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Review Article

Teleorthodontics: Navigating skepticism and uncertainity

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ABSTRACT

Teleorthodontics, a subset of teledentistry, involves the use of digital communication technologies to provide remote orthodontic care. This approach enables orthodontists to diagnose, monitor and manage patients' treatment without the need of in person visits. The concept has garnered traction due to advancements in telecommunication technologies, increasing accessibility to smart phones, and the need for remote healthcare services. Despite skepticism, there are several advantages of including tele-orthodontics in the clinical orthodontic practice. This article reviews the strength and weaknesses of this emerging healthcare communication system and its impact on orthodontics, which is set to transform the future of our clinical practice.

1. Introduction

Tele-orthodontics refers to the use of information technology and telecommunications to enable remote orthodontic consultations, involving communication between practitioners, patients and the general public. It serves to provide guidance on care, educate both practitioners and patients, and raise public awareness about orthodontics.[1] The perspectives of orthodontists and general dentists on teledentistry have been evaluated by various authors, indicating support for the use of teledentistry to make orthodontic consultations more accessible to dentists and patients.[2] The field of orthodontics is undergoing a significant shift, driven by impressive technological innovations and emergence of tele-orthodontics. This cutting- edge method of orthodontic care leverages telecommunication and digital technologies to provide patients with enhanced convenience, improved accessibility, and increased efficiency in achieving a perfectly aligned smile.[3] This article explores the fascinating and captivating world of tele-orthodontics, examining its various aspects, from virtual consultations and treatment planning to the transformation of orthodontic care in the digital era. Tele-orthodontics signifies a major

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upheaval and monumental transformation in orthodontic care. Traditionally, orthodontic treatment required regular in-person appointments to the orthodontist's office for evaluations, adjustments, and consultations. Yet the emergence of tele orthodontics has enabled orthodontists and patients to connect remotely, reshaping the patient experience.[4] There are two modalities of teledentistry: Synchronous teledentistry as a form of real-time consultation where dental professionals and patients interact instantly, often through video conferencing or live chat platforms. Asynchronous teledentistry, on the other hand, involves the store-and-forward method, where clinical information, radiographs, photographs, and laboratory tests are captured and forwarded to specialists for consultation at a later time.

Both modalities facilitate communication and collaboration between dental professio.[5] One of these innovative communication methods involves medical apps for digital tablets or smartphones, which have demonstrated positive outcomes in improving educational system and healthcare services.[6] In this context, the use of digital technology to share healthcare-related information has been on the rise over the past few decades. However, the COVID-19 pandemic has accelerated the adoption of telemedicine because it allows for healthcare consultations during emergencies that requiring social distance.[7] One of the main advantages of tele-orthodontics is the capacity to perform virtual consultations and smile assessments.[8] Patients can commence their orthodontic treatment from the convenience of their homes by submitting photos and digital scans of their teeth. Orthodontists, in turn, can assess the patient's condition and remotely decide if orthodontic treatment is required.[9] This initial interaction contact lays the groundwork of smooth and convenient orthodontic experience. After a patient is considered a suitable candidate for orthodontic treatment, the digital journey carries on.[10]Orthodontists can employ sophisticated software to design the treatment plan and create custom orthodontic devices like clear aligners or braces. Digital models and 3D printing technologies have substantially improved the accuracy and customization of orthodontic treatment.[11] As treatment progresses, patients can utilize tele-orthodontics for virtual monitoring. Regular check-ins and progress evaluations can take place via video conferencing, photo uploads, and digital scans. This leads to fewer in-person visits and less interference with the patient's daily routine, making orthodontic care more accessible and focused on patient's needs. It not only improves convenience but also enhances treatment effectiveness.[12] The use of digital technology enables orthodontists to monitor the patient's progress, make prompt adjustments, and respond to any issues.

The outcome is frequently a shorter overall treatment duration, which is especially attractive to patients. Artificial intelligence is playing a burgeoning role in tele-orthodontics. Artificial intelligence powered algorithms are used to examine patient data, evaluate treatment progress and refine treatment plans. It can assist orthodontists in making data- informed decisions, boosting treatment accuracy, and achieving optimal results for patients. Although tele-orthodontics presents many benefits, it is not without its challenges. Effective communication between the patient and orthodontist as well as a stable internet connection is vital for success. Additionally, the orthodontic profession is evolving to accommodate this new paradigm, and regulatory frameworks and standards of care continue to develop.[13]

2. Discussion

Tele-orthodontics encompasses various technologies such as video conferencing, digital imaging, and cloud based platforms for sharing patient data. It allows orthodontists to consult with patients, assess orthodontic progress and even guide treatment, like aligner adjustments, remotely. This approach offers several benefits, including improved access to orthodontic care, reduced travel time for patients, and greater convenience for both orthodontists and patients.[14] Technological advancements involve new tools and software for diagnostics, treatment planning and monitoring are changing the way orthodontists work. 3D imaging, digital impressions and artificial intelligence are transforming traditional practices. Healthcare regulations and standards are frequently updated to ensure patient safety and treatment quality. Orthodontists must stay abreast of these changes to remain compliant. The focus on personalized, patient centred care requires orthodontists to consider individual needs, preferences, and outcomes when developing treatment plans.[15]As the field evolves, so do the educational and training requirements for orthodontists. Continuous professional development is essential to keep pace with new techniques and technologies. Tele-orthodontics is undeniably reshaping the orthodontic landscape.[16]

It brings accessibility, convenience, and efficiency to orthodontic care while upholding the commitment to delivering beautiful and healthy smiles. The convergence of digital technology, artificial intelligence, and orthodontic expertise is offering patients a transformative experience that marries traditional orthodontics with the innovations of the digital age.[17] As teleorthodontics continues to evolve, it is poised to make orthodontic treatment more patient-centered and accessible than ever before, paving the way for a future where a perfectly aligned smile is just a click away. It is viable for a general dental practitioner to deliver interceptive orthodontic care to socially disadvantaged children, supported by immediate guidance from an orthodontist through teledentistry.[18] Additionally, tele-orthodontics can facilitate more frequent follow-ups and

real- time communication, potentially improving treatment outcomes and patient satisfaction. It is particularly useful for patients in remote or underserved areas where access to orthodontic care is limited.[19] However there are challenges associated with tele orthodontics, including concerns about data security, patient privacy, and the need for reliable technology infrastructure. Moreover, not all the orthodontic procedures can be fully managed remotely, and some cases still require in person visits. Overall tele-orthodontcs represent an innovative and evolving approach to orthodontic care, with the potential to enhance patient engagement and accessibility while addressing some of the logistical constraints of traditional orthodontic treatment.[20] The provision of healthcare services and the storage of medical data on devices like tablets, smart phones, and laptops raise issues regarding safeguarding patient privacy and the vulnerability of healthcare information.[21] In this context, orthodontic practitioners are required to obtain signed consent that meets the criteria outlined in the General Data Protection Regulation of European law, ensuring that it is freely given, specific, informed, and unambiguous.[22]

It's crucial to acknowledge the potential risk of privacy breaches when sharing patients' photos, radiographs, and other healthcare data via tele-orthodontics. Additionally, consent should explicitly address the possibility of service interruption due to breaches or loss of electronic communication. Patients should also be informed about who will access their sensitive data and how it will be disseminated. One approach could involve securing images with watermarking and transmitting them using encryption or private networks, aligning with the recommendations of the American Telemedicine Association. The step further privacy concerns is the patients' consensus to the therapeutic limitations of tele-orthodontics or remote monitoring systems.[23] For instance, in virtual consultations, patients should understand that while they provide valuable clinical information, a thorough in-office oro dental and craniofacial assessment remains crucial for orthodontic diagnosis and treatment planning. The data gathered virtually cannot substitute a definitive diagnosis. Regarding the utilization of dental monitoring systems, given the absence of specific guidelines; it is recommended that clinicians develop an informed consent form. This document should confirm the patient's willingness to participate and comply with the monitoring protocol established by the clinician or medical staff.[24] In other words, clinicians harbour skepticism due to two hypothetical risks. Firstly, tele-orthodontics' reduction in face-to-face visits might inadvertently suggest to patients that the orthodontist's role is less crucial than traditionally believed. This concern is valid, especially with the onslaught of companies offering at-home impression kits in the orthodontic market. These kits enable clients to self-administer impressions and receive clear aligners at a low cost, potentially fostering a "do it yourself" mentality that could diminish the need for orthodontic professionals.[25] However, a notable portion still expresses a preference for traditional in-office appointments.

This indicates the potential benefits of introducing this technology incrementally into clinical practice, considering the economic, social, and psychological profiles of patients. It also serves as an efficient tool for orthodontists to address patient concerns, understand symptoms, and mitigate the risk of cross-infection by directing those needing urgent care to in-person appointments during pandemics. Despite widespread awareness and a favourable attitude towards teledentistry, orthodontists displayed only moderate levels of comprehension and utilization during the COVID-19 crisis.[26] Orthodontic treatments are usually long-term therapies that continue with routine checkups. Amidst COVID-19 restrictions, patients encountered various treatment-related challenges, leading to concerns about extended treatment durations.[27] Implementing social distancing measures, such as limiting the number of patients and accompanying individuals in clinics, has been a key consideration in orthodontic practice. Exploring the efficacy of conducting certain types of orthodontic checkups remotely via tele dentistry during the pandemic has garnered significant attention as a means to mitigate the risk of cross-infection and alleviate patient anxieties.[28] Brecher et al. investigated tele dentistry applications in pediatric dental patients.[29] Estai et al. conducted a review on the diagnostic precision of teledentistry applications for identifying dental caries.[30] Mandall et al. found that teledentistry serves as a reliable and time-efficient clinical screening tool for identifying patients necessitating referral to an orthodontic specialist.[31] Borujeni et al. proposed that teledentistry serves as an effective method for encouraging patients to improve oral hygiene during fixed orthodontic treatment is crucial.[32] However, there is a lack of reports assessing the effectiveness of teledentistry in orthodontic clinics during COVID-19 restrictions and lockdowns.[33] Consequently, broader adoption of teledentistry practices may alleviate overcrowding in emergency departments and mitigate the risk of disease transmission, thereby preventing strain on the healthcare system.

The American Dental Association has endorsed the use of teledentistry during the pandemic. A recent study proposed that despite initial skepticism, teledentistry can offer numerous benefits to clinical orthodontics by enabling remote management of treatment. In situations where close personal contact is undesirable, teledentistry provides valuable support for orthodontists and patients dealing with orthodontic emergencies. Previous research has indicated that teledentistry could be on par with face-to-face visits, particularly in areas with limited access to oral healthcare, and that remote monitoring could reduce chairside time and costs for both orthodontic providers and patients.[34]

3. Conclusion

Tele-orthodontics is a rapidly growing market and offers a valuable means of promoting patient compliance with orthodontic instructions during treatment. The clinical perspective of tele-orthodontics is nearly limitless. Virtual consultations and remote treatment monitoring will improve the treatment experience as well as its effectiveness. Considering the general characteristics of the orthodontic treatment, remote monitoring represents the strong point of clinical application of tele-orthodontics. In future studies, comparing the experiences of orthodontists in other countries could be valuable in developing optimized teledentistry model. While further research is necessary to assess the efficacy, cost-effectiveness, and long-term implications of these initial results, it is firmly believed that teledentistry will emerge as a pivotal component of orthodontic care in the coming years. Despite skepticism, patients' responses appear favourable, with a considerable proportion reporting continued awareness of being monitored despite fewer in-office visits. Teleorthodontics is poised for a monumental advancement, given its capabilities and profound impact, surpassing spatial and temporal limitations to become a primary mode of connectivity. Its efficacy is undeniable, serving to simplify our lives and promote comprehensive societal progress.

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5. Conflicts of Interest

There are no conflicts of interest.

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