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Dental and Occlusal anomalies in Paediatric Patients with Endocrine Disorders

Comparison of Alignment Efficiency of Superlastic and Heat activated Niti archwires

Dental Arch Width Dimensions of Orthodontic Patients

Detrimental Effects of Orthodontic Treatment: A Review Article

Management of Severe Spacing with Bimaxillary Proclination: A case report

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Detrimental Effects of Orthodontic Treatment: A Review Article

Adeloye AY and Uwaoma EN

Abstract

Orthodontic treatment plays a vital role in correcting malocclusions, improving oral function, and enhancing aesthetic appearance. However, like any medical intervention, it carries the risk of adverse effects. This article critically reviews the various detrimental outcomes associated with orthodontic therapy, including physiological, psychological, systemic, and appliance-related complications. It also explores management strategies aimed at preventing or mitigating these effects.

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Introduction

Orthodontics is the dental specialty focused on the study of craniofacial growth, dental development, and occlusal function, with particular attention to the diagnosis and treatment of dentofacial anomalies.[1] Treatment modalities such as fixed appliances, clear aligners, and removable appliances are instrumental in correcting dental malocclusions, enhancing function, and improving facial aesthetics. While these therapeutic outcomes are well recognised, it is imperative to acknowledge that orthodontic interventions may also be associated with adverse effects, some of which may be transient and others irreversible.[6] Understanding these complications is essential for proactive risk management throughout the orthodontic care process.

Physiological and Biological Effects

1. Root Resorption

Root resorption is among the most frequently encountered adverse outcomes of orthodontic treatment.[1] It is an inflammatory process initiated by localised ischemia and subsequent necrosis of the periodontal ligament under orthodontic force.[1] The onset and progression of root resorption are associated with risk factors which are related to the orthodontic treatment such as the duration of treatment, the magnitude of the force applied, and the direction of the tooth movement. Others are the method of force application, the orthodontic movement that are patient-related such as individual susceptibility on a genetic basis, some systemic diseases, anomalies in root morphology, dental trauma, and previous endodontic treatment.[1]

Clinical evidence shows that root length loss of approximately 1 mm during a two-year fixed appliance therapy is common and usually not clinically significant. A relationship has been observed between changes in overjet and the severity of root resorption. The greater the overjet during orthodontic treatment, the more severe the root resorption in the maxillary anterior teeth.[1] This is because greater tooth movement is required to reduce the overjet. However, an increased overbite may be associated with greater root resorption of the maxillary lateral incisors.[1]

It has been established that the deeper the overbite, the greater the root resorption observed in the distal

root of the maxillary permanent first molar and the maxillary incisors.[1] However, susceptibility to root resorption varies among teeth. Research indicates that maxillary teeth are more prone to resorption than mandibular teeth.[1] Anterior teeth are generally more susceptible than posterior teeth.[1] In the lower arch, canines are the most affected, followed by lateral and central incisors.[1] Root resorption in molars and premolars is minimal, typically less than 1 mm.[1]

Management: Periodic radiographic monitoring, light orthodontic forces, and modification of treatment plans are essential preventive strategies.[1, 4] Prevention of root resorption during orthodontic treatment involves controlling risk factors.[1]

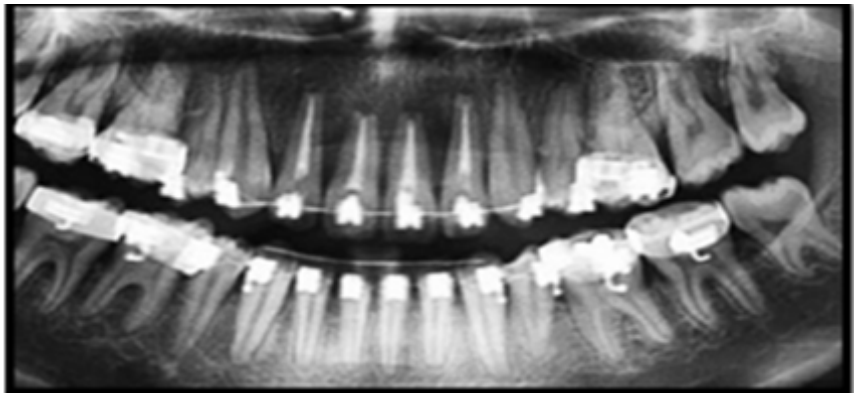

Figure 1.1: Panoramic radiograph showing resorption of the apical roots of maxillary anterior teeth. (Abdulrazzaq et all., 2018)

2. Tooth Decalcification and Demineralisation

Demineralisation occurs as a result of prolonged plaque retention around orthodontic appliances, leading to acid-induced dissolution of the enamel matrix. White spot lesions, the earliest clinical sign, often emerge in areas around brackets and bands.[2] Contributing factors include poor oral hygiene, high sugar intake, and prolonged appliance wear.[1, 2] These lesions differ from hypocalcified enamel developmentally and can progress to caries if untreated.[2]

Management: Daily fluoride rinses, topical fluoride applications, fluoride varnish around brackets, and oral hygiene reinforcement and dietary counselling are effective.[1] Discontinuation of treatment may be warranted in severe or uncooperative cases.[10]

Preventive Measures: Use smaller brackets, remove excess adhesive during bonding, and apply glass ionomer cement when banding. Selective use of looped archwires and careful appliance placement reduce plaque retention.

Figure 1.2: *(A–D)* Case demonstrating remineralisation occurring a few weeks after the completion of orthodontic treatment. Images (A) and (B) show the presence of white spot lesions immediately post-debonding. Images (C) and (D) illustrate notable remineralisation, attributed to improved oral hygiene practices and the natural availability of minerals from saliva, fluoridated toothpaste, and other remineralising agents. **Jasim HA. (2022)**

3. Periodontal Issues

Periodontal disease encompasses gingivitis, alveolar bone loss (periodontitis), loss of attached gingival support, and gingival recession. The periodontal response to orthodontic appliances is influenced by host resistance, presence of systemic conditions like uncontrolled diabetes mellitus, amount and composition of dental plaque, lifestyle factors, such as smoking, which can further compromise periodontal health.[6] Fixed and removable orthodontic appliances are known to increase dental plaque accumulation and alter the composition of the oral microbiota.[6] This bacterial shift can lead to localised gingivitis during treatment; however, progression to periodontitis is rare.[6] Orthodontic tooth movement outside the alveolar housing, particularly in patients with thin biotype or pre-existing recession, may lead to bony dehiscence and further attachment loss.[1]

Periodontal considerations before orthodontic treatment includes a comprehensive evaluation of periodontal status, particularly in adult patients. Before initiating orthodontic treatment, control of periodontal health is essential prior to starting orthodontic therapy, measurement of the level of attached gingiva from the free gingival margin to the mucogingival junction, minus the gingival sulcus depth.[6] Seeking a periodontal consultation is advised if an inadequate amount of attached gingiva is identified before treatment.[6] Management: Pre-treatment periodontal assessment, oral hygiene reinforcement, fluoride/chlorhexidine varnishes, and consultation with periodontists when required, are critical.[1,6]

Figure 1.3: Lower central incisor exhibiting localised gingival recession that developed during orthodontic treatment. **Jasim HA. (2022)**

4. Gingival Hyperplasia

Gingival hyperplasia during orthodontic therapy is commonly triggered by chronic plaque accumulation, resulting in inflammation and fibrotic overgrowth.[5] It may also be influenced by genetic predisposition, drug use (e.g., phenytoin, cyclosporine), and excessive mechanical irritation from orthodontic appliances.[5]

Management: Proper oral hygiene, regular prophylaxis, appliance adjustments to reduce irritation, and in severe cases, surgical intervention (gingivectomy) are warranted.[5]

Figure 1.4: A picture showing gingival hyperplasia after completion of orthodontic treatment. **LUTH Orthodontic Clinic**

5**. Black Triangle Formation**

Black triangles are small, triangular gaps that appear between teeth near the gum line following orthodontic alignment. These spaces result from inadequate or absent interdental papilla, often due to underlying bone loss, recession, or root divergence.[10] When teeth are uprighted or tipped during treatment, the crowns may appear aligned, but the roots remain apart, preventing complete gingival fill.[10] This creates visible voids, posing aesthetic concerns and increasing susceptibility to plaque retention and periodontal inflammation.[10]

Management: This depends on the severity of the embrasure space and the underlying cause. Mild cases may respond well to orthodontic or cosmetic intervention, while more severe cases may require restorative or surgical approaches.[10] Aligning the roots of adjacent teeth helps reduce divergence, allowing the interdental papilla to better occupy the embrasure space.[10] Crown and veneers, composite buildup, or papilla reconstruction are applicable.[10] These interventions aim to enhance aesthetics while preserving periodontal health.[10]

Figure 1.5: Black triangle showing between the maxillary central incisors. **(Athar S and Jayadev S (2020)**

7. Temporomandibular Joint Disorder (TMD)

Temporomandibular disorders (TMDs) refer to a collection of musculoskeletal and neuromuscular conditions that affect the temporomandibular joint (TMJ), masticatory muscles, and associated structures. TMD has a multifactorial etiology which can be psychological, hormonal, genetic, traumatic, and occlusal factors, all of which contribute to its onset and progression.[1] Temporomandibular disorders may arise during or after orthodontic treatment, especially in cases where therapy extends beyond two years.[1] Patients may experience joint discomfort, clicking, or restricted mandibular movement. The use of certain appliances, such as high bite turbos, may contribute to altered occlusion and muscular adaptation, potentially exacerbating TMD symptoms. In dissatisfied cases, patients may associate the onset or worsening of TMD with their orthodontic experience, even when a direct causal link is uncertain. This misattribution can result in perceived malpractice and strained patient-practitioner relationships.[1]

Prevention of TMD: This includes pre-treatment screening with detailed history and TMJ evaluation. Treatment should aim for occlusal stability and minimise interferences by using low-profile appliances or aligners. Educating patients on symptom recognition enhances early detection.

Management: This involves recommending a soft diet, occlusal splints for bruxism, jaw exercises, thermal therapy, and light-force mechanics. In complex cases, multidisciplinary care involving oral specialists and physiotherapists is advised.

8. Pulpal Injury

Pulpal injury may occur when excessive apical movement during orthodontic treatment compromises vascular supply to the pulp, potentially leading to inflammation or necrosis.[1] Traumatized teeth are especially vulnerable due to pre-existing pulpal compromise.[1,6]

Management: It begins with thorough clinical and radiographic assessment before treatment.[1,6] Minimal, controlled forces should be applied, and at-risk teeth should be closely monitored.[1,6] Early detection of pulpal or periapical changes is crucial. Collaborative care involving both the orthodontist and conservative dentist is essential for long-term success.

PSYCHOLOGICAL AND SOCIAL EFFECTS

1. Self-Esteem and Body Image Concerns

Visible orthodontic appliances, particularly during the early phase of treatment—can cause a decline in self-confidence and heightened self-consciousness among patients, especially adolescents. The appearance of the smile significantly affects adolescents' self-perception, and the presence of braces may lead to embarrassment, reluctance to smile, or social withdrawal.[12]

2. **Bullying and Social Stigma**

Children and teenagers with visible braces are sometimes subjected to teasing or derogatory nicknames like “metal mouth” or “train tracks,” which can cause emotional distress, social anxiety, and disruption in academic performance.[13] A follow-up study reported that 78% of previously bullied adolescents ceased to be targeted after orthodontic realignment, highlighting the positive psychosocial impact of orthodontic treatment.[13] Clear aligners may similarly reduce negative peer reactions.[13]

3. **Treatment Fatigue and Psychological Stress**

Orthodontic treatment, typically spanning 18–36 months, can lead to patient fatigue due to slow progress, frequent appointments, dietary limitations, and discomfort.[14] This prolonged burden often diminishes motivation and compliance, fostering feelings of overwhelm and psychological stress if patients feel uninformed or unsupported.[14]

4. **Social and Lifestyle Limitations**

Orthodontic treatment can interfere with everyday social routines; public eating may feel uncomfortable

due to food trapping in brackets, and chewing difficulties are common.[15,16] Speech may also be temporarily impaired by appliances such as expanders or headgear, leading some individuals to avoid dating or public speaking.[15,16] These lifestyle limitations often result in heightened self-consciousness and social anxiety, particularly in adolescents.[15,16]

5. **Financial Burden of Orthodontic Treatment**

Orthodontic treatment can impose significant financial strain on individuals and families, particularly those with limited resources or inadequate insurance coverage.[17] These costs often include not only the initial treatment but also ongoing expenses such as retainers, emergency repairs (e.g., rebonded brackets or loose bands), and extended treatment due to relapse or non-compliance.[17] Such financial pressures can generate stress for both patients and caregivers, especially when multiple family members require treatment.[17]

Management: Provide supportive communication to highlight treatment benefits and realistic timelines for improvement. Consider discreet appliances like clear aligners or lingual braces for patients concerned about appearance.

EFFECTS OF ORTHODONTIC APPLIANCES

1. Pain

Most patients experience pain or discomfort within the first 2–6 hours after appliance placement, with intensity peaking at around 24 hours and subsiding over the next 7 days.[18,19,20]

Pain perception varies due to age, gender, emotional state, and appliance type.[19,20,9]

Common procedures like separator placement and archwire activation typically induce mechanical pressure, ischemia, and inflammation—biological triggers for pain.[18,19,20,9]

Visual Analogue Scale (VAS) and Numerical Rating Scale (NRS) are widely used tools to assess this pain objectively.[19,20]

Prevention of Orthodontic Pain: Educating patients about the transient nature of orthodontic discomfort helps reduce anxiety and improve compliance.[9,19] Using light, controlled forces during appliance placement and adjustments limits inflammation and associated pain.[19] Self-ligating brackets may cause less discomfort than conventional systems due to lower friction.[19] Maintaining oral hygiene and using orthodontic wax can minimise mucosal irritation.[19]

Management: This includes pharmacological and non-pharmacological methods. Paracetamol is commonly recommended for pain relief without interfering with orthodontic movement, unlike NSAIDs which may inhibit prostaglandin-mediated tooth movement.[18,20] Preoperative analgesics have also shown effectiveness in reducing pain, especially in anxious patients.[18,20] Adjunctive therapies such as low-level laser therapy, transcutaneous electrical nerve stimulation (TENS), vibratory stimulation, and analgesic chewing gum are noninvasive options shown to relieve discomfort while preserving biologic tooth movement.[19,20]

2. **Allergic Reactions**

Allergic reactions, though relatively uncommon, are clinically significant complications in orthodontics, particularly among sensitive individuals.[2,6] Nickel, a major component of stainless steel brackets, archwires, and auxiliaries, is the most frequently implicated allergen.[2,6] Patients with nickel hypersensitivity may present with erythema, intraoral mucosal irritation, itching, or cutaneous rashes especially around the lips and cheeks.[2]

Latex is another potential allergen, often present in elastomeric ligatures and gloves used during appliance placement.[6,8] In latex-sensitive patients, exposure can result in symptoms ranging from mild contact stomatitis and mucosal swelling to more pronounced inflammatory reactions.[8]

Management: It begins with early recognition and identification of allergenic materials during patient history-taking. Nickel-free or titanium-based

appliances are strongly recommended in known sensitive individuals.[2,6] In cases where complete material avoidance is not feasible, temporary physical barriers such as covering metal parts with protective coatings may be considered. Latex-free ligatures and gloves should be used as standard protocol in at-risk patients.[8] These preventive measures significantly reduce the likelihood of allergic reactions and enhance patient comfort throughout treatment.[2,6,8]

3. Injury or Discomfort

a. Headgear-Related Ocular and Soft Tissue Injury

Orthodontic headgear, especially models using elastic traction, can pose significant risk when the facebow unexpectedly recoils, striking the face, neck, or eyes.[2] Such incidents often occur during sleep or sudden patient movements, increasing the potential for soft tissue injuries or, rarely, penetrating ocular trauma.[2] Although serious eye injuries are uncommon, their severity underscores the necessity of robust preventive protocols.

Management and Prevention: All headgear systems, including Kloehn facebows, must incorporate safety features such as automatic releases or disengagement mechanisms to minimise recoil injuries.[2] Strict adherence to fitting guidelines, patient education, and routine equipment inspection is essential. Failure to uphold these safety standards may lead to medico-legal ramifications for the practitioner.[2]

b. Effects on Soft Tissues

The oral soft tissues comprising the lips, buccal mucosa, palate, floor of the mouth, and tongue are especially vulnerable during orthodontic treatment.[2,6] Repetitive friction from protruding archwire ends, labially placed brackets, or molar bands can result in irritation, ulceration, or open sores that interfere with speech, mastication, and hygiene.[2,8]

In addition to mechanical trauma, **chemical and thermal burns** may occur due to improper handling of instruments or materials.[6] Accidental contact with acid etchants, uncooled electrothermal debonding tools, or heat-sterilized pliers can cause soft tissue damage, delayed healing, and significant patient discomfort.[6]

Management and Prevention: Adherence to strict clinical protocols is essential to minimise injury risk. This includes careful trimming of archwires, smoothing sharp edges, ensuring proper bracket and band placement, and confirming that all heated tools have adequately cooled before intraoral use.[2,6,8]

4. Candida Infection:

Fixed orthodontic appliances can predispose patients to an increased colonisation of *Candida* species, most notably *Candida albicans*.[6,8] These appliances create plaque-retentive niches that alter salivary flow and disturb oral hygiene, leading to microbial imbalance.[6,8] The risk of oral candidiasis is influenced by fungal virulence factors—such as adhesion and biofilm formation—as well as host immune status.[6]

Management: It involves co-management with an oral medicine specialist and includes the use of **nystatin mouthwash** alongside improved oral hygiene practices and appliance care.[8]

5. Palatal Inflammation During Orthodontic Treatment

Palatal inflammation may develop during orthodontic therapy due to two primary causes: poor oral hygiene and mechanical entrapment of gingival tissue.[1]

a. Poor Oral Hygiene

In most cases, inflammation correlates directly with regions covered by the appliance and is commonly triggered by a mixed bacterial and fungal infection.[1] Poor hygiene under palatal acrylic components creates plaque-retentive zones that predispose to mucosal irritation and microbial overgrowth.[1] This condition can lead to gingival hyperplasia and, in some instances, co-occur with angular cheilitis.[1]

Management: This focuses on enhancing the patient's oral hygiene through guided instruction and improved plaque control.[1] Warm saline rinses are

encouraged, particularly when appliance relief allows flow beneath the palatal surface. In more severe cases, adjunctive therapy with topical antifungal agents such as **nystatin**, **amphotericin**, or **miconazole** gel applied to the appliance surface four times daily may be necessary.[1] If angular cheilitis is present, **miconazole cream** should be applied to the commissures of the lips.[1]

b. Entrapment of Gingival Tissue and Orthodontic appliance: In some instances, gingival tissue becomes mechanically trapped between the acrylic base of the appliance and the adjacent teeth being moved, resulting in localized inflammation and discomfort.[1] Proper appliance adjustment to relieve pressure and eliminate soft tissue entrapment is essential for resolution.[1]

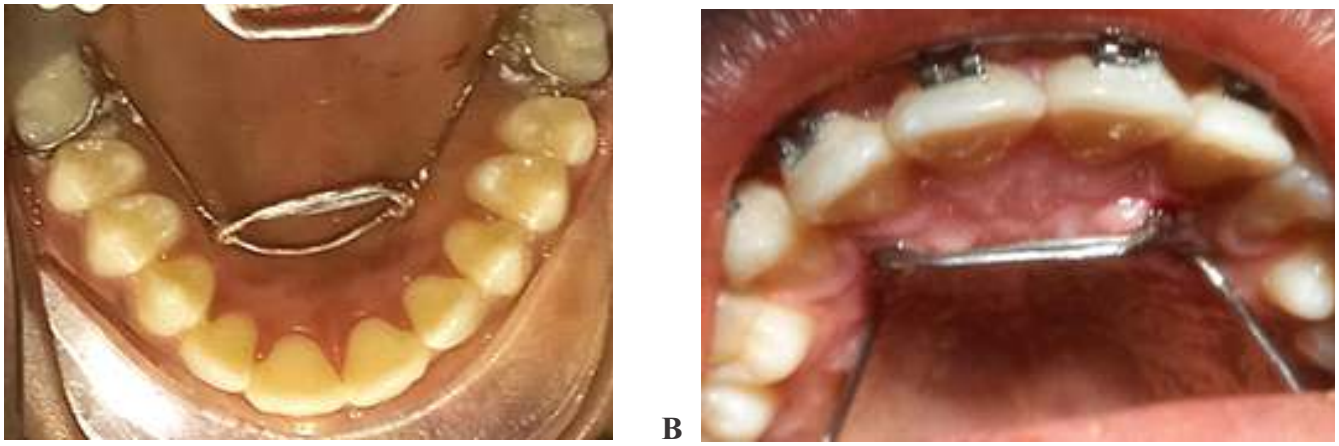

Figure 1.6: (a)Initial fitting of goal post appliance (b) Entrapment of goal post appliance **(LUTH Orthodontic Clinic)**

6**. Tissue overgrowth**

A common adverse effect observed during fixed orthodontic therapy.[5,1] It is typically a response to localised inflammation resulting from plaque accumulation around orthodontic appliances, poor oral hygiene, or underlying systemic predispositions.[5] Orthodontic brackets and wires create niches for microbial retention, which initiates gingival inflammation.[5] The inflammatory process stimulates fibroblastic activity and extracellular matrix production, contributing to fibrotic tissue enlargement.[5,1] If uncontrolled, it can impair aesthetics, oral hygiene access, and patient comfort.[5]

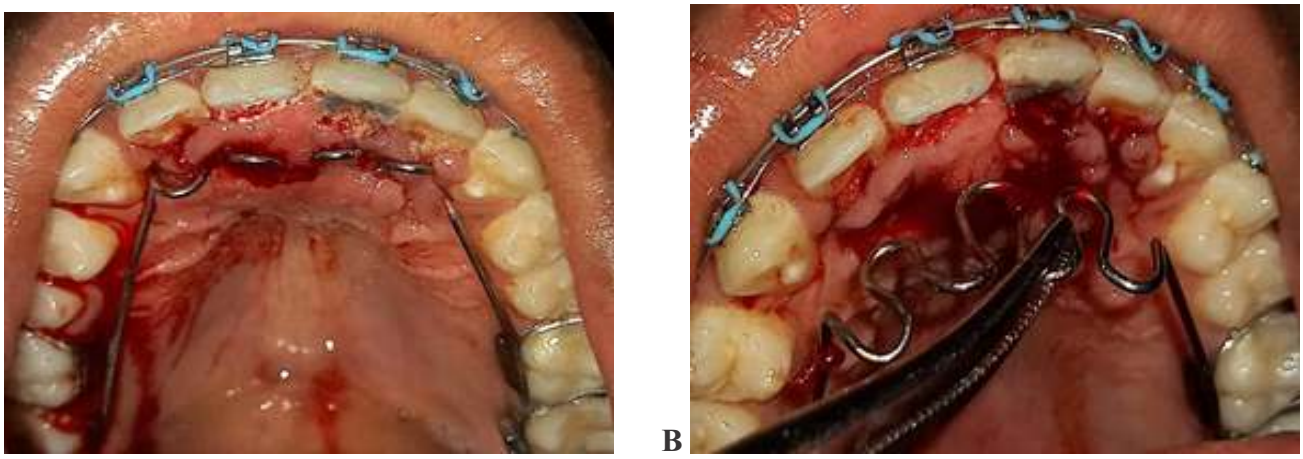

Figure 1.7: (a) Encapsulation of tongue rake which was partially embedded into the palatal mucosa (b) Tongue rake relieved from the palatal mucosa using artery forceps **(LUTH Orthodontic clinic)**

Figure 1.8: A case of fibrotic encapsulation of nance appliance was reported in a 19-year-old female patient using a Nance appliance, where the appliance became completely embedded within the mucosal tissue. **Adeloye et al., 2023**

Figure 1.9: Intraoperative clinical photographs: (A) Trans-surgical view: partial thickness palatal mucosa flap raised using a periosteal elevator to expose buried Nance appliance. (B) Retrieval of the Nance appliance from within the palatal mucosa. (C) Trans-surgical view showing the repositioned flap and the outline of the incision made. (D) Flap sutured into position using black silk sutures. **Adeloye et al., 2023**

Figure 1.10: Postoperative clinical photographs: (A) One week postoperative image after suture removal. (B) Two weeks postoperative image. (C) Four weeks postoperative image. (D) Six weeks postoperative image after fitting of new Nance appliance **Adeloye et al., 2023**

7. **Enamel wear and fracture**

Enamel wear is a documented complication of orthodontic treatment and typically results from repeated contact between tooth surfaces and appliance components such as brackets or buccal tubes.[2,1] The degree of wear varies with the bracket material, ceramic brackets are most abrasive, followed by metal and then composite brackets.[2]

In cases of deep bite, the use of ceramic brackets on the lower anterior teeth should be avoided until overjet is sufficient to prevent occlusal contact with the maxillary incisors.[2] A common site of wear is the cusp tip of the maxillary canines during retraction, as they often strike the brackets on the lower canines.[2]

Enamel fracture can also occur during the debonding phase, especially when excessive force is applied or if the bonding material has high retention strength.[1,2]

Figure 1.11: Upper canine cusp tip exhibiting abrasion resulting from occlusal contact with the lower canine metal bracket during orthodontic treatment**. (Jasim HA. (2022)**

LONG-TERM or POST-TREATMENT ISSUES

1. Orthodontic Relapse

Orthodontic relapse—the tendency of teeth to shift back to pre-treatment positions—remains one of the most frequent post-treatment challenges, affecting 20–50% of patients within the first 1–5 years.[21] This tendency stems from factors like incomplete periodontal fibers remodeling, unfavourable occlusion, persistent soft tissue forces, and ongoing skeletal growth.[21,22]

Poor retainer compliance is a critical contributor, with non-use after a retention phase of only 1–2 years resulting in significant relapse in up to 70% of cases after 10 years.[21,22] Soft tissue pressures from the tongue, lips, and cheeks, as well as physiological age-related changes, further contribute to tooth movement.[21]

Management and Prevention: Design a **customised retention plan** during the active treatment phase.[22] Prescribe **long-term retainer wear** (removable or fixed), with Hawley retainers showing better compliance than vacuum-formed ones after two years.[21,22] Consider adjunctive procedures such as supracrestal fiberotomy in high-risk cases.[21] Educate patients thoroughly about the risk of relapse and the **importance of lifelong retention**.[21]

2. **Factors Affecting Final Treatment Outcome**

In some orthodontic cases, the final treatment outcome may fall short of ideal aesthetic or functional goals.[23] Common reasons include misdiagnosis or inadequate treatment planning such as failure to recognize skeletal discrepancies, growth potential, or tooth-size imbalance.[23] Poor patient compliance, like inconsistent elastic wear or poor oral hygiene, may interrupt treatment progress.[23] In some cases, undetected Bolton discrepancies contribute to residual spacing or crowding, particularly in the anterior region.[23]

3. **Extraction-Related Consequences**

Orthodontic extractions, while effective for space creation and bite correction, can occasionally result in unintended aesthetic and functional effects. Retraction of anterior teeth following premolar

extraction has been associated with reduced facial fullness, particularly around the lips and midface, leading to concerns about profile flattening in some patients.[24,25] These soft tissue changes are typically subtle but may affect esthetic outcomes in profile-sensitive cases.[25]

Furthermore, midline deviations or asymmetrical outcomes can occur if extraction planning is uneven or anchorage is not adequately controlled.[25] These shifts can compromise smile symmetry and long-term occlusal stability. Thorough planning, including facial analysis and anchorage reinforcement, is essential to minimise such risks.[24,25]

SYSTEMIC EFFECTS

1. **Infective Endocarditis**

Infective endocarditis (IE) is a rare but serious condition that may result from transient bacteremia following invasive dental procedures. The American Heart Association (AHA) recommends antibiotic prophylaxis for patients with high-risk cardiac conditions, including those with prosthetic heart valves, a history of previous infective endocarditis, certain congenital heart defects, and cardiac transplant recipients with valvulopathy.[26]

In orthodontics, prophylactic therapy is not routinely required, but may be considered in specific situations that could involve significant bleeding or mucosal trauma.[26] These include: Tooth extractions, placement of mini-implants or skeletal anchorage devices, orthognathic surgical procedures, placement or removal of orthodontic bands (which may cause gingival injury). To reduce bacteremia risk in susceptible individuals, clinicians are advised to prefer bonding brackets over banding where feasible.[26]

2. Ingestion or Aspiration of Orthodontic Components

Accidental ingestion or aspiration of small orthodontic parts, such as brackets, wires, or bands, is a known risk during treatment.[11] These components are often slippery due to saliva and easily displaced during procedures—especially in patients positioned supine or semi-reclined.[11]

Prevention involves identifying high-risk individuals during the medical history, using high-volume suction, and applying gauze, rubber dam, or cotton rolls as barriers.[11] Appliances should be well-retained, include radio-opaque markers when removable, and lack sharp edges.[11] Supporting long unsupported wire spans with tubing and thoroughly checking for missing components at each visit is essential.[11] Upright positioning may also be preferable in some cases.[11]

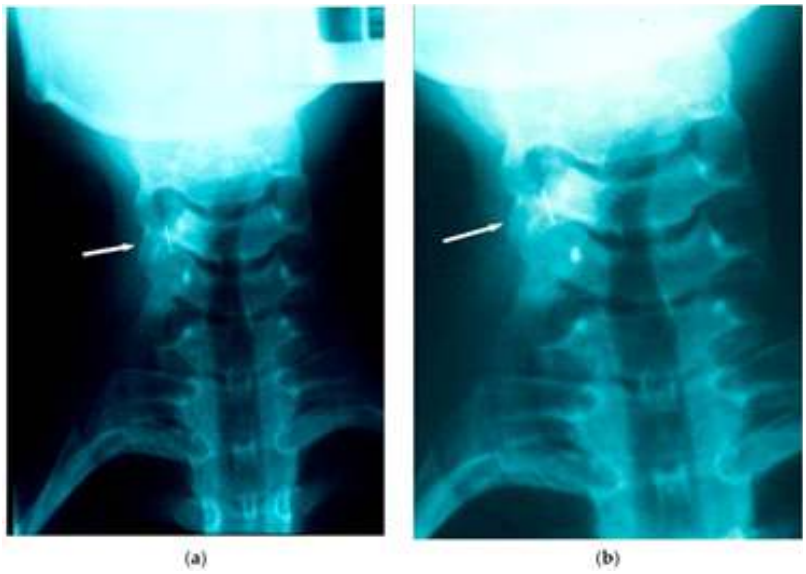

Figure 1.12: A and B showing Distal part of archwire in the right piriform recess
Puryer et al., 2016

SPEECH

Speech is a highly coordinated neuromuscular function involving respiration, phonation, articulation, and resonance.[1] Among these, articulation—the production of distinct speech sounds—depends on the tongue's precise interaction with oral structures such as the palate, alveolar ridge, lips, and dentition.[1] Orthodontic appliances,

particularly those that contact the palate or occupy intraoral space, can temporarily interfere with tongue movement and articulation.[1] Fixed labial and lingual braces, palatal expanders, Hawley retainers, and tongue-thrust therapy devices have been shown to affect speech, commonly leading to distortions in sibilant and palatal consonants.[28]

A study of adults with fixed labial appliances found that 57% experienced speech alterations post-placement, with most adapting within two months; however, 17% still had noticeable errors after eight months.[28] Similarly, rapid palatal expanders may distort speech in early weeks, although function typically returns to baseline once the device is removed.[29] These effects are usually temporary but should be considered during treatment planning, particularly for patients with speech-sensitive roles.[28,29]

Conclusion

Orthodontic treatment, like any other medical intervention, can be associated with undesirable side effects. A clear understanding of these potential adverse effects is crucial for both the orthodontist and the patient considering treatment. The etiology of detrimental effects in orthodontics is multifactorial, often influenced by factors such as genetics, oral hygiene, the type of appliance used, and the duration of treatment. A comprehensive medical, dental, and family history must be obtained prior to initiating therapy. Additionally, regular monitoring through diagnostic records such as radiographs and periodontal assessments is vital for ensuring treatment success. Equally important is securing informed consent from the patient, which should accompany a carefully structured treatment plan.

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