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Implant Surgery: What Can Go Wrong?

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Abstract

Implant surgery complications are frequent occurrences in dental practice and knowledge in the management of these cases is essential. The aim of this review was to highlight the challenges of treatment plan-related, anatomy related, and procedure-related surgical complications as well as to discuss the etiology, management and treatment options to achieve a satisfactory treatment outcome. (Implant Dent 2008;17:159– 168)

Key Words: dental implants, implant complications, implant failures.

Introduction

Surgical complications during implant placement are not uncommon. According to a retrospective study by McDermott et al, 1677 patients (2379 implants) were investigated, and an overall frequency of complications was 13.9%. Operative complications made up a mere 1% of the overall, whereas inflammatory and prosthetic complications were 10.2% and 2.7%, respectively.

A. Planning complications.

1. Lack of a proper history

Well organized, thorough treatment plans lead to successful implant treatment and patient satisfaction, which are the ultimate long-term goals. Patient selection is one of the most important determinants of success or of failure. Predictability of implant success can be jeopardized by absolute and relative risk factors. Therefore a complete medical record and patient analysis post treatment play a significant role.

2. Errors in angulation

Implant angulation is yet another determinant for implant success. Proper angulation should be determined according to the future prosthesis with the consideration of bucco-lingual, apicocoronal, and mesio-distal positions. Surgical guides can help control the implant placement angle if they are made and used correctly.

Mandibular teeth in the natural dentition are lingually inclined in relation to both the mandibular base, specifically as 109 degrees, as well as the maxillary opposing arch dentition (eg, lingual cusp buccal inclination)and therefore implants should be placed at a similar inclination. Failure to do so may result in perforation of the lingual concavity, constriction of the lingual space or damage of the lingual artery.

Teeth adjacent to implant sites and surgical guides with long drill channels, often require the use of drill extensions and maximum opening by the patient which may be strenuous. Short breaks to relieve muscle tension, using a bite block and having the patient shift their jaw to the opposite side can help ensure the correct angulation of the drill. Yet another issue is the finger placement. Due to the length of implant drills ("10#20 mm), using a finger rest while drilling, results in an inclination of the drill towards the hand that is steadied. Hence, using finger rests is an ergonomic principle that should not be used for implant placement.

3. Improper implant location

It should be ensured that the implant body is 1.5mm from the adjacent teeth nad 3-4mm between adjacent implants. Preoperative measurements and planning are essential to achieve an ideal implant placement that facilitates future implant prosthesis. Hypothetically, a surgical complication could also occur, but not be realized by the surgeon at the actual time of surgery, especially when placing multiple implants, the one placed the away from an adjacent implant can have adequate stability and function but may later result in lateral bone loss.

4. Communication failures

An informed consent form is an excellent way of communicating potential surgical risks and complications to a patient. Common problems to address include but are not limited to postoperative infection, bleeding, swelling, facial discoloration, transient pain, paresthesia, neuralgia, fracture, joint pain, muscle spasm, tooth looseness and sensitivity, recession, speech change, trismus, and swallowing of foreign objects. Should a complication occur during the post operative healing time, it is recommended to give emergency contact information as well.

B. Anatomical complications

1. Nerve injury

When placing implants in the mandible, proper radiographs and pretreatment planning must be done to ensure complete aversion of the inferior alveolar, mental, incisive or lingual nerves. If the mandibular canal cannot be seen on a panoramic radiograph, a computer tomography (CT) scan should be taken to verify the location. Possible causes of nerve injury include poor flap design, traumatic flap reflection, accidental intraneural injection, traction on the mental nerve in an elevated flap, penetration of the osteotomy preparation and compression of the implant body into the canal. Radiographs should be taken if the surgeon has any doubt about where the drill is or if the drill or implant is in close proximity to or invading, neural anatomical structures. If the situation is the latter, the implant needs to be removed, or a shorter body implant should be placed instead. Within days or months, minor trauma injuries usually

heal but permanent damage from neuritis can occur. Treatment options include neuronal anti-inflammatory drugs such as clonazepam, carbamazepine or vitamin B-complex.

2. Bleeding

Risk sites as described above in the posterior mandible include the sublingual fossa and lingual cortex. Life-threatening airway obstruction is a serious threat and early treatment is essential. Treatment involves having the patient stick out their tongue to compress the blood vessels against the body of the mandible. Placing pressure with gauze in the sublingual area does not work as one would intuitively think. Extraoral pressure to the submental or submandibular arteries for 20 minutes against the body of the mandible helps. The posterior superior alveolar and infraorbital arteries are located approximately 19 mm above the maxillary alveolar ridge, and the anastomoses of these arteries can pose a risk during sinus lift procedures by lateral window preparation. Bone wax, pressure, crushing, and electrocautery can alleviate hemorrhage. In summary, hemorrhage treatments at implant osteotomy sites include compression, finger pressure, vasoconstriction, cautery, bone graft, bone cement, and ligation of arteries.

3. Cortical Plate Perforation

The buccal cortical plate varies in thickness throughout the mouth and traumatic dental extractions can cause markedly thin plates or concavities, as well as overall ridge width deficiency. When preparing osteotomy sites or placing implant fixtures in areas with minimal labial plate thickness, or if the implant is placed too buccally, a fenestration or dehiscence implant defect is a common finding. Immediate correction with particulate bone grafting with or without a membrane during the time of implant placement, can be done as long as primary stability has been achieved. “Flapless” implant surgeries should be avoided in areas of potential perforation of the buccal or lingual bone.

4. Sinus Membrane Complications

Sinus complications often occurred when the membrane is perforated at time of surgery. Bone density after grafting should be assessed, regardless whether or not a perforation occurs, because poor bone quality often lead to a higher implant failure rate. Lastly, losing an implant into the maxillary sinus is a relatively uncommon surgical complication. However, in cases with less than 5 mm of bone, mastication can cause the implants to move during the graft maturation time frame. Transantral endoscopic surgery is a reliable, minimally invasive method for retrieving displaced objects from the maxillary antrum with minimal complications, but it does require having an endoscope or a referral to an ENT or oral surgeon.

C **Procedure Related.**

1. Mechanical errors

Dense cortical bone (eg, type I bone quality), when compared with type III or IV soft cancellous bone, can be overheated when preparing osteotomies because more pressure is needed to advance the drill apically in comparison to soft bone. To reduce frictional heat, high speed handpieces, an up-down motion technique of the bone preparation, and copious irrigation can be used. According to Quirynen et al, 55

overpreparation or overheating osteotomies can result in inactive and active retrograde peri-implantitis lesions that can be detected on radiographs as periapical radiolucencies up to a month after insertion.

2. Lack of primary stability

It should be dealt with at the time of implant surgery. An unstable implant should be removed or an attempt to place a larger diameter should be completed. To leave an unstable implant without action can often lead to fibrous encapsulation that causes implant failure.

3. Mandibular fracture

The mandible is the most frequently fractured facial bone. Attempts to place implants in patients with severely atrophic mandibles increases the risk of fracture, especially when monocortical grafts and ridge-splitting surgeries are completed. A fracture of the mandible should be restored to maintain form and function. Management should include stabilization with an attempt to also simultaneously eliminate atrophy if indicated. The most relevant option of our field includes combined bone augmentation, fixation and simultaneous implant placement. Increasing mandibular height after augmentation may be unpredictable but using implants concurrently may reduce bone resorption.

4. Aspiration and ingestion

Most instruments have a special tip to help ensure screws and abutments transfer directly from the surgical tray into the patient's mouth, but nevertheless, accidents happen. For these reasons, preventative measures such as gauze throat screens and floss ligatures on implant pieces are encouraged. If a patient swallows or aspirates an implant component, they should be referred to the hospital because acute obstruction can be life threatening and prolonging the removal of foreign objects may make a bronchoscopy technically more difficult. If the foreign object is aspirated it should be removed within 24 hours.

Conclusion

Surgical implant complications are not uncommon and should be addressed immediately. Causality may be iatrogenic, due to poor treatment techniques, or lack of communication between dental disciplines. Time should be spent in the implant "planning" stages, such as tracing preoperative radiographs, measuring models, taking CT scans and making proper surgical guides. Basic anatomy must not be forgotten and should be reviewed by the surgeon in every case. As more surgically inexperienced dental professionals start placing implants an increase in surgical complications will likely occur. In summary, a competent surgeon should be able to treatment plan a predictable surgery, and recognize how to remedy a problematic dental-implant situation.