

Implant Success versus Implant Survival

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Abstract

In literature, 'implant survival' and 'implant success' have different and distinct meanings. These two definitions are sometimes misused. Misunderstanding leads to implant failure or just a survival. The reason for many dental implant mistakes is due to the fact that implant dentistry was not a part of the dental school curriculum of vast majority of dentists in practice today. Dental schools are now incorporating adequate training programs in implantology.

There are many reasons that mistakes happen. Many dentists simply do not possess the training or qualifications necessary to be successful. Sadly, these dentists are more concerned with saving money by cutting corners or performing a procedure too quickly. Below we have provided several factors that can contribute to dental implant mistakes and we will illustrate the common reasons for dental implant failure. Many dentists use two-dimensional panoramic X-rays to place dental implants. Although this method works well for most dental surgeries, there is much more sophisticated technology available for dental implants. So we have to use 3D CT scans which give a much clearer image of the exact position of nerves and blood vessels present in the bone. These powerful CT scans combined with radiography techniques are used best to determine the precise placement of every dental implant. They only take a few minutes and radiation exposure is minimal. Another main reason for dental implant failure is the quality of the fixture. With over 200 companies that provide dental implants, there are only a handful of reputable companies with proven research that documents their reliability and quality. The temptation is great for dentists to save costs with cheaper fixtures. Costs vary greatly with substandard products, coming in nearly one-hundredth of the cost of high quality fixtures. We are learning now that cutting on costs can lead to serious complications like infection, nerve damage that causes facial numbness and pain, or the implant can be misplaced into the sinus cavity.

Keywords: Implant; Implant failures; Implant mishaps; Implant success; Implant survival

Introduction

Implant treatment is regarded as a safe technique for restoring missing teeth, with high rates of success. Nevertheless, it has, as every surgical procedure, several complications that can occur and must be known in order to prevent or solve them. Implantology is an ever growing field that is reaching the practice of general dentists due to the simplification of technical procedures. Specialists in oral surgery now perform more demanding procedures. Along with general dentists, they must pay special attention in order to avoid risks. Nowadays, implants are considered as the first line of treatment almost all cases of complete or partial edentulous patients. Only by using a good work protocol, we can detect the local and systemic risk factors that could determine the success of the treatment and allow us to implement preventive measures if needed. It is mandatory to know all those clinical complications.

Be aware that the majority of problems that can arise in an implantology treatment are accidents, complications or iatrogenic errors, and are a consequence of an inadequate indication such as [1]:

- Poor quality or quantity of bone
- An erroneous surgical technique
- Infections
- Lack of oral hygiene
- Smoking habit
- Systemic diseases that were poorly controlled

Failures of implants normally occur once they are correctly osseointegrated, as the development of an acceptable masticatory function and the consequence of loss of bone support derived from a

peri-implantitis produced by the presence of bacterial plaque and/or overload. That was acceptable as normally the bone loss about 1 mm around the implant yearly.

Early complications include infection, edema, ecchymosis, hematoma, emphysema, bleeding, dehiscence of the area and sensitive alterations. While the group of late complications includes mucoperiosteal flap perforations, maxillary sinusitis, mandibular fractures, loss of osseointegration, bone defects and peri-implant lesions. Nevertheless, some of them, like bleeding, could appear at any moment during the treatment. The prosthetic complications or peri-implantitis are not illustrated in this review.

It is important to differentiate between the meaning of Survival and Success. 'Implant survival' means that implants are still in the mouth at the time of examination, regardless of the state of the prosthesis or patient satisfaction. A nonfunctional implant requiring additional treatment is counted in the surviving group while 'Implant success' means that implants are not only in the mouth, but are also functional and satisfactory.

Discussion

We prefer to describe these failures and mishaps as they arise in the course of the treatment and are divided accordingly.

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Angulation of an implant

It is advisable to assess the characteristics of the edentulous zone clinically and by using and cone beam CT imaging before treatment. A wrong planning that involves a malposition or an over-angulation would represent impossibility for carrying out the prosthetic restoration, while it also would deteriorate long-term implant viability. We should know that the angulation in the case of a single implant will increase tension forces between the implant and the bone. As a result of a negligence or bone deficit, an implant may have been placed with an angulation that makes it dysfunctional as seen in Figures 1-3, it is suggested the use of a repositioning system that has yielded excellent results and which is based on the osteogenic distraction of a bone fragment containing the integrated implant. All of which improves esthetic effects, as well as the biomechanical behavior of the implant by correcting crown-root proportion, contour of soft tissues and the relation with neighboring teeth.

Note that the distraction rate is the usual value (1 mm/day) and the suggested consolidation period is 8 weeks, and confirm the implant stability in time.

Distribution of implants along the arch

A lot of dental practitioners do not make an ideal treatment plan, and 98% of them do not use the surgical stent for proper implant sites and angulation placement. They depend on their imagination and illusion as seen in Figure 4. So we appreciate that all implant practitioners use the Cone Beam Computed Tomography (CBCT) and the surgical stent. Both of them give us a fantastic result with 99% accuracy.

Number of implants

Most studies prefer to place 6 maxillary and 4 mandibular implants

in a right angulation and distribution [2-4]. But within our studies we found that the 8 maxillary implants and 6 mandibular implants are more efficient and durable as they withstand the horrible force of mastication for a level that we cannot imagine [5]. We should know that more than documented numbers will lead to weak mandible or maxilla and further result in fractures as seen in Figure 5. The exception of unparallel implants is All-In-Four Technique, 4 maxillary implant and the same in the mandible. It is a fantastic one.

Lesions of adjacent teeth

The malposition of an implant may lead to the lesion of an adjacent tooth, where this involves a lesion on the radicular surface or the root apex and a subsequent post-operative pulpitis, or periodontitis that must be treated, in the majority of cases, by endodontic means, while sometimes it involves the non-integration of the implant because of the inflammation. It is of utmost interest to study the axis of those



While the 2 mesial implants, they are more or less not bad, but the problem in the most mesial one is the adjacent to tooth number 14.

Figure 3: Wrong angulation of the 2 distal implants as illustrated in Figures 1 and 2.

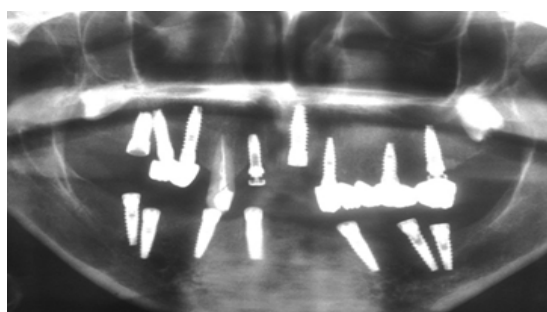


Figure 1: Wrong angulations of implants.



Figure 4: Bad implants distribution.

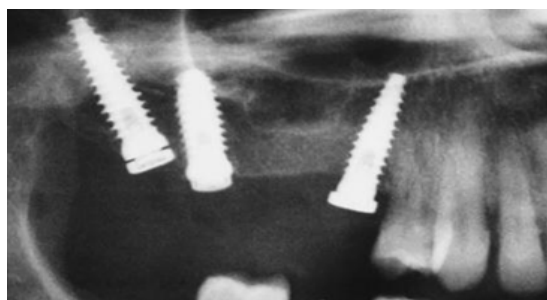
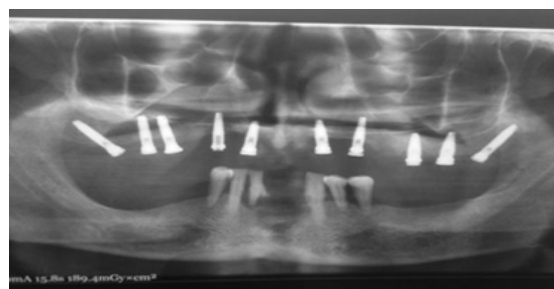


Figure 2: 3 implants in different parallelity to each other in the upper right quadrant.



They are too much in number and are costly for the patient. The case was in need for only 6-8 implants.

Figure 5: The practitioner placed 10 implant fixtures.

teeth delimiting the edentulous space to be rehabilitated with implants to decide, before surgery, implant axis and thus choose the most convenient one, or reduce its length to curb its convergence and thus prevent this type of dental iatrogenic lesions. On some other occasions, the inflammatory-infectious origin in the apical zone is a tooth adjacent to the implant and this is especially due to the proximity of the tooth to the implant and to the time elapsed since the endodontic procedure on the tooth was performed, so the risk of a retrograde peri-implantitis increases when the distance between tooth and implant apexes is shorter and when the lapse of time between the endodontic procedure and the implantation is also shorter as seen in Figure 6.

Lack of primary stability

Primary stability is determined by bone density and cortical bone thickness, a fact that explains why it is easier to obtain a better stability in mandibular implants than in maxillary or in those cases in which the implant is immediately placed after an extraction procedure.

So a low insertion torque value (<10 Ncm) will determine a higher risk of osseointegration failure (type bone IV), whereas a too-high torque value (>45 Ncm) could lead to a bone compression which would result in a bone necrosis (type bone I), and in an osseointegration failure.

Cooper described, in a study on 1084 implants, that there was a 6.43-fold lower risk of primary implant stability failure in the anterior mandible than in other locations. The maxilla had a 2.7-fold higher risk of primary stability failure versus the mandible. Females had a 1.54-fold higher risk of primary implant stability failure versus men and implants less than 15 mm in length had a 1.49-fold higher risk of primary implant stability failure versus longer implants as seen in Figure 7 [6].

Implant displacement

The invasion of the maxillary sinus by an implant can occur during or after the surgery as a result of an insufficient primary stability. It has been reported a case of an implant which had been implanted 9 months earlier during a maxillary sinus lift surgery, and which was found inside the sinus only a few days after having placed the fixture. Therefore, any implant could undergo a displacement at any time after having been fixed with a cover screw (osseointegration period), even avoiding regenerative techniques in a spontaneous and asymptomatic way, or even afterwards, at the time of connecting the healing abutment as seen in Figures 8-11.

In general, implant displacements occur sometimes after an implant placement because there is an absence or loss of osseointegration and, therefore, of stability (low osseous density around it). Nevertheless, some authors report the displacement of

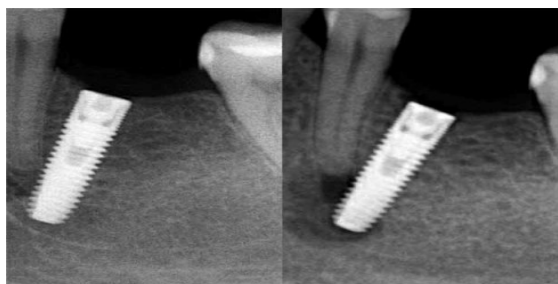


Figure 6: A radiolucent area adjacent to the body of the implant.



As discussed before that maxilla is more liable to fail in addition to that the risk of failure in females are greater than males.

Figure 7: A female patient with implant failure due to lack of primary stability in upper right maxilla which was placed to restore the missing tooth number 17.

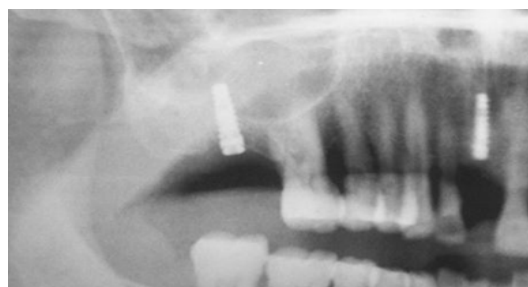


Figure 8: The distal implant tip inside the maxillary sinus.

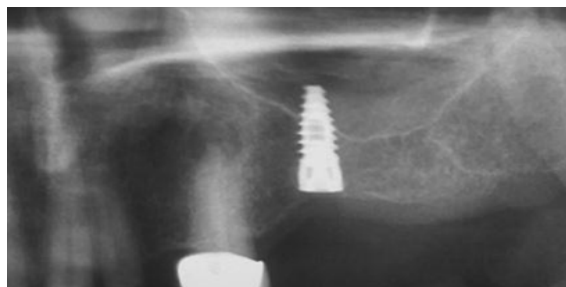


Figure 9: The implant apical 1/3 inside the maxillary sinus.

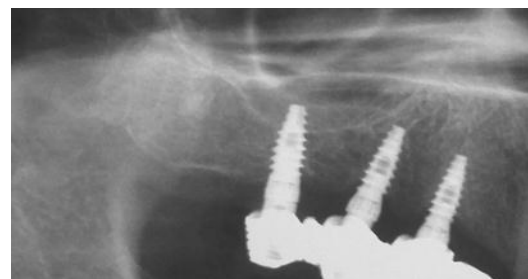


Figure 10: The distal implant apical 1/3 inside the maxillary sinus.

implants into the maxillary sinus during their installation [3,4]. When this happens, the implant remains, in almost all the cases, lodged inside the sinus, and can be removed a few days later by opening the lateral wall of the maxillary.



Figure 11: The implant displacement inside the maxillary sinus.

Neurosensory impairment

Nerve lesions are both an intraoperative accident and a postoperative complication that can affect the infraorbital nerve, the inferior alveolar nerve and the lingual nerve. Neurosensory impairment may occur at any time during implant surgery including anesthesia administration, incision, raising a flap, as well separating it too tightly, during drilling, bone augmentation, implant placement, suturing or any soft tissue swelling after surgery. Symptomatology is of a large variety and depends on the severity of the axonal damage. Several implants can be in contact with the inferior alveolar nerve in patients with postoperative paresthesia as seen in Figure 12.

The complication could manifest as a paresthesia when the lesion is due to a nerve compression, or a minor stiffening of nerve fibers, without sectioning any of them (neuropraxia). Dysesthesia may occur in cases of nerve compression, traction, partial crush or stretching (axonotmesis) of nerve fibers with different intensities. Hypoesthesia or hyperesthesia may be caused by extreme stretching, complete crush and direct trauma on nerve fibers (neurotmesis); anesthesia and pain appear as consequence of a complete nerve section.

Treatment with corticosteroids and non-steroidal anti-inflammatory drugs is indicated to control inflammatory reactions that provoke nervous compression. It seems that the topical application of dexamethasone (4 mg/ml) for 1 or 2 minutes enhances recovery, and when it is administered orally and in high doses within one week of injury, it has shown to inhibit axon sprouting centrally and ectopic discharges from injured axons, and prevention of neuroma formation.

Esthetic failure

Multiple esthetic indices have been validated for objectively evaluating clinical outcomes, including failure of an implant-supported crown, on the basis of objective indices, esthetic failures in implant dentistry can be categorized as pink-tissue failures and white-tissue failures as seen in Figure 13.

Type of implants

Many dentists do not have the enough knowledge to choose the proper dental implant type. Not all types are suitable for all cases as seen in Figure 14.

Dimension of implants

Using an implant with a large diameter may lead to fracture of the surrounding bone. This mistake mostly is done because of insufficient diagnosis of the cases or lack of knowledge of practitioner for the selection criteria of implant as seen in Figure 15.

Direction of implants

Placing implant without knowing the following rules; posterior implant should be placed in the center of the occlusal surface, while anterior should be angled to allow long axis with cingulum, lead to direction failure of implant as seen in Figure 16.



Figure 12: The tip of the implant rests on the inferior dental canal.



Figure 13: Part of the implant body which is esthetically unacceptable.

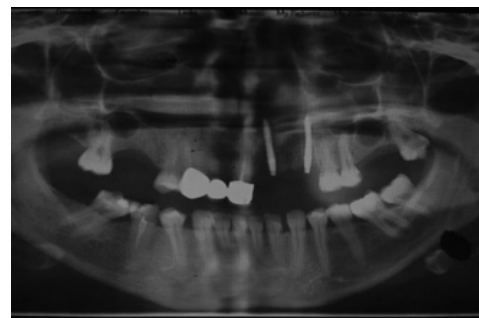


Figure 14: One piece dental implant totally embedded inside the bone.



Figure 15: The buccal bone fracture around dental implant.

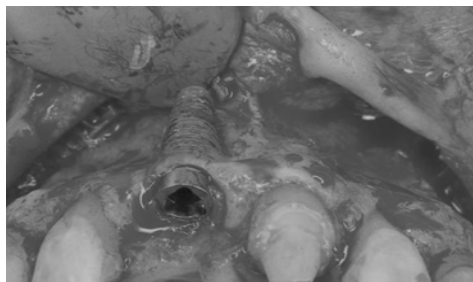


Figure 16: The implant placement away from the ridge.

Conclusion

The vast majority of complications in implant surgery can be prevented by correctly selecting patients and treating difficult cases in the most adequate way, while knowing the risks, trying to avoid them with the necessary information and having carefully devised a specific plan for every patient. All implants which are not functional but still in the mouth at the time of examination, regardless of the state of the prosthesis or patient satisfaction considered as the implant survival not success.

Informed Consent

Written informed consent was obtained from the patients for publication of this case report, and any accompanying images.

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