DENTAL IMPLANTATION AND ITS COMPLICATION, ROLES OF RADIOLOGY TEAM IN LONG TERM CARE

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Abstract:
Following the loss of a tooth, an individual may desire tooth replacement in order to restore both their functional abilities and aesthetic appearance. Over the past decade, clinical prosthodontics has made considerable developments and improvements in response to scientific progress and the evolving wants and needs of patients. The available alternatives in prosthodontics for replacing a single missing tooth are the detachable partial denture, partial and full coverage bridgework, and resin-bonded bridgework. Dental implants have become more popular due to their ability to restore near-normal function in both partially and totally edentulous arches. Choosing a suitable imaging approach for implants has grown difficult due to the introduction of new imaging modalities, several of which are utilized for implant imaging. When it comes to imaging, the modality should not only take into account the anatomy, but it should also ensure precise measurements. A majority of dentists utilize the conventional approach, predominantly orthopantograph (OPG), in their regular practice of implant implantation. Nevertheless, due to the disadvantages linked to OPG, more advanced technologies like computed tomography (CT) and cone beam computed tomography (CBCT) are more widely embraced.

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DOI: 10.53555/ecb/2022.11.6.95

Introduction:

In order to determine the quality of dental health care that is being delivered, it is helpful to have an understanding of the pattern of tooth loss in a community. This is because the quality of dental health care differs geographically and culturally from country to country. Dental caries and periodontal disorders have been shown to be among the most common reasons for tooth extraction, according to studies [1]. A significant number of countries have advanced dental caries, which accounts for 63.1% of tooth loss, followed by periodontitis, which accounts for 26.2% of tooth loss [2].

In the event that an individual loses a tooth, they may decide to seek replacement of that tooth in order to restore both their function and their appearance. Over the course of the last ten years, clinical prosthodontics has undergone tremendous development and improvement in response to the breakthroughs in scientific knowledge as well as the requirements and requirements of patients. The removable partial denture, partial and full coverage bridgework, and resin-bonded bridgework are the conventional choices available in the field of prosthodontics for the replacement of a single tooth that has been lost [3].

Implants were introduced into the dental profession, which resulted in the availability of a more appealing alternative to traditional dentures and bridges. Single crown implants and implant-supported fixed partial dentures (FPDs) are the two choices that are now offered to patients. In the process of osseointegration, osteoblasts grow and directly integrate with the titanium surface of dental implants that have been surgically inserted inside the alveolar bone [4]. This process is the foundation upon which dental implants are built. Because they are able to restore function to a level that is almost normal in both partially and totally edentulous arches, dental implants have garnered a lot of favor over the years [4].

Imaging plays a significant role in the operations that involve dental implants. The imaging modalities range from the standard projections that are commonly available in dental offices to the more advanced radiographic procedures that are typically only available in radiology centers. Implant imaging presents diagnostic information that is accurate and dependable regarding the anatomy of the patient at the site where the implant is intended to be placed. Typical projections consist of radiographs taken inside the mouth (periapical and occlusal) as well as those taken outside the mouth (panoramic and lateral cephalometric). Traditional X-rays, computed tomography (CT), and cone beam computed tomography (CBCT) are examples of imaging techniques that are considered to be less straightforward. The selection of radiographic techniques for a specific case is influenced by a number of criteria, including the patient's anatomy, the cost of the technique, the availability of the technology, and the amount of radiation exposure. The goal of the dentist is to find a balance between these elements in order to significantly reduce the likelihood that the patient will experience any difficulties [5].

Imaging is performed for the purpose of determining whether or not implant treatment is suitable for the patient, determining the location of vital anatomical structures such as the inferior alveolar nerve and the maxillary sinus, determining the quantity of bone, height, buccolingual width, and angulation of the alveolar process, identifying any potential pathological conditions, and determining the length and width of the implant that will be placed [6].

Review:

Implant-supported single crowns and multiple implant-supported bridges may suffer from various mechanical, biological, or technical complications. Poor patient selection is one of the important factors that adversely contribute toward failures in implant dentistry [7].

Mechanical complications are usually a sequel to biomechanical overloading. Factors contributing to the biomechanical overloading are poor implant position/angulation (cuspal inclination, implant inclination, horizontal offset of the implant, and apical offset of the implant), insufficient posterior support (i.e., missing posterior teeth), and inadequate available bone or the presence of excessive forces due to the parafunctional habits, that is, bruxism [8].

Digital tomographic images offer increased image quality by contrast enhancement, reduction of blurring, and image manipulation. Further image processing may yield precise information on bone volume, (relative) bone density, and help to simulate implant surgery by visualizing the planned implant in relation to the anatomic structures [9].

For radiographic visualization of the mandibular canal, cross-sectional imaging provides the best information. When comparing computed to conventional tomography (hypocycloidal and spiral) for measuring the distances to the mandibular canal CT does not seem to be more accurate. Spiral tomography performs better than hypocycloidal tomography as the borders of the

canal are better identified with the former technique. The greatest inaccuracy is found when using panoramic images [10].

CBCT scanners are designed specifically for diagnosis and treatment planning in implant therapy. Multiple pictures of the region of interest are generated in a single scan. This enables the dentist to perform minimally invasive surgery without raising a flap, thereby reducing surgery time, postoperative pain and swelling, and faster recovery time. A master cast can be fabricated pre-surgically using the information that is stored in the surgical plate, and a provisional restoration can be placed immediately after surgery [10].

Radiographic markers can be inserted at the time of the scan and these identify the precise location of the proposed implants. Stents provide radiographic landmarks that can be used to correlate proposed clinical location and angulation of implants with the available alveolar bone [10].

Magnetic resonance imaging (MRI) was first discovered by Lauterbur. The presence of ferromagnetic (high magnetic susceptibility) metals can distort the magnetic field and compromise the images. Non-ferromagnetic alloys do not produce image deformities, whereas non-precious ferromagnetic alloys (cobalt–chromium) produce large image deformations. One study found that MRI images are not affected by implants of the Branemark system [11].

MRI differentiates the inferior alveolar canal and neurovascular bundle from adjacent trabecular bone, and visualizes the fat in the trabecular bone. MRI avoids radiation hazards associated with CT. Since the introduction of CBCT scanners in the late 1990s, there has been great interest in these devices in the field of oral and maxillofacial surgery, orthodontics, and dentistry. Swennen and Schutyser stated that with CBCT, the image value of a voxel of an organ depends on the position in the image volume. Several studies have described the value of computer-guided implant bed preparation for dental implantology. Gert another study, evaluated a novel approach in the placement of interforaminal mandibular dental implants with computer-assisted navigation and without conventional elevation and reflection of mucoperiosteal flaps or mucosal punching at the surgical site [12]. Patel *et al*., stated that perhaps the most clinically useful aspect of CBCT imaging is the highly sophisticated software that allows the huge volume of data collected to be broken down and processed or reconstructed into a format that closely resembles that produced by other imaging modalities. Vannier stated that when new developments in the synthesis and optimization of CBCT reconstruction algorithms allow the full exploitation of the potential of area detectors in CBCT, it will provide important benefits for craniofacial imaging. It is expected that improvements in cone-beam reconstruction algorithms and post processing will solve or reduce this problem [13].

Overloading of the implants usually causes loosening or fracture of the implant component. In one study stated that screw loosening or fracture prevailed more with the prosthetic screws as opposed to the abutment screws. Implants restored with single crowns have shown more screw loosening as compared to multiple implants with multiple restored units, and mandibular molar implant restorations are more affected by screw loosening as compared to the maxillary ones. In another study, the incidences of loosening of the abutment screw or the abutment were found to be 59.6% in a follow-up of 15 years [14]. In a systemic review by the yearly rate of abutment or screw loosening ranged from 0.62% to 2.29% that converts into a 5-year complication rate ranging from 3.1% to 10.8%. In another follow-up study of Branemark single-tooth implants, screw loosening was reported to be the most frequent complication [15].

To ease the incidence of screw loosening, it is advised to maximize the joint clamping forces while curtailing joint separating forces. Joint separating forces include excursive contacts, cantilevered contacts, interproximal contacts, off-axis centric contacts, and nonpassive frameworks. In an article that was suggested to torque the abutment or the screw retained crown, with twice the force recommended by the manufacturer at an interval of 5 min between each rotation. Over the course of years, many manufacturers have revised the conventional implant components to reduce the incidents of screw loosening [16].

Conclusion:

In order to successfully complete the dental implant operation, it is frequently necessary to employ a number of different dental professionals. A periodontist, for instance, may be sent to the patient by the general dentist in order to do an evaluation and placement of implants. This could lead to the conclusion that orthodontics would be necessary in order to create adequate space for the implant and prosthesis, and that a bone augmentation treatment or bone grafting procedure would also be necessary in order to develop sufficient bone for the implant. This could be the case in certain instances. Obviously, there is also the possibility that there are teeth that need to be pulled. Therefore, an oral

surgeon can also become engaged in the situation. In most cases, the final step involves the participation of a restorative dentist who is responsible for the actual prosthesis. Without any regard for the preservation of the surrounding bone and tissue, the oral surgeon, who is not collaborating with the implant team, may just extract the teeth without any thought being given to the matter. When the patient returns for implant placement at a later date, it is possible that it will be recognized that the inability to preserve tissue during the tooth extraction procedure led to insufficient bone for implants. As a result, the patient will be required to have further augmentation surgery prior to implant installation. Therefore, the first step in preventing extra surgery and difficulties is to have a close-knit implant team that interacts well with one another. It is possible to improve the success rate of implant placement by making use of the good imaging techniques that are widely available today. When choosing an imaging modality, it is important to take into consideration the type and quantity of implants, as well as the location of the implant and the anatomy that surrounds it. In the same way that it is necessary to apply proper selection criteria to every imaging technique, it is necessary to do so before picking the technique that is most appropriate for each individual patient.

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