

Teledentistry-breaking the stereotype

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Abstract: An amalgamation of telecommunication and dentistry is known as 'Teledentistry'. Increased use of smartphone and related software applications has created a new era in sharing clinical data among patients and clinicians, providing health services in situations where it is necessary to overcome geographical, temporal, social and cultural barriers. It can extend care to underserved patient populations, such as those in rural areas. Teledentistry increased patient access to dental care, improved quality of care and the cost effectiveness. It has the potential to be a highly effective mechanism for enhancing early diagnosis, getting relief immediately or referral to specialists and for dental education. More and more private and public insurance are adding coverage for Tele-health and teledentistry worldwide. Given the latest updates in scientific publications about the impact of COVID-19 on oral health, we need to emphasize the inexorable need for close monitoring by a specialized dentist in such COVID-19 patients, which could contribute to a better understanding of the pathogenesis of SARS-CoV-2 in oral health. During this difficult lockdown period and pandemic situation, if at all any oral lesions appear in the patient's mouth along with COVID infection or for the relief of regular oral problems also, patients can easily consult with the dentist via teledentistry. Therefore, this article would cover the role of teledentistry in today's scenario, it's advantage and disadvantage and its future aspects.

Key Words: COVID-19, Dental education, E-consultation, Technology, Telecommunication.

1. INTRODUCTION:

Health care has changed dramatically with the era of computers and telecommunication. The term "teledentistry" was used in 1997, when Cook defined it as "the practice of using videoconferencing technologies to diagnose and provide advice about treatment over a distance" (1). Oral health is an integral part of general well-being. Technical advances in dental care have documented early diagnosis, preventive treatments and early intervention can prevent or reduce the progress of most oral diseases (2). Teledentistry is one of the recent advances in the use of telecommunication technology, digital diagnostic imaging services, computers devices and Software for analysis and follow-up (3). In 2002, the National Health System reported a concern about the dental assistance of patients living in remote and isolated regions, declaring that teledentistry is a support alternative for dentists who worked in these regions (4). Teledentistry is converting the stereotypical dental practice to a whole new digital level. During the current pandemic, most routine dental procedures all around the world, have been suspended, and only emergency dental procedures and surgeries are being performed. Dental practice will be needed to reorganize and innovate to continue dental care with minimal risk of cross-infection. Teledentistry can provide an innovative solution to continue dental practice during the current pandemic, as well as beyond.

2. HISTORY:

The beginning of telemedicine can be traced long back in 1924, back then physicians started consulting patients in remote areas using telephones and radios as the means of communication. The initial concept of teledentistry developed as part of the blueprint for dental informatics in 1989. Teledentistry was used 1970 by NASA and in practice in US army in 1994 as TDA (Total Dental Access project) by doing dental consultations on person located more than 100 miles apart. Since then, various organization have practiced teledentistry with varying degree of success (5). Albert Jutra used communication cable to transmit videotaped telefluoroscopy examinations between two hospitals in Montreal, 5 miles apart (Weinstein et al. 1987) (6).

3. TYPES OF TELEDENTISTRY:

There are two forms of teledentistry:

- a. Two-way interactive or real time consultation or E-Consultation
- b. Store and forward teledentistry.

- a. Real-time consultation involves a videoconference in which dental professionals and their patients, at different locations, may see, hear, and communicate with one another showing their dental problems to the clinician online by using advanced telecommunication technology and ultra-high-bandwidth network connections. After which, the clinician gives consult to the patient or advice for referral.
- b. Store and forward involves the exchange of clinical information and static images uploaded by the patients, collected and stored in the telecommunication equipment. The dental practitioner collects all the required clinical information and digital intraoral and extra oral images and radiographs (or scanned, originally no digital images) interprets it, forwards them for consultation and treatment planning via established networks and/or the Internet and treatment is provided by the nearby dentist in a far timelier, targeted, and cost-effective manner (7-10).

3.1. Medical e-prescription

With the help of teledentistry, the patient can receive the medicinal treatment without even traveling to a specialist at far areas. However, the patient should be asked regarding drug allergies. In case, the patient is not recovering, he/she should visit the specialist personally.

4. TELEDENTISTRY IN DENTAL EDUCATION:

Tele education is gaining popularity in abroad as well as India, to supplement and sometimes substitute traditional teaching methods in dental education and organizing Continuing Dental Education programs, providing new opportunities for dental students and dentists (11). Formal online education can be divided into two main categories: Web-based self-instruction and interactive videoconferencing. Web-based self-instruction: an educational system, contains information that has been developed and stored before the user accesses the program. The advantage of Web-based Self instruction is that the user can control the pace of learning and can review the material as many times as he or she wishes. Interactive videoconferencing: conducted via plain old telephone system (POTS), satellite, Integrated Services Digital Network (ISDN), Internet or Intranet. It includes a live interactive videoconference with at least one camera set up where the patient's information is transmitted; having cameras with both patient and the clinician's end would be ideal as supportive information (such as patient's medical history, radiographs) can be sent at the same time.

5. TELEDENTISTRY - A BOON IN THE CURRENT PANDEMIC:

The COVID-19 pandemic has challenged the existing healthcare systems across the globe. Dental practice will need to reorganize and innovate to continue dental care with minimal risk of cross-infection. The ongoing lockdown in many parts of the world have hindered the patients to move around and for receiving dental care by professionals. The role of salivary glands as potential reservoirs for SARS-CoV-2 (12), the appearance of oral vesiculobullous lesions (13), and the presence of maculopapular manifestations in suspected and confirmed COVID-19 cases (14), in all these there should be a close monitoring by a specialized dentist. Teledentistry (a subunit of telehealth along with telemedicine) provides facilitation of dental care, guidance, education or treatment via the use of information technology rather than through direct face-to-face contact with any patient. Direct contact is harmful for both patients and clinicians in a dental setup as most of the treatments involve production of aerosols, which is the main cause of transmission of corona virus/SARS COV-2/COVID-19 (15). Due to the lockdown many academic dental institutions are closed, as well as CDE programs and conferences are not organized physically. To overcome such loss, online lectures by dental professionals of individual institutions, many webinars and CDE programs are organized online via teledentistry.

6. TELEDENTISTRY IN RURAL AREAS OF INDIA:

India's 2/3rd of the population is situated in the rural areas. This part of the population are more prone to chronic oral diseases due to negligence in oral health, illiteracy, unawareness and absence of specialist in most of the rural parts. In rural areas, the dentist patient ratio is 1:1,50,000, which can well depict the condition in rural areas. With advancement in technology, teledentistry acts as a boon to many villagers by providing early diagnosis of chronic and deadly oral diseases. It can also be effective for school children by providing preventive treatment as well as by detecting debilitating oral diseases like rampant and early childhood caries. Primary Health care centres or schools should be equipped with telecommunication systems to provide best treatment to the patients even by specialists belonging to urban areas.

7. USES OF TELEDENTISTRY IN DIFFERENT SPECIALITIES OF DENTISTRY:

7.1. ORAL SURGERY: Dental Implant construction can be done digitally by observing the digital 3D images of the bones of the jaw and skull, also many bone defects can be diagnosed as early as possible to develop a standardized treatment plan for the patient.

7.2. ORTHODONTICS: Modern orthodontics use digital 2D and 3D models for analysis. Measurements and assessment of relationships are done by using software to process the images. Instead of casting jaw models in plaster which could be hectic and filled with error sometimes, the dentist can send the impressions by special postal service to

specialized companies for three-dimensional (3D) digitization of working models. With the help of impression they create digital 3D models and return it through internet to the dentist. The dentist can share this digital model of the jaws with others like his/her colleagues for advice, through network. One of the renowned computerized digitization system is Orthocad I emodels.

7.3. ENDODONTICS: Diagnosis of periapical lesions can be adequately assessed by the digital radiographs or assessment of the dental defect during videoconferencing or by sending a clear picture of the lesion/defect, a necessary plan can be devised for a proper endodontic management of the lesions.

7.4. PEDODONTICS AND PREVENTIVE DENTISTRY: Apart from providing preventive services to school children in rural areas, it also acts as a high quality alternative in children, afraid of dentists, reducing their fear and anxiety compared to clinical examination in real Time.

7.5. ORAL MEDICINE: An effective distant access to oral lesions, it's early diagnosis of malignant and non malignant oral diseases and the benefits of use of e-mail services and a Store-And- Forward image system.

7.6. PROSTHODONTICS: CAD/CAM (computer-aided design and computer aided manufacturing) systems are gaining priority in the manufacturing of individual dental crowns, dental inlays and onlays. Since it is done digitally, transfer of images between clinician and patient will be easy.

7.7. PERIODONTICS: A Periodontist can diagnose hidden chronic periodontal diseases via high quality images and details of the patient's symptoms received by the specialists digitally, thus preventing the condition to worsen in future.

8. ADVANTAGES OF TELEDENTISTRY:

- Diagnosis of oral diseases from a distance.
- Perform preventive dental and general health services in both children and adults.
- Decreased time and labour required to store the data.
- No physical documentation of patient records required to store data.
- Ease of storing data on computer as a soft copy along with the diagnostic images and other relevant information.
- Better image quality and less patient exposure to harmful radiations due to digitalization of techniques and equipments.
- Better discussion of patient's problems with other peer dentists of concerned speciality within minutes, therefore, better high quality treatment planning/outcome.
- Better coordination with dental laboratories.
- Better money and time management.
- A dentist in remote area can consult peer dentists located distantly and treat the much in need poor patients there itself under specialist guidance, thus treat the one otherwise been left untreated (16,17).
- It can ease the problem of a shortage of specialized dental consultants and professional isolation in rural areas (16,17).
- Provide oral health-care services to patients who are medically or physically compromised, children, adolescents and geriatric populations.
- Has become a boon to the patients in heavily affected areas with the COVID-19 and with restriction of movement.

9. DISASDVANTAGES OF TELEDENTISTRY:

- Teledentistry may only help in the preventive and diagnostic procedures. For nonmedicinal treatment, the patient has to visit the specialist for clinical work such as restorations and surgical procedures.
- Poor internet connection affects good teleconferencing.
- A backup communication system and technical support group is required.
- Experience of the peer dentist and the knowledge may change from dentist to dentist.
- Discussion of problems on social networking sites is a bit confusing and risky as we don't know whose opinion is the best and we have to rely on our judgment only.
- If any misdiagnosis or medical error occurs due to technical problems during data transmission, issues of responsibility and malpractice need to be considered.
- Privacy and security are important issues in cyberspace. If patient's data is lost or stolen during the process of transmission, the entire project may need to be discontinued, especially once the Health Insurance Portability and Accountability Act becomes law (10,18).
- The ability of providers to bill and collect fees for health-care services provided through telehealth is not easy.

10. FUTURE ASPECTS:

With the advancement of technology and better network connections, in the developing countries like India, the future of teledentistry seems very bright. The ongoing demand of dental services during pandemic and its role in dental education has proved a broader aspect of teledentistry in dental profession. Due to its global outreach anyone can avail the services of top specialists being anywhere around the world in a cost-effective and timesaving manner. Keeping the urban areas aside, where most of the dentists are easily available, major group of population that would benefit from this are the rural areas where there is unavailability of good dental services.

11. CONCLUSION:

Teledentistry can extend care to additional patient populations at a reasonable cost, moreover students can be educated and staff can be trained via a videoconference proving teledentistry as a potential source of health care. Our community health care centres and primary health care centres should be equipped with the facility of teleconsultation for easy access of health care. Dentistry forms an important part of our healthcare system, it has become severely compromised during the current pandemic of COVID-19. It is much needed to incorporate teledentistry into routine dental practice, if not fully replace, but at least complement the existing compromised dental system during the current pandemic. Keeping aside the current pandemic, teledentistry should be made mandatory mainly focusing on the underserved areas of the society as receiving medical help is the right of every citizen of a country regardless of caste, creed, religion or sex.

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