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COMPARATIVE ANALYSIS OF ORAL HEALTH IMPACTS IN ORTHODONTIC PATIENTS: FIXED VS. REMOVABLE APPLIANCES- A REVIEW

Orthodontics

Dr Sakshi Chouhan — 2nd year resident, Department of orthodontics and dentofacial orthopaedics, Government college of dentistry, Indore.

Dr Ram K. Ratre — Professor and Head, Department of orthodontics and dentofacial orthopaedics, Government college of dentistry, Indore.

Dr Bhumika Daheriya — 2nd year resident, Department of orthodontics and dentofacial orthopaedics, Government college of dentistry, Indore.

Dr Varsha Dogra — 2nd year resident, Department of orthodontics and dentofacial orthopaedics, Government college of dentistry, Indore.

Dr Ketan Goel — 2nd year resident, Department of orthodontics and dentofacial orthopaedics, Government college of dentistry, Indore.

ABSTRACT

Aesthetics is now considered one of the most important aspects of everyone's life, and Orthodontic treatment plays a crucial role in improving dental aesthetics and function. However, these treatments are often accompanied by various oral impacts that can affect patients' quality of life. **Aim:** This article aims to explore the common oral impacts experienced by patients undergoing orthodontic treatment, comparing the experiences of those with fixed and removable appliances. Factors such as oral hygiene challenges, discomfort, pain, speech difficulties, and psychosocial effects are discussed to provide a comprehensive overview of the challenges faced by orthodontic patients. **Conclusion:** Orthodontic treatment, whether through fixed or removable appliances, significantly impacts patients' daily lives, oral health, and psychosocial well-being. Fixed appliances, while effective in addressing complex dental and skeletal discrepancies, present challenges such as increased plaque accumulation, greater discomfort, and speech difficulties. In contrast, removable appliances provide advantages, including improved oral hygiene, reduced pain, and better aesthetics.

KEYWORDS

Orthodontics treatment, oral impacts, fixed appliances, removable appliances.

INTRODUCTION

Malocclusion is often considered to negatively influence an individual's physical, social, and psychological well-being, as well as self-esteem (1). Orthodontic treatment is widely used to correct dental and skeletal discrepancies, improve oral function, and enhance facial aesthetics. Fixed and removable appliances are the primary modalities used in orthodontics to achieve these goals. Despite their benefits, these appliances can cause various oral impacts that may affect a patient's oral health, comfort, and overall well-being. Understanding these impacts is essential for clinicians to provide better patient care and for patients to have realistic expectations about their treatment journey (2).

Orthodontic patients may require either removable or fixed appliance therapy based on the diagnosis and severity of the condition. Fixed orthodontic appliances, such as brackets, may have an unsightly appearance, impose functional restrictions, and cause discomfort and pain, affecting patients' oral health-related quality of life (3). Removable appliances are often advocated for use in the mixed dentition phase and as adjuncts to fixed appliances. However, in most instances, the disadvantages of removable appliances outweigh their potential benefits (6). With increasing interest among adult patients in orthodontic treatments that do not impair facial aesthetics, clear aligners have emerged as alternatives to traditional metal braces (5).

The existing literature on comparison of oral impacts in patients undergoing fixed or removable appliance therapy_highlights many factors which can be a challenge to both the orthodontist and the patient. This review emphasizes on four of such factors.

ORAL HYGIENE CHALLENGES

Good oral hygiene is very important to ensure successful orthodontic treatment. Maintaining good oral hygiene in orthodontics is one of the elements related to compliance (7).

Fixed Appliances:

Fixed orthodontic appliances, such as traditional braces, consist of brackets, wires, and bands that are bonded to the teeth. According to the study done by bloom et al after orthodontic appliance placement, there is an overall increase in salivary bacterial counts, particularly Lactobacillus. Travess et al in their study reported that plaque build-up is greater in patients wearing fixed orthodontic appliances due to the difficulty in cleaning the teeth (8). The components of fixed orthodontic treatment create numerous retention sites for plaque and food debris, making oral hygiene more challenging. Even with good cleaning of the teeth during the treatment period, generalized gingivitis commonly develops in most patients (9). Studies have shown that patients with fixed appliances have a higher risk of developing plaque accumulation, gingival inflammation, and dental caries due to the difficulty of cleaning around the brackets and wires. This can lead to conditions such as decalcification or white spot lesions, which are precursors to cavities.

Removable Appliances:

Removable appliances, such as clear aligners and Hawley appliances, allow patients to maintain better oral hygiene compared to fixed appliances (10). Orthodontic patients receiving removable appliance therapy have significantly lower food impaction than those receiving fixed appliance therapy (11). Since these devices can be removed during meals and brushing, patients can clean their teeth more effectively. Some discomfort when eating may be attributed to tooth sensitivity during orthodontic movement (12). Removable orthodontic appliances facilitate brushing and flossing, contributing to improved oral hygiene and oral health among orthodontic patients (13). However, compliance plays a critical role; patients who do not adhere to the recommended wear time may experience hygiene-related issues similar to those with fixed appliances.

DISCOMFORT AND PAIN

Orthodontic patients experience pain and discomfort to varying degrees during the course of treatment (14).

Fixed Appliances:

Orthodontic treatment with fixed appliances is often associated with discomfort and pain, particularly in the initial stages of treatment and after adjustments. Jones and Chan found that the pain experienced after initial archwire placement is much greater than the pain after extractions. The pain progression after initial archwire placement is well established in the literature. Pain increases four hours after the placement of the initial archwire, peaks at 24 hours, and decreases to almost baseline levels at seven days (15) (16–18). Patients may experience a considerable amount of discomfort from orthodontic

treatment, such as feelings of tension, pressure, soreness of teeth, and even pain (19). The pressure exerted by the brackets and wires on the teeth can cause soreness, which usually subsides within a few days.
Clinical experience and recent research data indicate that patients may adapt to continuous pain and discomfort as the treatment progresses, with the sensations either ceasing or at least disappearing from their focus of attention (20). The continuous presence of the appliance can also lead to irritation of the soft tissues, such as the cheeks and lips, due to rubbing against the brackets. Pain experience, for instance, does not seem to be directly related to the magnitude of force exerted by different archwires but rather depends on the psychological well-being of the individual concerned (21). Pain, functional impairment, esthetic concerns, and associated complaints are the primary reasons for poor cooperation (22). Oliver and Knappman reported that 70% of the subjects in their study experienced at least some degree of pain, regardless of the type of appliance worn (23).

Removable Appliances:
Patients using removable appliances generally report less discomfort compared to those with fixed appliances. Clear aligner therapy is not necessarily more pleasant, but it is more tolerable as it satisfies patient needs concerning food consumption and the absence of mucosal ulcerations (24). The Invisalign aligner group's mean pain level returned to baseline by day five and decreased slightly below baseline levels on days six and seven (25). Removable appliances are also less likely to cause soft tissue irritation since they lack the sharp edges associated with brackets. Hawley appliances apply gradual pressure to the teeth, often resulting in milder and more tolerable pain. However, some patients may experience discomfort when adjustments are made.

SPEECH DIFFICULTIES

Difficulty with speech is known to be one of the main adverse effects of orthodontic treatment (26). The acquisition of precise speech production, without distortions or changes, is an important consideration when selecting the appropriate orthodontic appliance. Orthodontic appliances can reduce intraoral space, adversely affect tongue movement, and, consequently, result in the distortion of certain specific sounds (27).

Fixed Appliances:
Speech difficulties are a common complaint among patients with fixed appliances, particularly during the initial phase of treatment. Fixed appliances have been demonstrated to significantly affect speech output. The sounds /i/, /s/, /t/, and /d/ are the most severely affected (28). Some studies suggest changes in speech production at the start of treatment in aligner groups; however, patient self-assessments have demonstrated that orthodontic treatment, regardless of the type of appliance used, interferes with their perception of speech (29). The brackets and wires can interfere with tongue movement, affecting articulation and leading to temporary speech impairments such as lisping. These speech issues often diminish as patients adapt to the appliance. Orthodontists should advise patients that potential changes in speech production are temporary and that adaptation will likely occur during the first month of treatment.

Removable Appliances:
Removable appliances, especially those that cover the palate (e.g., Hawley retainers), can also impact speech. Clear aligners, on the other hand, generally have minimal impact on speech, as they are thin and closely conform to the teeth. Wan et al. evaluated the effects of using removable retainers (Hawley and vacuum-formed retainers) on changes in speech articulation in adult patients aged 19 to 29 years old after active orthodontic treatment. The patients exhibited distorted speech articulation regardless of the retainer type; however, speech articulation distortion was more apparent in patients using Hawley retainers (30). Patients typically experience a brief adjustment period with mild speech alterations.

PSYCHOSOCIAL IMPACTS

Orthodontic treatment, along with the appliances used, may affect the psychological and social activities of patients due to the appearance of these devices (31).

Fixed Appliances:
The visibility of fixed appliances can have significant psychosocial effects, particularly in adolescents and young adults who are concerned about their appearance. The metal brackets and wires are often perceived as unattractive, leading to self-consciousness, reduced self-esteem, and social anxiety. These psychosocial impacts can affect a patient's willingness to engage in social interactions and may contribute to negative feelings about the treatment process.

Removable Appliances:
Removable appliances offer a more aesthetically pleasing option for orthodontic treatment. Patients often feel more confident wearing Hawley retainers, as they do not have to worry about the appearance of metal brackets. However, the need for frequent removal during meals can still cause some degree of social discomfort.

CONCLUSION

Orthodontic treatment, whether with fixed or removable appliances, presents distinct challenges and advantages that significantly affect patients' oral hygiene, comfort, speech, and psychosocial well-being.

Fixed appliances, such as traditional braces, pose considerable difficulties in maintaining oral hygiene due to plaque retention around brackets and wires, which increases the risk of gingival inflammation and dental caries. They also tend to cause more discomfort, particularly in the initial phases, and can lead to soft tissue irritation and temporary speech difficulties. However, as patients adapt over time, these issues often diminish.

In contrast, removable appliances, such as clear aligners and Hawley retainers, generally allow for better oral hygiene, offer less discomfort, and cause fewer speech impairments, though compliance plays a critical role in their effectiveness.

The psychosocial impact of orthodontic treatment also differs between appliance types. Fixed appliances, being more visible, may contribute to feelings of self-consciousness and lower self-esteem, particularly in adolescents. Removable appliances, on the other hand, are more discreet, often resulting in greater patient confidence. However, their need for removal during meals and cleaning can still cause some social inconvenience.

Ultimately, the success of orthodontic treatment, whether with fixed or removable appliances, relies not only on the technical aspects of the devices but also on patient compliance and adaptation to the challenges presented throughout the treatment process. Orthodontists should tailor their approach to each patient's needs, taking into account both functional and psychosocial factors to optimize treatment outcomes.

This review summarizes patients' experiences with removable and fixed orthodontic appliances, focusing on their impacts on daily activities, food consumption, and oral symptoms. It hypothesizes that limitations in daily activities, food consumption, and oral symptoms differ between patients receiving removable and fixed appliance orthodontic treatment.

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