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SHORT COMMUNICATION

Are We Hearing Right? The Negative Impact of New SARS-CoV-2 Preventive Measures and Prolonged Use of Treatment Modalities during Orthodontic Treatment

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ABSTRACT

Since the dental treatment involves the use of various instruments and machines, there is ample presence of both distracting as well as destructive noise, and these are defined based on various parameters. With an increase in safety measures incorporated into dental practices, such as extra-oral suction devices and respirators, there has also been a corresponding rise in noise levels usually present in a clinic. Previous clinical experiments and trials have shown that the noise in a dental office can permanently bring about hearing damage. In addition to this, working with added safety measures during the pandemic, such as the use of personal protective equipment, respirators, and face shields can decrease operator efficiency and the ability to communicate normally. Dentistry has already been demonstrated to be one of the most hazardous occupations because of the high risk of infections. An Orthodontist must protect their eyes and mouth from potentially hazardous situations and the ears to prevent hearing damage.

Keywords: Orthodontics; Hygiene; Occupations; Hearing.

Introduction

Dental professionals, in general, are predisposed to a variety of occupational hazards purely by the nature of their occupation. From life-threatening infections such as Viral Hepatitis and HIV to the use of chemical-based materials, radiation, and last but not least, noise [1-5]. Previous studies have shown that Hearing loss may not be symptomatic, but some dentists have previously reported signs such as Tinnitus [6]. Since the dental treatment involves the use of various instruments and machines, there is ample presence of both distracting as well as destructive noise, and these are defined based on various parameters. In many ways, the last year has redefined the way we practice dentistry in general and Orthodontics, to be more specific. With an increase in safety measures incorporated into dental practices, such as extra-oral suction devices and respirators, there has also been a corresponding rise in noise levels usually present in a clinic.

Previous studies have reported a positive correlation between the length of treatment provided and the extent of hearing damage in dentists [7]. Dentists with more than ten years of work experience have also been found to be at a higher risk of damage to their hearing capabilities [8]. A previous study reported that dentists that report higher usage of high-speed handpieces had been found to have more hearing damage compared to their counterparts that report less usage [9]. Data obtained from previously conducted research has also shown that there is more significant hearing loss in the left ear in the range of 4000 to 6000 Hz. Male dentists report such problems more than female dentists [10]. A significant problem that has been seen during various stages of the pandemic-initiated lockdowns is the removal of brackets in patients undergoing fixed appliance therapy [11]. Studies conducted during this period have shown that removed brackets, tubes, bands, and archwires are the most reported emergencies over the pandemic period [12]. The critical thing to consider is that all of these require the use of high-speed handpieces coupled with extra preventive measures such as high volume extra-oral suction devices.

Rise in Noise Levels

A glance around any orthodontic practice worldwide would show Orthodontists, clinic personnel, and patients communicating at a higher-than-normal volume because they are talking through masks. Previous clinical experiments and trials have shown that the noise present in a dental office can bring about hearing damage permanently [13]. The devices that have been shown to cause the maximum auditory damage are low-speed and high-speed handpieces, ultrasonic cleaning instruments, high-velocity suction devices, and even model trimming machines [13]. As has been commonly seen during the last year, because of irregular lockdowns, many patients have been reporting to dental clinics with removed brackets, broken wires, and poor oral hygiene [14]. To fix removed orthodontic brackets and provide oral prophylaxis, many of the devices mentioned above are used, which has only added to the hazardous nature of our profession.

Auditory Effects from Devices in the Orthodontic Office

Hearing damage has been demonstrated to come about by exposure to high-intensity sounds for a sudden short duration or prolonged exposure to high-level sounds. Sounds of intensity more than 140 decibels cause damage to the inner ear tissues of the ear and can even lead to permanent damage [13]. On the other hand, sounds between 90 to 140 decibels progressively damage the inner ear tissues over a few years [13]. The devices that have been shown to generate high-level sounds include piezoelectric ultrasonic cleaners, high-velocity suction, high-speed handpiece devices, and scalers [15-18] (Table 1).

Table 1. The sound levels of different devices used in an orthodontic office to carry out treatment.

Device/Instrument	Sound Levels When Carrying out Treatment on the Teeth (dBAeq)
High-Speed Handpieces	82.64 dBAeq
Low-Speed Handpieces	79.62 dBAeq
Scalers	85.80 dBAeq
Intra-Oral Suction	77.00 dBAeq
Air-Blow Syringe	100.00 dBAeq
High-Volume Aspirator	61.61 dBAeq

Non-auditory Effects in an Orthodontic Office from Exposure to Noise

Previously conducted studies have shown that the stressful environment in a dental office can cause enhanced levels of stress, decreased efficiency, and even suffer from headaches, neck pain, and a rise in heart rate [1,13]. Loud noise has also been demonstrated to harm other organic functions such as behavior, digestion, cardiovascular system, and even neurological problems [16]. In addition, working with added safety measures during the pandemic, such as PPE, respirators, and face shields can decrease operator efficiency and the ability to communicate normally. Reduced mobility, efficiency during working, and communication difficulties can add to high-stress levels in a practice [17].

Signs and Symptoms of Auditory Damage

According to clinical reports, many signs and symptoms indicate auditory damage. Initially, this may include signs such as asking patients to repeat their sentences, not responding to bells or ringing phones, and inability to comprehend when ambient noise is present. Other worrying symptoms include asking people to speak louder even in an external environment, watching television or listening to music at a higher-than-normal sound level, and Tinnitus or hearing a ringing sound in the ears [18,19]. In addition, tinnitus has been found to be associated with noise-induced hearing loss, and previous research conducted in the UAE found a high rate of tinnitus among dental practitioners [20].

Steps to Avoid Auditory Damage

Although these may still require extensive clinical trials, there are guidelines and recommendations from the American Dental Association to prevent sensorineural hearing loss. These include the use of noise-canceling earplugs and headphones [21]. While purchasing dental equipment, the orthodontist must consider the noise levels of the device. Also, it has been advised that it would be good to get regularly tested to identify any potential damage at the earliest possible step to avoid or minimize additional risk [22]. Periodic audiometric changes are recommended to identify hearing damage as soon as possible. Another recommendation would be to remove surfaces in the treatment room that are more susceptible to acoustic reverberation [23].

Regulations Audiometric Testing in an Orthodontic Practise

According to the Canadian Standards Association Z1007 Hearing Loss Prevention Program, working professionals exposed to noise above 85dB must be monitored for any adverse effects on their hearing due to noise [24]. In such scenarios, they have made the following recommendations:

- Monitoring of exposure to noise;
- Control methods;
- Use of hearing protection aids;

- Audiometric testing annually;
- Maintenance of records;
- Improvement plans.

Steps to Minimize Aerosol and Noise Generating Procedures

Previous research has advised using bio-inspired therapies to ensure that fixed orthodontic patients maintain good oral hygiene throughout treatment, thereby reducing the need for aerosol-generating procedures [25]. During bonding, we must also ensure that correct pre-bonding procedures are followed so that there is a minimal incidence of bracket detachment during treatment [26]. At the debonding appointment on the use of a lift-off debonding instrument, there is less discomfort and less damage to the enamel and reduced requirement for the use of aerosol-generating procedures [27,28].

Conclusion

The ears are as important an organ as others and should be treated so. An Orthodontist must protect their eyes and mouth from potentially hazardous situations and the ears to prevent hearing damage. There is evidence that prolonged exposure of dentists to loud noise can cause hearing damage over time, and there has been an increase in orthodontic emergencies over the pandemic period. Therefore, there is extensive use of noise-generating protective devices in the clinic to manage these orthodontic emergencies along with the regular appointment schedule. This makes it essential for us to protect our ears from any auditory damage.

Authors' Contributions

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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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