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Review Article

A comparative review one-stage and two-stage dental implants

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ABSTRACT

Dental implants have been used as an effective treatment for missing teeth. Dental implantology has a long history that reaches back to ancient times when attempts were made to replace missing teeth with various materials. Modern dental implants are designed to osseointegrate, where the implant fixture fuses with the jawbone. The surgical procedure involves placing the implant, followed by the adaptation of the surrounding tissue. There are two main surgical techniques: one-stage surgery and two-stage surgery. One-stage surgery involves placing the implant and allowing a healing abutment to protrude through the gums. This eliminates the need for a second surgery but carries the risk of overloading the implant during the healing phase. Two-stage surgery is the standard approach, where the implant is initially submerged, and a second surgery is performed to connect the abutment. The choice between one-stage and two-stage surgery depends on many factors, including bone quality, clinical parameters, and aesthetic considerations. One-stage surgery offers quick aesthetics but can pose a higher risk of implant failure due to early loading. Two-stage surgery provides a higher success rate but requires two surgical procedures.

Keywords: Dental implants, One-stage surgery, Two-stage surgery, Osseointegration

INTRODUCTION

Implants have been used to restore missing teeth since the beginning of time. The process began with the creation of an anatomical copy of the actual tooth using a range of materials, including ivory, bone, metals, and precious stones.[1] Dental implants have been used successfully and commonly in recent years as an alternative treatment for removable and fixed dental prostheses in cases of partial and total edentulism.[2] Biological complications (periimplantitis, peri-implant mucositis) may occur around dental implants. The development of dental implants dates back to the turn of the 19th century.[1] Branemark used the term "osseointegration" to refer to the histology data that supported the effective integration of dental implants into the jaw bone.[3] In order for a dental implant to operate

normally in a clinical setting, it must be biologically and mechanically fixed to the jaw bone. In a healthy state, the intricate process of implant osseointegration requires several weeks of recovery. At the bone-implant interface, inflammatory and bone cell reactions happen right away after implantation. Following these occurrences is the process of bone regeneration, which is controlled by a number of biological variables close to the implant.[4] At the contact and distant sites of dental implants, bone mineralization (remodelling) then takes place. There have been a number of advancements in dental implant design recently. The majority of dental implant designs that are commercially accessible are threaded with cylindrical or conical (root) forms. The biomechanical attachment and performance of a dental implant in the bone tissue are mostly impacted by its shape. The primary factors on which implant performance mainly depends are believed to be implant diameter and length, as well as thread pitch, shape, and depth. The surface area for direct bone-implant integration is increased by implant threads.[5] Also, implant thread design can significantly enhance long-term stability of a dental implant.[6] A surgical technique can be a one- or two-stage protocol.[7] With a one-stage implant, there is no requirement for two-stage surgery. One-stage implants also provide cost and time benefits, the possibility of early loading, and accessibility for clinical monitoring during the osseointegration period. Two-stage surgeries require a two-piece implant system consisting of the implant, which is submerged during the first surgical procedure, and the transmucosal abutment, which is connected to the implant during the second surgical procedure. This surgical technique was encouraged to avoid preloading and minimize the bone resorption around an implant during the early phase of healing.[7] In recent years, a consensus has been reached with respect to the fact that the marginal bone loss that occurs around the dental implant in the first year in particular is an important parameter in the evaluation of the success of the dental implant.[8-10]

METHODOLOGY

This study is based on a comprehensive literature search conducted on 22 May 2023, in the Medline, PubMed, and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the differences between one-stage and two-stage dental implants. There were no restrictions on date, language, participant age, or type of publication.

DISCUSSION

Restoring the extracted teeth via dental implants has become an increasingly popular alternative treatment. The success of implants is affected by factors depending on the patient (bone amount and quality, i.e., clinical parameters) and the surgical procedure followed.[8] The periodic assessments are quite important in terms of determining the short- and long-term success and complications of the implants.[11] Implant placement requires an adequate quantity and quality of bone. The anatomic limitations of the residual alveolar ridge may make the insertion of dental implants difficult. Implants placed into the alveolar bone sites, previously augmented with graft material, have been associated with a high success rate.[12] The usual protocol of conventional implant placement procedures, though, requires two surgical procedures: the first for bone augmentation and the second for implant placement at an interval of about 3–4 months. However, bone augmentation can be done with simultaneous implant placement, which saves time for a second invasive procedure called a one-stage procedure. A two-stage surgical protocol for implant placement has been the standard surgical technique for the insertion of dental implants. Recently, one-stage implant placement has been widely used, which involves a transmucosal healing abutment. This eliminates the need for a second surgery and may reduce treatment time.[13] Most implant systems follow a standard process consisting of the following steps.[14]

Soft tissue reflection

The attached gingiva is split in half by making an incision over the bone crest.[15] This makes a thick mass of tissue around the final implant. The edges of the tissue, known as flaps, are retracted to show the underlying bone. Alternatively, flapless surgery may be used, where a tiny piece of tissue is cut out to insert an implant.

Drilling at high speed

Once the soft tissue is reflected, precision drills are used to create pilot holes.[14] The drilling speed is carefully controlled to prevent damage to the bone, such as burning or pressure necrosis.[16] Surgical guides or stents may be used to ensure accuracy.

Drilling at low speed

The hole is enlarged using progressively bigger drills.[14] This is typically done through several drilling steps, ranging from three to seven, depending on the size of the implant. Care is taken to avoid overheating and damaging the osteoblasts or bone cells.[17] Cooling saline or water spray is used to maintain a low temperature.

Placement of the implant

The implant screw is inserted into the site that has been prepared.[14] It may be self-tapping or tapped with an implant analogue. A torque-controlled wrench is used to screw the implant into place with precise torque. This prevents overloading the surrounding bone, which can lead to osteonecrosis and failure of the implant.[18,19]

Tissue adaptation

The gingiva is adjusted around the entire implant to create a thick band of healthy tissue around the healing abutment.[14] This promotes proper healing and integration of the implant. Alternatively, the implant can be "buried" by sealing the top with a cover screw and completely covering it with tissue.[20] In such cases, a second procedure is required to uncover the implant at a later time.

Timing of implants after extraction of teeth

There are different approaches to the placement of dental implants after tooth extraction.[21] The approaches are immediate post-extraction implant placement, delayed immediate post- extraction implant placement (two weeks to three months after extraction) and late implantation (three months or more after tooth extraction). An increasingly common strategy to preserve bone and reduce treatment times includes the placement of a dental implant at recent extraction site. On one hand, it shortens treatment time and can improve aesthetics because the soft tissue envelope is preserved. On the other hand, implants may have a slightly higher rate of initial failure. Conclusions on this topic are difficult to draw, however, because few studies have compared immediate and delayed implants in a scientifically rigorous manner.[21]

One versus two-stage surgery

One-stage dental implant surgery is when an abutment protrudes from the gingiva after just one procedure, enabling the operator to cover it with a tooth.[22] This procedure provides the benefit of quick aesthetic enhancement. Since most patients desire anterior teeth when they leave the dental chair, the one-stage dental implant procedure is a suitable option for the anterior teeth. One-stage procedures are not always feasible, though. The implant is twisted using 35 Newtons (N) torque when the surgery is done. However, if the socket has an implant that spins or thin bone, a twist of less than 35 N torque is only possible. In these cases, it is better to make a two-stage procedure. The one-stage technique has the advantages of requiring less surgery, less pain, and quick aesthetic results.[23] The drawback is that loading the dental implant during the osseointegration phase, when the implant and bone are fusing, can overwhelm it.[22] Once the patient gets the implant, they chew normally, do not feel any different from having a dental implant, and can still harm the osseointegration. The bonding of the dental implant to the bone can fracture more than the dental implant itself. The success rate of two stages of surgery is therefore higher than that of one stage of surgery. Two procedures are required throughout the two-stage dental implant process, which increases success rates.[24] In the initial stage of dental implant surgery, the implant is placed in the jawbone and given two to three months to osseointegrate, or fuse, with the surrounding bone. The two-stage treatment has a 98% success rate because no pressure, biting, or loading forces are placed on the tooth implant.[23] After two months, when the dental implant has fused to your bone, we can begin the second step of surgery, which entails exposing the implant and attaching the abutment to the fixture. Compared to the first stage of dental implant surgery, which causes swelling and discomfort, the second stage's discomfort and suffering are mild. Under special conditions, an implant can be placed and a crown placed on top of it at the same time. However, this is a very special circumstance requiring ideal conditions, surgical experience, and crown fabrication know-how. It is generally safer and wiser not to subject an implant to biting forces until it is fully healed and integrated with the supporting bone. A two-stage procedure is typically used for replacing teeth where there is no immediate need for a cosmetic solution and when more of a margin of safety is required. With this approach, the implant(s) are placed into the jawbone, and the gum tissues cover them. They are not exposed to the mouth but stay buried and left to heal. Once healed, a second surgery is performed to attach an abutment to secure the crown in place. This approach is used when there is poorer bone quality or quantity.[25] This may make it necessary to regenerate bone around the implant at the time of its placement. There may also be other health considerations dictating that a two-stage approach may be indicated. Results from earlier research indicate that one-stage surgery may produce outcomes nearly similar to those of two-stage surgery.[26-29] Numerous studies comparing one-stage surgery with two-stage surgery for crestal bone loss found no appreciable differences between the two techniques.[30,31] The potential to obtain greater initial stability with the insertion of a bigger implant into the lower jaw, which has a higher density of bone than the upper jaw, may explain why one-stage approaches are more popular in the mandible than the maxilla.[32] The decision to use a two-stage procedure is influenced by the increased number of implants in order to lower the risk of failure. The edentulous area typically has to be temporarily replaced by a detachable appliance when more than three implants are required. This form of prosthesis puts the success of the underlying implant at risk by applying early stress. The surgeon therefore chooses to hide the implants and subsequently uncover them in a subsequent procedure.[32] One-stage surgery does this without sacrificing long-term clinical results in terms of implant survival and the health of the tissue surrounding the implant, which is strongly advised to cut down on restorative therapy time.[32] Implant placement in one or two stages has been challenged. Numerous considerations must be made during the decision-making process before a treatment plan is created.[32] Soft tissue factors must be considered. In two-stage surgery, the initial incision is less significant. The width of the keratinized tissue can be altered during the second stage of surgery, even if the implant is not positioned to allow 2 mm of keratinized gingiva on either side of the implant. When one-stage surgery is intended, the initial incision should always be made with care to leave the implant's buccal and lingual/palatal sides with >2 mm of keratinized soft tissue.[32] The possibility to utilize a one-stage technique also when using extra-short implants brings several

advantages, including less morbidity, more patient comfort, reduced chairside time, and reduced costs.[33]

CONCLUSION

Dental implants have revolutionized the treatment of missing teeth, offering a reliable and aesthetically pleasing solution. The choice between one-stage and two-stage surgery depends on various factors, including patient-specific considerations and treatment goals. One-stage surgery provides aesthetics sooner but carries the risk of implant overloading during the healing phase. On the other hand, two-stage surgery, the traditional approach, offers a higher success rate and allows for optimal osseointegration. With proper planning and execution, dental implants continue to provide a reliable and effective solution for restoring oral function and aesthetics.

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