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IMMEDIATE IMPLANTS: A REVIEW

Dental Science

Dr. Sneha S. Puri* (MDS) Senior Lecture Department of Periodontics, Swargiya Dadasaheb Kalmegh Smruti Dental College, Nagpur Maharashtra – 441110. *Corresponding Author

ABSTRACT

Dental implants are one of the most exciting and rapidly developing aspects of dental practice. In the last two decades a great deal of activity in the field has occurred with the development of better materials and newer techniques that have resulted in improved clinical performance of implants. Moreover, the individual healing potential of the fresh extraction socket as well as the implant surface characteristics may provide better opportunities for osseointegration. With careful patient selection, immediate implant placement, particularly in the esthetic zone of the mouth, has gained acceptance among the scientific community. The aim of this article is to present the clear understanding about immediate implant placement in detail.

KEYWORDS

Extraction socket, immediate implant, osseointegration, stability

Introduction:

In patients with non restorable failing tooth after extraction the socket is allowed to heal for 3 to 6 months before placement of a dental implant. After complete socket healing, bony ridge and soft tissue deficiencies are corrected in order to make the site suitable for implant placement which prolongs the overall treatment time. Due to these obstacles, new surgical innovations have led to various radical modifications to this original protocol. One such modified treatment protocol is the placement of implants into fresh extraction sockets, commonly known as immediate implant placement[1].

William Schulte[2] first reported placement of a Tubingen dental implant into a fresh extraction socket in 1976. Immediate implant placement may be defined as implant placement immediately following atraumatic tooth extraction as part of the same surgical procedure, thereby avoiding the need for a second surgical procedure. Implant is anchored to a small part of 3 to 5 mm subapical alveolar bone which provides it with satisfactory initial stability. Moreover, the individual healing potential of the fresh extraction socket as well as the implant surface characteristics may provide better opportunities for osseointegration. With careful patient selection, immediate implant placement, particularly in the esthetic zone of the mouth, has gained acceptance among the scientific community. Therefore the aim of the review is to describe immediate implants in detail.

Advantages

The proposed and perceived advantages of immediate implants include;

- Reduction in overall treatment duration.
- Maintenance of soft tissue profile
- Prevention of the bone loss in both vertical and horizontal directions.
- Reduced number of surgeries, thus reducing the overall cost and morbidity.

Disadvantages

- The ideal modality for the treatment of marginal voids is subject to considerable controversy.
- The additional cost of associated grafting and use of barrier membrane offsets the perceived advantage that the cost is lower due to a lesser number of surgeries.
- More extensive soft tissue manipulation is required, if the submerged healing protocol for immediate implants is to be used.
- The procedure may be technically more demanding.

Surgical Procedure

Atraumatic Extraction

The facial bony plate is usually very thin and easily fractured during the extraction procedure. Pressure is applied apically at the mesial and distal aspects of the tooth, taking care not to force it labially and gently the tooth is removed.[3]

Tools and Techniques Proposed for Minimally Invasive Tooth Removal

1. Periotomes

Periotomes are extraction instruments that employ mechanisms of "wedging" and "severing" to facilitate tooth removal. Periotomes are composed of very thin metallic blades that gently wedged down the periodontal ligament (PDL) space in a repetitive circumferential fashion.[4] The use of a periotome and luxator is critical in achieving atraumatic tooth extractions. The surgical approach involves intrasulcular incisions around the tooth to be extracted. Either no flap or a minimal flap is raised around the neck of the tooth. This gives access for the periotome and luxator. In addition to minimally invasive luxation, the periotome blade severs Sharpey's fibers that secure the tooth within the socket. Once a majority of Sharpey's fibers have been separated from the root surface, rotational movements allow for extraction of the tooth with minimal lateral pressure [5]. This reduces potential trauma to adjacent bone and associated gingival structures.

Disadvantages include fatigue and adding a significant amount of time to the extraction procedure.

1. Powertomes

The Powertome® combines the atraumatic extraction advantages of the periotome with mechanized speed. The Powertome® is an electric unit that has a handpiece with a periotome blade and controlled by a foot switch. The automated periotome blade is controlled by a solenoid within the handpiece. Power output to the handpiece is regulated by the controller box and may be adjusted to 10 different power settings. The Powertome® is operated by selecting a power setting on the controller unit and inserting the blade into the PDL space. User experience indicates that it is often easiest to begin interproximally. After inserting the blade into the PDL space, the Powertome® is activated via the foot switch. Keeping the blade parallel to the long axis of the tooth, the blade should follow the contours of the tooth in a sweeping motion, advancing apically in 2-4 millimeter increments. During activation of the unit, the blade advances easily with minimal hand pressure yielding much faster and less fatiguing results than traditional periotomes. Following use of the Powertome® the tooth in question should be gently removed with forceps in a rotational fashion. In some instances, simple suction is all required to remove smaller single rooted teeth. Multirooted teeth, on the other hand, may require surgical sectioning to convert the tooth into multiple "single rooted" teeth. Prior to sectioning multirooted teeth, it is recommended to use the Powertome ® in the same fashion as applied to single rooted teeth. In some instances, especially in the cases of fused or convergent roots, multi-rooted teeth may be removed without the need for sectioning. If the roots are flared, however, sectioning the tooth into multiple single rooted teeth will reduce potential for damage to adjacent bone.

2. Physics Forceps

The principle of biomechanics is the basis for the development of a different type of dental forceps called "Physics Forceps". The physics forceps is a dental extractor that uses first class lever mechanics. It has a bumper on one beak, which is placed below the tooth, usually at or above the MGJ. The other beak is placed on the tooth root in the gingival sulcus. The handles of the forceps act as a lever to rotate the

tooth from the socket. Once in position, it is used as a one unit. A few degrees of rotation facially place moment forces on the tooth, which is held for 60 seconds. Another few degrees of rotation are then applied, and the tooth releases and elevates.

3. Orgam System And Easy X-Trac System

The Ogram System (a specific protocol and instrumentation to use fingertip pressure to minimize the force and surrounding tissue damage) and the Easy X-TRAC system (to hollow out the tooth with rotating instruments and remove remaining tooth fragments from the inside) both specifically designed for atraumatic extraction are considered to be highly effective compared to the other techniques. They allow a vast majority of teeth be removed without traumatizing the bone, gums, and adjacent teeth.

4. Piezosurgery

Ultrasonic surgery, also known as Piezosurgery, has been introduced recently in the field of oral surgery. (Vercellotti et al 2001, Blus and Moncler 2006)[6,4] Instruments involved in Piezosurgery are versatile because their novel vibrating tips lead to new therapeutic applications like tooth extraction, and implant osteotomy preparation. Vibrating syndesmotomes are among these recently developed tips for tooth and root extraction. They are brought through the gingival sulcus into the space occupied by the periodontal ligament between the root and socket to cut the periodontal ligament fibers surrounding the tooth socket up to or greater than 10 mm. Thus, when the roots or teeth are mobilized after severing the most apical fibers, the coronal portion of the socket has not been submitted to a violent "rip." At this stage, a nearly atraumatic extraction can be achieved. The UBS device (Resista) was used for the Piezosurgery. It works in the 20- to 32-KHz range and its maximum ultrasound power is 90 W. (Blus and Moncler 2006)[4] The tips used with this instrument are made of titanium alloy. Six different extraction tips are available for adaptation to various clinical situations. The first tip is arrow like and sharp on both sides; it was used to penetrate the periodontal ligament at the coronal aspect of the socket and start sectioning the periodontal ligament fibers. To section the periodontal ligament fibers deeper in the apical direction, four syndesmotomes are used. Two of them are straight, with teeth, and their cutting directions are parallel and perpendicular to the long axis of the tip. The other two are angled at 45 degrees (one to the right and one to the left) to better adapt to the socket's geometry. The last tip was indicated for removal of ankylosed teeth.

Evaluation of the Socket

A curette is used to gently explore the labial aspect of the socket for fenestrations or fractures. If the labial wall is intact and there is no sign of infection, immediate implant placement will have a higher likelihood of success (Funato et al 2007, Garber et al 2001).[7,3] If the labial plate is not intact or there is chronic infection present, a ridge preservation procedure should be done and implant placement is delayed (Buser et al 2004)[8].

Place the Implant along the Palatal Wall

The thicker palatal walls resist osteotomy drills, which may inadvertently be directed labially, thus compromising the thin labial bone. To prevent this from happening, and to take advantage of the thicker palatal bone, a new apex and pathway for the osteotomy drills is created using a round bur or a Lindemann bur. Lateral pressure is placed against the palatal wall during the osteotomy preparation by sequential twist drills. A bone tap may be used in dense bone to prevent labial displacement of the implant during insertion. The implant is counter sunk by 1- 1.5mm to reduce crestal bone loss.

After insertion of the fixture there is usually a gap between the occlusal part of the implant and the surrounding socket walls referred to as horizontal defect distance (HDD). The dilemma facing implants placed in fresh extraction sockets has been the horizontal distance between the implant surface and the labial plate of bone. It has been postulated that a connective tissue interface will develop when the gap is greater than 1.5 mm at the coronal aspect of the implant. Few investigators have suggested the distance should be 0.5 mm or less (Botticelli et al 2003)[9]. Hence concomitant placement of regenerative materials has been shown to result in predictable, high levels of osseointegration (Fugazzotto PA 2005)[10]. Therefore various autogenous and non-autogenous particulate materials combined with various membranes (GBR therapy) have been employed to regenerate alveolar bone at the time of placement of implant in fresh extraction sockets.

Evaluation of Stability of the Implant

A minimum of 35 Ncm of torque is needed to provide sufficient stability to safely place a provisional restoration. [3,11] Based on the amount of stability the implant exhibits, a decision can be made to place either a provisional restoration, a transmucosal healing abutment or a low profile cover screw for a 2 stage procedure.[12] If a restoration is placed, it is kept out of occlusion and the patient is instructed to avoid function on that tooth [3].

Soft Tissue Closure after Immediate Implants

Four important factors are to be considered for closure over immediate implants (Rosenquist B et al 1997)[13]: (1) position and width of attached gingival, (2) buccal contour/volume of alveolar process, (3) configuration and level of the gingival margin, and (4) shape and size of the interdental papilla.

The following techniques have been reported in the literature to achieve closure over immediate implants: (1) coronally repositioned flap, (2) free gingival graft, (3) subepithelial connective tissue graft, (4) pedicled island flap, (5) pedicled palatal flap, and (6) membranes. All of these techniques have pros and cons, and it is usually up to the surgeon's discretion to choose any one of them. However, it is not always imperative to completely submerge immediate implants and to have complete soft tissue coverage. Successful and uneventful healing of immediate transmucosal implants has also been reported [14]. However, it is extremely important to ensure strict postoperative plaque control.

Conclusion:

Therefore based on this review, immediate implant placement following tooth extraction might be a viable alternative to delayed placement. However, it requires a careful case selection and a specific treatment protocol because it is a very sensitive technique and more difficult to execute than a conventional protocol.

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