

Teleorthodontics: Future Trend And Beyond

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ABSTRACT

Digital era has been impacting people's lives since the creation and advancement of cellular phones. Medical diagnostics, teaching armamentarium, treatment alternatives and surgical techniques were advanced significantly with the aid of digital technology that created its way into dental and orthodontic offices in 1974 with the introduction of computerized scheduling. Digital technology influences every aspect of orthodontic treatment including diagnosis, virtual treatment planning and execution with the help of CAD/CAM techniques. Basically, orthodontic diagnosis, care, advice and treatment can be taken care of with information technology. This gave rise to Tele-dentistry which gradually made its presence in the field of Orthodontics. This has benefitted all those in need especially during the periods of restriction as the one subsequent to COVID-19 emergencies. The purpose of this article is to introduce and discuss this concept of tele-orthodontics, its applications and scope in this digitally driven future.

Keywords:

Teledentistry, Teleorthodontics, Virtual Reality, Covid-19

1. Introduction

The extension of telemedicine in the field of dentistry has given rise to tele-dentistry. Since the late 1950s,^[4] telemedicine has been practiced and a considerable amount of financial resources have been used for research and demonstrations in the field.

Among the various definitions of telemedicine that were expressed, most accepted is given by the Association of American Medical Colleges, or AAMC which states that Telemedicine is the use of telecommunications technology which will send data, graphics, audio, and video images to the participants who are physically separated for the purpose of clinical care and the doctor and vice-versa.^[5] This definition aims at providing an in dept overview of the existing practice which can be amended to include oral health care and education.

In 1997, Cook used the term tele-dentistry and defined it as the practice of using video calling technology to diagnose and discuss treatment plan over a distance. Telemedicine is considered to be the mode of delivering, diagnosing, consulting, treating and educating public about health care using interactive communication methods by the State of California. Whereas the federal government, in its Telemedicine Report to Congress given in 1997, described it as a method to distantly provide clinical care using information technology.”^[7]

2. Teledentistry as used in Orthodontics

Tele-orthodontics is a way to provide orthodontic care and treatment through the medium of web consultations instead of direct personal contact. Orthodontists often seek advice from colleagues by sharing records of the patient digitally and communicating over the net. Usually the tele-orthodontic consults and treatments are done independent of general dentists. Although less commonly they have also been reported in conjunction with general dentists.^[8-9]

Orthodontists have achieved success in providing orthodontic services to patients with restricted access with the help of general dental practitioners until the early to mid-2000s. [8-10] However, now with the help of this remote provision it's easier to observe patients throughout the retention period with patients sending photos through apps rather than travelling for in-office visits. This concept has yet not been explored to its full potential as development of prescription appliances, custom-made appliance systems and clear aligner therapy (CAT), has already reduced chair-side time and in-office visits. [11-14]

One of the major drawbacks of traditional orthodontics is that the patients are given a pre-decided treatment time period which are average time frames applied to all patients in general and are not specific to treatment plan whereas tele-orthodontics, and more specifically remote monitoring, allows the possibility of scheduling the in-office visits based on personalized treatment plan to create a more efficient workflow. This maximizes profitability by reducing chair time along with improving patient convenience. People with frequent travel job profile or who have busy schedules are benefitted tremendously. Remote monitoring is advantageous in early diagnosis, saves time and transportation costs and increased convenience for patients. [18] Tele-orthodontics can be used for either phase-1 devices or traditional appliances or Clear Aligner therapy, or even custom-made appliances that require less frequent in-office adjustments. While the added convenience of reduced appointments there is inconvenience of submitting weekly scans, which becomes frustrating and tedious because the scans sent is also rejected and need retrieval. In addition, there could also be a loss of rapport with the orthodontist due to the diminished contact time. The patients need to be trained in scans and photography before the start of treatment to ensure better understanding and cooperation.

3. Tele-orthodontics: use during the covid-19 pandemic and in future for daily practices

According to history, several pandemics have occurred in recent centuries. Each one resulted in a high mortality rate and also affecting the socio-economic status of all the affected countries. In 2020, when modern medicine has cure for almost all diseases, this deadly hit by diffusion of SARS-CoV-2 virus has taken aback everyone with surprise and brought the life on globe to a halt to contain the virus. [19]

This infection is highly contagious and has a high morbidity which can evolve into a fatal type of respiratory disease. The transmission of virus through air/droplet/little particles of aerosols spread while simply sneezing, coughing or talking pose a higher risk for professionals working in close contact with patients such as dentists. The aerosol procedures which involve usage of drills and handpieces add to the spread making the dentists a high-risk category. [20] Therefore, to contain this infection and avoid the spread of it certain operative protocols should be devised to reduce the risk of cross infection such as wearing appropriate personal protective equipment (PPE) and adequate sterilization methods, hand hygiene protocols, etc. According to DCI rules and regulations the dental procedures being undertaken by professionals have been limited to the emergencies only but some ongoing treatment such as orthodontic therapies and some crucial situations which need to be treated urgently to avoid any serious outcomes, require timely follow-up appointments. Therefore, special precautions have to be applied for follow-up visits of ongoing active therapies (e.g., orthodontic treatment) [21-22].

Currently, available technologies such as high-speed internet connection, digital videos and pictures, smartphones, and websites are used for the purpose of tele-orthodontics. Costa et al. [23] suggests various communication services (MSN, Skype, etc.) which are helpful in-patient

management amongst which, WhatsApp messenger seems to be the most widely used communication tool according to the survey conducted. ^[24] This also helps in building and maintaining a positive patient–clinician relationship with the help of continuous virtual contact. ^[24]

The evolution of digital technology including smartphones, web connections and various communication applications have changed the face of imagine and impression making in dental setup. Not only this but it proves to be a great tool to the orthodontist for accessing, analyzing and communicating with patients, colleagues, and/or dental technicians. ^[11] Dental Monitoring TM (DM), an application for smartphones is one such medium that uses an algorithm of artificial intelligence that allows remote monitoring of orthodontic patients. It provides precise records of the patient's occlusion with the help of phone camera thus helping with distant follow up. An intraoral video is taken which is reconstructed as a 3D image with phone camera and special cheek retractors thus helping in tracking tooth movements and assessing orthodontic outcomes. This smartphone application (Android, iOS) provided comfort and access to dental treatment even to those people with limited access or people with busy schedule or frequent travelers. Patients undergoing orthodontic treatment during this pandemic will be benefitted exceptionally from remote monitoring. This way unnecessary follow-up appointments can be avoided to track problems such as broken ligatures leading to wounds and ulcers, debonded brackets, non-tracking aligners, which can be managed at an early stage and speed up the chair-side time and manage the progress of treatment.

4. Discussion And Conclusion

This review is a compilation of studies and innovations⁵ in digital technology which state the efficacy of teleassistance in orthodontics. Development of a definitive treatment or vaccine in the near future for the novel corona virus is uncertain and will surely have effects on long term patient management. Until then, a standard operative protocol for dental appointments and patient management must be given priority. Instant messaging platforms protect from cross infection while allowing for virtual consultancies. Tele-orthodontics aims at maintaining the expected results by allowing regular monitoring with decreased unnecessary follow up visits. This concept has great potential in terms of remote consultation that can be carried out across the globe, making the distance irrelevant and scheduling of appointments easier. Additionally, all dentofacial orthopedic removable appliances and orthodontic treatments which might need some in-office maintenance, for instance some clear aligner therapies, can easily be managed. Although in-office visits are required for several procedures, this opens up new avenues in methods of management and follow-up of patients. There is, however, limited literature regarding tele consultation. There is an imminent need of higher studies with increased focus on objectively evaluating the efficacy, cost-effectiveness, and long-term results. In any case, we are confident that teleassistance in orthodontics will have a massive role to play in the future.

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