclusion as a factor for food impaction

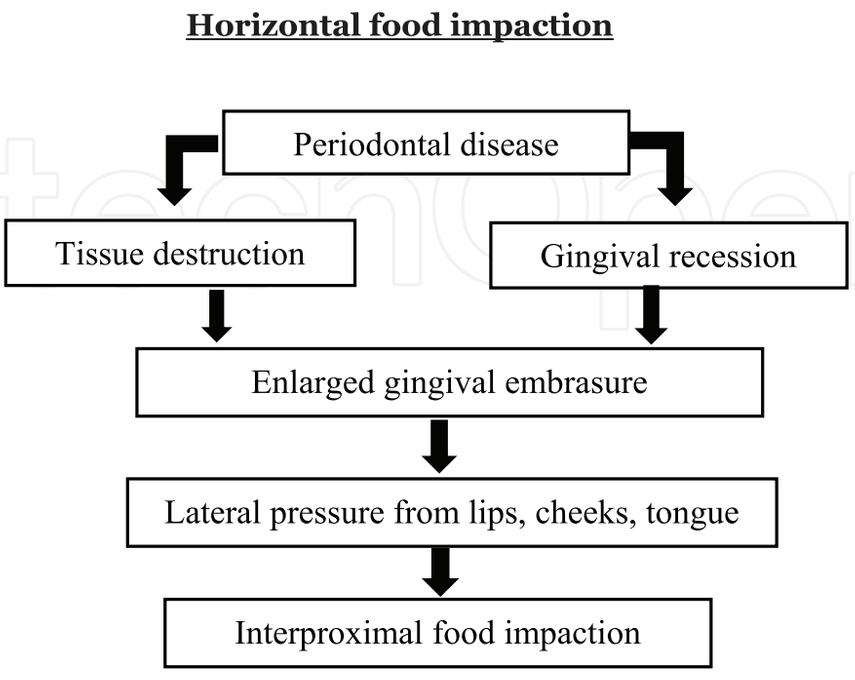
Mal-aligned teeth and malocclusion contribute to formation of periodontal disease, especially gingivitis in the initial stages and later into periodontitis. This is because of the fact that mal-aligned teeth and malocclusion consent the accumulation of plaque and calculus around the teeth and this, in turn, leads to well-established gingivitis and further progression into periodontitis with loss of attachment and accumulation of food in the lost periodontal tissue areas [15].

5. Clinical sequelae of food impaction

5.1 Vertical food impaction



5.2 Horizontal food impaction



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6. Diagnostic methods

6.1 Clinical diagnosis

6.1.1 Detailed history from the patient

It is always essential to take a detailed history from the patient regarding the symptoms the patient encountered from the existing problem. The commonly quoted questions could be as follows:

- *Whether food gets stuck between teeth or gums?*
- *When was the first time the food got stuck?*
- *How long the food lodgement was occurring?*
- *What were the symptoms when food was stuck?*
- *What were the means used to retrieve or remove the trapped food?*
- *Whether any treatment has been undergone before for the same?*

Once the above questions are inquired to the patient, the next and vital step in diagnosis includes the clinical examination of the challenging entity.

6.1.2 Systematic clinical examination

Factors to be evaluated clinically in food impactions include

- *Proximal contact between adjacent teeth*
- *Presence of proximal caries*
- *Approximation of contact areas in class II restorations*
- *Surface of proximal restorations whether polished or rough*
- *Shape of the embrasures*
- *Condition of interdental papilla*
- *Presence of gingival inflammation*
- *Probing depth in interdental region*
- *Presence of food debris or food particles*
- *Presence of calculus in the interdental region*

Once a thorough systematic clinical evaluation was executed, pertaining to initiating the management, a radiographic examination will be vital to validate the extent of periodontal involvement and to initiate a definitive treatment.

6.2 Radiographs as adjuvant

6.2.1 Intraoral periapical radiograph and bitewing radiograph

Radiograph acts as a necessary diagnostic tool to evaluate the extent and severity of periodontal lesions. Intraoral radiographs both intraoral periapical radiographs and bitewing radiographs are considered the most commonly used methods, which provide a two-dimensional view. A typical radiographic feature of food impaction exhibits complete loss of interdental bony crest, representing reverse bony architecture. It was empirical that bone quality and periodontal ligament space scored better on conventional intraoral radiography than CBCT. It was also evident that CBCT does not offer a significant advantage over conventional radiography for assessing periodontal bone levels [16].

6.2.2 CBCT

Various studies have reported that CBCT was as accurate as direct measurements using a periodontal probe and as reliable as intraoral radiographs for interproximal areas. 3D CBCT scanning has got advantages over periodontal probing and 2D intraoral radiography in assessing the exact amount of bone loss architecture. CBCT had better potential in detecting periodontal bone defects in all directions compared with periapical radiographs and was as reliable as radiographs for interproximal areas. CBCT could be considered a superior technique than conventional intraoral 2D radiography since the facial and lingual osseous defects could not be diagnosed with the 2D radiographs. Considering the various benefits, CBCT is currently being considered as a superior diagnostic tool for applications in periodontology [17, 18].

7. Management

7.1 Restorative

Proper proximal contact was crucial in maintaining functionality and stability of dental arch as well as periodontal health [19]. When restoring marginal ridges, deepening occlusal embrasure to provide adequate height helps create spillway for food to prevent vertical food impaction [4]. Cusp-marginal ridge occlusal contacts were predictive factors for contact failure in our specific sample. Periodic evaluation of dental restorations involving proximal surfaces with special attention to patient age and occlusal pattern are recommended. Stability of retreated defective restorations in patients with vertical food impaction was 66%–89% within a 10-year time frame [20].

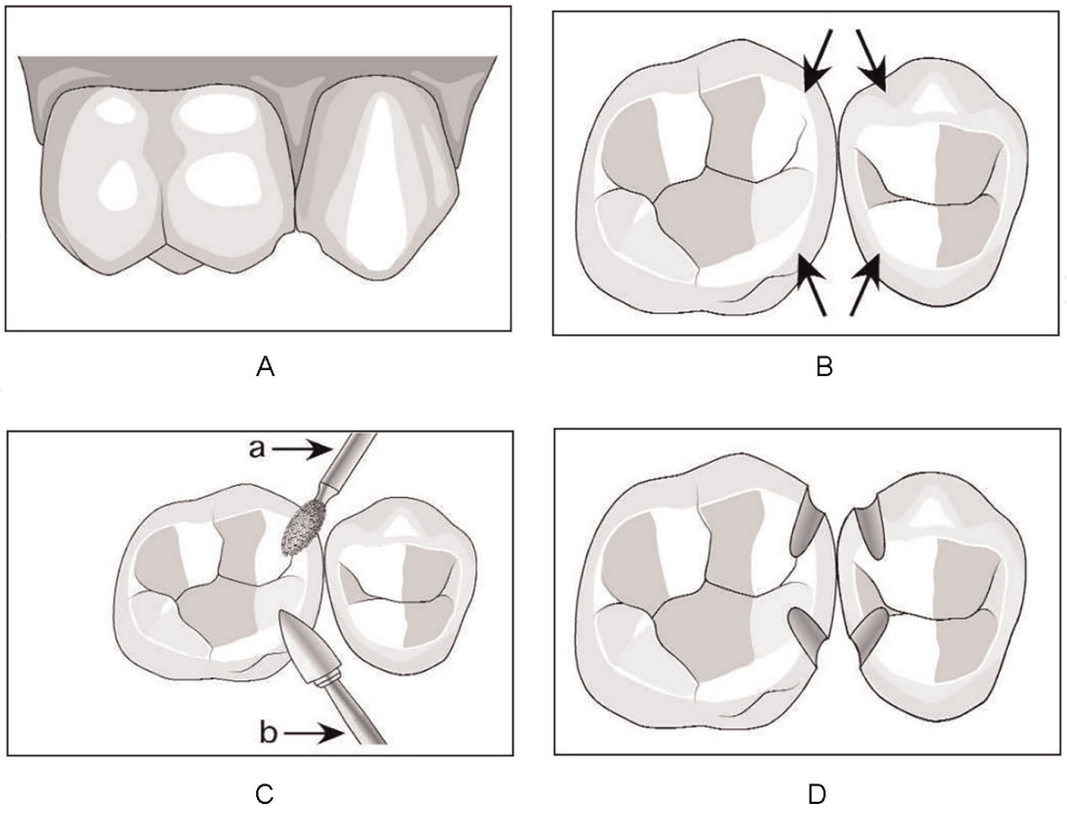

Figure 8.
A: no food escape grooves; B: points of preparation of escape grooves; C: grooves preparation using flame-shaped burs; D: final preparation of escape grooves.

7.1.1 Occlusal adjustment for food impaction

Patients with food impaction associated with a tight contact were evaluated for the presence of the following:

1. adequate food escape grooves

2. uneven marginal ridges

3. a prominent cusp opposing the contact area

When the food escape grooves were not noticed, one should prepare the food escape grooves in the the cuspal ridges just adjacent to the marginal ridges with a 5 mm long, 3.5 mm wide coarse, friction grip, football diamond stone (**Figure 8A–D**) [21]. If the marginal ridges were uneven, the more prominent ridge should be reduced. If a plunger cusp was detected, it should be reduced at the contact point while maintaining light occlusal contacts. All areas altered by the diamond stone were then smoothed with a 7 mm long, 2.5 mm wide friction grip, fine grit, flame-shaped, white Arkansas stone (**Figure 7a–d**) [21]. Care should be taken to remove a minimal amount of tooth structure or restoration to accomplish these goals.

7.2 Orthodontic correction

Among the factors, which contribute to localized periodontitis because of food, impaction is the malalignment of erupting teeth. The forceful wedging of food between the teeth during mastication occurs when proper contact relationship between approximating teeth.

Schuyler has stated definite objectives for correction of occlusal disharmony [22] including:

1. To associate the centric occlusion with unstrained maxilla-mandibular centric relation.
2. To obtain the maximum distribution of occlusal stress in centric relation.
3. To retain the maxilla-mandibular opening.
4. To equilibrate the steepness of similar tooth inclines, thereby distributing eccentric occlusal stresses.
5. To establish smoothness of guiding tooth inclines.
6. To minimize the incline of guiding tooth surfaces, so that occlusal stresses may more favourably be acting on the supporting tissues.
7. To retain the sharpness of cutting cusps.
8. To increase food exits.
9. To decrease contact surfaces.

Hence, it was clear that the role of an orthodontist is vital in evading periodontal disease caused by food impaction due to malocclusion by bringing out a harmonious occlusion to a dentition, which commonly acts as one of the predisposing factors.

7.3 Periodontal treatment

Hancock et al. [7] reported that 80% of proximal contacts with vertical food impaction had moderate-to-severe gingival inflammation (GI score >2). From this, it was evident that a significant proportion of patients with food impaction could be reported with periodontal problems. Therefore, a definitive periodontal treatment was obligatory for the patients with complaints of food impaction.

7.3.1 Phase I periodontal treatment

Phase I periodontal treatment is comprised of thorough scaling and root planning of the involved sites. The prime goal of nonsurgical periodontal treatment is to restore gingival health by completely removing the factors that provoke gingival inflammation (i.e., biofilm, calculus and endotoxin) from the tooth surface. A thorough scaling

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and root planning result in reduction of periodontal pathogens along with elimination of inflammation clinically [23].

Root surfaces with biofilm and calculus exposure stance a different problem of causing cemental irregularities [24]. Subgingival calculus was porous and harbours bacteria and endotoxin and therefore should be removed completely [25]. When dentin is exposed, biofilm bacteria may invade dentinal tubules. Therefore, scaling alone was insufficient to remove them, and a portion of the root surface must be removed to eliminate these deposits.

Patients with minimal amounts of calculus and relatively healthy periodontium can be treated in single appointment. Most other patients require multiple treatment sessions. The dentist should estimate the number of appointments needed on the basis of the number of involved teeth, severity of inflammation, amount and location of calculus, depth and activity of pockets, presence of furcation involvements and patient's compliance with oral hygiene maintenance.

It has been argued that such proficiency in instrumentation cannot be attained, and therefore periodontal surgery is necessary to gain access to root surfaces. Still, the mastery of scaling and root planning is essential to the ultimate success of any course of periodontal therapy.

Subgingival scaling and root planning are performed with universal or Gracey curettes by holding the curette with a modified pen grasp, the correct cutting edge slightly adapted to the tooth, with the lower shank kept parallel to the tooth surface and moved towards the tooth so that the face of the blade is nearly flush with the tooth surface. The blade was then inserted in the gingival sulcus and advanced to the base of the pocket using a light exploratory stroke. With a working angulation between 45 and 90 degrees, pressure is applied laterally against the tooth surface. Calculus is removed by short, powerful pull strokes (**Figure 9**). Once the calculus was removed, the resistance to the passage of the cutting edge of the curette diminishes until only a slight roughness remains. Longer, lighter root planning strokes are then activated with

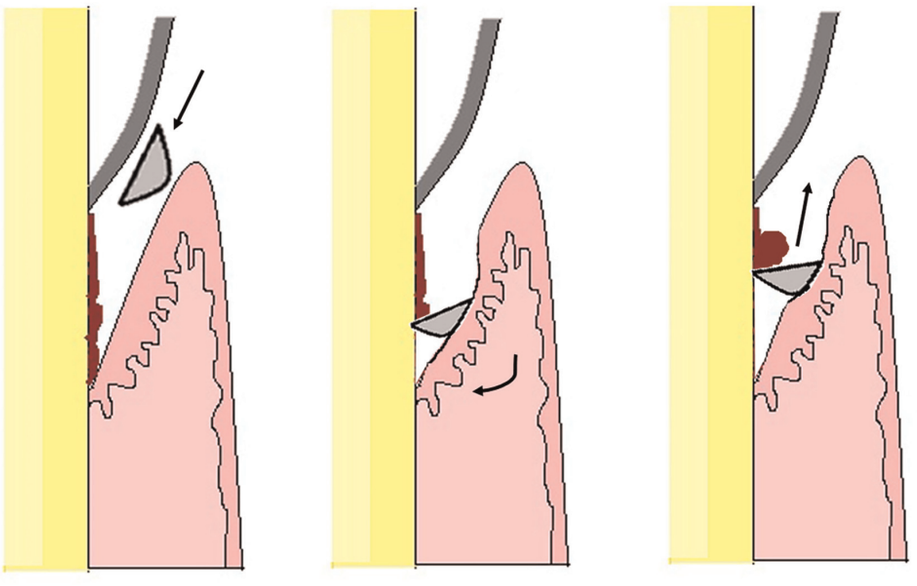

Figure 9.
Root surface planning using a curette with blade insertion and establishing stroke.

less lateral pressure until the surface of the roots is felt completely smooth without any irregularities [23].

7.3.2 Phase II periodontal treatment

Phase II periodontal treatment is performed only when the probing depth is 5 mm or greater, in accessible areas to perform scaling and root planning, lack of visibility to root surface, presence of subgingival calculus and its removal was difficult with scaling and root planning and evident bone loss.

Surgical periodontal therapy includes open flap debridement of the involved site using crevicular incision, full thickness flap reflection, thorough debridement of the site using curettes and/or ultrasonic scaler and then pacing the osseous defects using bone replacement grafts along with membrane over it and then approximating the flap using interrupted sutures.

Periodontal maintenance is vital following any means of periodontal management either phase I or phase II periodontal therapy.

7.3.3 Periodontal maintenance

Integrity of the proximal contact should be considered as primary factor for the periodontal maintenance of interproximal region. Each contact was tested twice with a double strand of unwaxed dental floss as described by O'Leary [26].

Each contact was described as given below:

1. Tight contact—definite resistance to the passage of dental floss.

2. Loose contact—minimal resistance to dental floss.

3. Open contact—no resistance to dental floss.

Based on the integrity of contact, need for creation of space between interdental contact areas to ease the entry of dental floss was established.

Based on the level of the presence of interdental papilla fill in the embrasure, oral hygiene maintenance, using various interdental cleansing aides, is to be prescribed for the patient (F**igure 10**).

1. No loss of interdental papilla: Dental floss

2. Interdental papilla loss of ½ the embrasure space: Interdental brush

3. Complete loss of interdental papilla: Uni-tuft brush

It was always pivotal to know that patients with evident interdental space, presence of interdental food impaction and loss of interdental papilla will have to rely on either of the interdental cleansing aides for their lifetime. Periodic review of the existing condition of interdental papilla health and interdental tooth or restorative surfaces with enforcement of scaling and root planning was central.

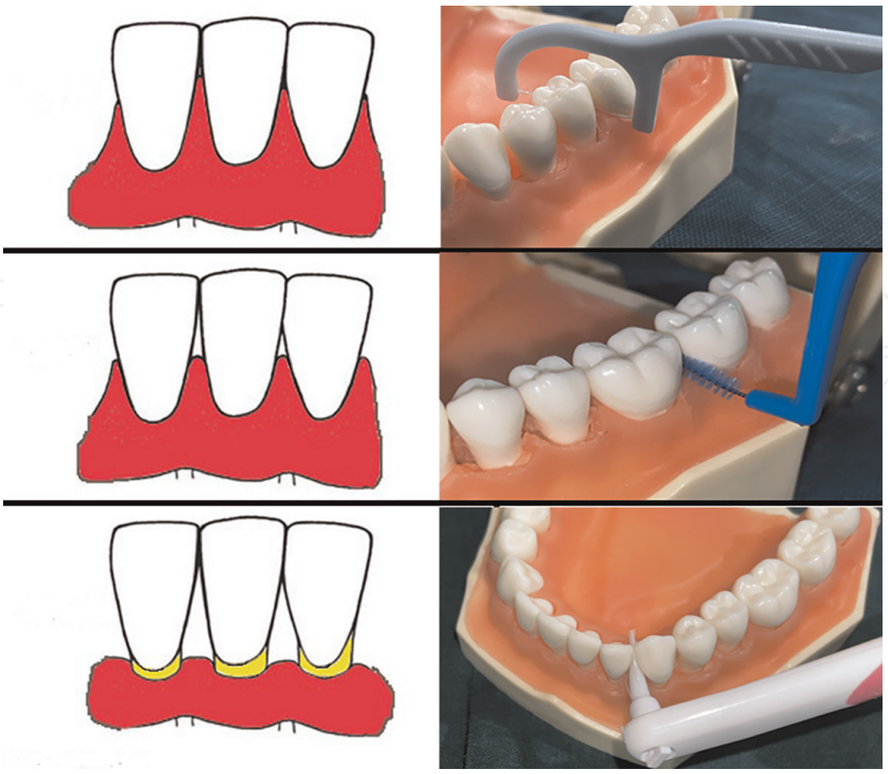

Figure 10.
Use of different interdental aides for different types of papilla.

8. Conclusion

Considering the aetiology as the fundamental core of food impaction, along with the aetiology, other factors, such as pattern of occlusion, periodontal status of the involved teeth and the harmonious alignment of the dentition, provided with the effective oral hygiene maintenance by the patient, plays a major role in the comprehensive management of the food impaction.

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Conflict of interest

The authors declare no conflict of interest.

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