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Complications of dental implants-A critical review

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Abstract

Dental implants have become very popular due to its ability of restoring missing teeth functionally and aesthetically, but like any surgical procedure, they are associated with their fair share of complications too. This book covers almost every possible complication related to dental implants as well as shares various article summaries that I have complied during my extensive research on this topic.

Keywords: Dental implant; complications; failure

Introduction

Dental implants have become increasingly popular in recent years due to their ability to restore functions to near-normal levels in both partial and total edentulous individuals. In the dental profession, dental implants have become a viable alternative to traditional dentures and bridges. Even though it is the first choice for replacing lost teeth, the insertion of a dental implant is a surgical process that carries a number of risks and can result in difficulties.

The various types of complications of dental implant can be grouped under:[1]

Surgical Complications

Haemorrhage and Hematoma: One of the most significant and life-threatening complications associated with dental implants is haemorrhage and/or hematoma. Due to the existence of sublingual and submental arteries, haemorrhage most usually occurs in the canine mandible, followed by the incisor and 1st premolar regions, but hematoma might occur in the floor of mouth.[2] The bleeding can readily extend to the soft tissues of the mouth's floor, causing significant edoema, deep space affection, fast airway blockage, and dyspnea, all of which can be life-threatening.[3] Following regular implant insertion, Niamtu J reported a case of near-fatal airway blockage due to sublingual haemorrhage and haematoma.[4]

Neurosensory Disturbances

Nerve damage can occur as a result of a variety of intraoperative and postoperative issues. Nerves can be mechanically harmed by retraction, laceration, pressure, stretching, and transection in both indirect and direct trauma.[5] Damage to nerves such as the mental and inferior alveolar nerves after surgery might result in numbness and tingling.[6] According to studies, around 73 percent of clinicians who conduct implant surgery have suffered nerve issues after the procedure. Libersa et al looked at transitory vs. persistent nerve damage following implant insertion and found that permanent injury was 75 percent of the time.[1]

Implant Malpositioning

Poor treatment planning prior to surgery, a lack of surgical skill, or a lack of communication between the implant surgeon and the restorative dentist are the most common causes of dental implant malpositioning.[5] Implant displacement can occur when the implant is put in the posterior maxilla. Three proposed causes for implant migration into the maxillary sinus include changes in intranasal and nasal pressure, inflammatory reactions causing peri-implantitis, and bone resorption induced by inappropriate occlusal force distribution.[7] Because to alveolar ridge reabsorption and gradual sinus cavity pneumatisation, the posterior maxilla's bone height is diminished, resulting in implant displacement into the maxillary sinus. Implant placement errors can result in sinus perforation and implant displacement if they are placed in locations with poor bone quality and quantity. According to Galindo-Moreno et al, cylindrical and narrower implants had a higher rate of implant migration into the maxillary sinus than conical and wider implants.[8]

Biologic complications

Inflammation and Proliferation: Infection can cause implant loss from two different directions: gingival or apical (intraosseous). Implant periapical pathology is an infectious inflammatory condition affecting the tissues surrounding a dental implant's apex. Overheating of the bone during drilling, over drilling of the site, implant surface contamination, pre-existing bone disease, the presence of root remnants, and implant placement adjacent to an infected maxillary sinus are some of the etiological causes.[9] Implants placed near the maxillary sinus provide a path for infection to spread from the mouth after inadequate oral care. Sinusitis is readily caused when a maxillary dental implant becomes infected due to the spread of inflammation. Minoru et al reported two cases of maxillary sinusitis caused by incorrect dental implant insertion.[6] Lang and colleagues produced a decision tree called "Cumulative Interceptive Supportive Therapy (CIST)" in 1977 to suppress inflammation and recover osseointegration based on the pocket depth, plaque index, and form of defects, as well as the presence of BOP.[10]

Dehiscence and Recession

Dehiscence is the opening of the surgical wound margins, revealing the implant head and/or surrounding bone structures in part or in full and can comes with a significant risk of consequences like wound infections, graft loss, and implant failure. Because the soft tissue flap lacks tensile strength, Chen et al predicted that delayed implant placement would result in increased wound dehiscence.[11]

Peri-implantiti

Peri-implant mucositis and peri-implanttitis are two types of peri-implant infection. Inflammatory lesions localised to the mucosa were described as "peri-implant mucositis"

(6TH European Workshop on Periodontology), whereas lesions in "peri-implantitis" sites expand to supporting bone (Lindhe and Meyle, 2008).[12] Retention of bacterial plaque, bacterial infection, high mechanical stress, poor component alignment, and toxic metal ion leakage into peri-implant tissue are all etiological causes (peri-implantitis). Periapical implantitis is caused by failed endodontic and apical operations at the implant site.[13]

Implant loss and Failure

Ailing, failing, and failed implants are the three types of implant failure. A failed implant is defined as one that has not just radiographic bone loss, but also mobility, and is essentially untreatable (Torosian and Rosenberg, 1993). A failing implant is described as a non-mobile implant with both radiographic bone loss and consistent deterioration, whereas an ailing implant is defined as a non-mobile implant with both radiographic bone loss and consistent deterioration (Sakka et al., 2012).[12] According to Moy et al, there is a statistically significant difference in implant failure in the maxilla and the mandible, with the maxilla having more failures. The impact of implant placement, surgical protocol, loading protocol, surgeon experience level, and surgeon speciality on implant failure was studied by Cosyn et al. Only the loading protocol was found to have an effect on failure.[14] Zarb et al in their study linked any implant failure determined at stage II surgery to one or both of the factors, namely, over-instrumentation of the bone site resulting in inadequate immobilisation of the implant during stage I surgery and insufficient bone length to engage the mandible's inferior cortical plate when unfavourable bone quality was present, both of which were likely iatrogenic.[6]

Complications Related to Augmentation Procedure

Autogenous Bone Harvesting and Grafting: Donor site (mandibular ramus, mandibular symphysis, zygomatic buttress, iliac crest, calvaria) morbidity is caused by bone harvesting.[15] Oroantral communication is the most common complication associated with maxillary tuberosity graft harvesting. The presence of a mandibular symphysis is linked to a higher risk of postoperative problems. Temporary mental nerve paresthesia is uncommon in patients who have had a symphysis transplant.[16] Wound dehiscence, flap necrosis, graft exposure, graft contamination, infection, and issues with bone graft integration and resorption are all complications that can occur at the recipient site.[15]

Guided Bone Regeneration

Soft tissue problems, which account for 16.8% of all complications during guided bone regeneration, are the most common, followed by membrane exposure and acute infection. This might lead to infection of the regeneration site and failure of the GBR operation if not handled properly. Secondary bleeding, fenestration/dehiscence, infection, graft particle leaking, graft collapse, and membrane exposure are all major problems. Premature exposure of the barrier membrane and necrosis of the overlying flap, soft tissue or bone graft infection, failure to regenerate adequate bone volume, and mucogingival problems, including loss of keratinized tissue and a decrease in vestibule depth, are all risks associated with the GBR procedure. The majority of these issues are caused by inadequate soft-tissue healing after tooth extraction, insufficient flap design, membrane and/or graft displacement induced by transmucosal loading, and inappropriate provisionalization. Complications can also result from flap suturing under strain, poor surgical technique,

contamination of the membrane or surgical site, compromise of the vascular supply, and flap advancement for graft coverage that diminishes the keratinized tissue and vestibular depth, among other things.[17]

Sinus Bone Augmentation

Intraoperative problems, acute postoperative difficulties, and chronic postoperative complications are the three types of complications related with maxillary sinus augmentation.

Perforation or tear (60 %), infection (21 %), bleeding (9 %), migration, and benign paroxysmal positional vertigo (BPPV) were the most common consequences of maxillary sinus grafts.[18] The posterior maxilla is at a higher risk of difficulties due to poor bone quality and quantity, as well as proximity to anatomical features such as the maxillary sinus. Low primary stability can be caused by soft bone and/or over-preparation of the implant site, which can lead to fibrous encapsulation.[8] Pain, swelling, edema, infection of the surgical site and sinus, sinusitis, bone resorption, bleeding, oral and nasal ecchymosis and hematoma (especially hemosinus), emphysema, wound dehiscence, incisional breakdown, graft loss, dislocation, migration or loss of the fixture, oroantral fistula, BPPV, and temporary or permanent palatal numbness are all examples of acute postoperative complications. For doctors, the migration of a fixture into the maxillary sinus is a difficult condition. The strategy used in the Caldwell– Luc operation is used to deal with this difficulty. Infection, sinusitis, implant periapical lesion, and postoperative maxillary cyst are all chronic postoperative problems.[18]

Complications related to placement and loading protocols

Immediate Implant Placement: Due to the likelihood of implantation in a supposedly infected chronic lesion that could be a developing lesion or more aggressive lesions such as a tumor or residual cysts, immediate implant insertion has shown certain hazards to implant survival.[19] Three criteria influence whether or not an implant should be placed right away: Acute non-contained infection should not present, the implant has achieved initial stability, and there is sufficient quantity and quality of bone present.[20] Del Fabbro et al stated that rapid implant insertion might be regarded a safe, effective, and predictable therapy option in the case of chronic periapical infection.[21]

Immediate Loading after Implant Placement

Immediate loading (IL) of implants has been shown to be a successful treatment in the maxilla and mandible, with 85.7-100 % survival rates.[22] Failure of the implant to Osseo integrate, surgical complications, aesthetic complications, implant malposition, restorative complications, complications with guided surgery and prefabricated restorations, and complications with immediately loaded hybrid restorations are all complications associated with the immediate implant loading protocol.[23] Premature loading, according to the original protocol, would cause micro motion of the dental implant, resulting in fibrous encapsulation and implant failure. Failure to attain primary stability and implant failure are the most serious consequences. Poorly made restorations can lead to complications. The microdesign of an implant can have an impact on its initial stability and success rates when it is immediately loaded.[5]

Implant placement using flapless approach

When utilizing a flapless technique, a number of complications might arise, including incorrect implant placement in relation to the final suggested restoration,

injury to adjacent structures, and the loss of keratinized tissue essential to anchor soft tissues around the implant.[23] Fenestration, poor implant placement, or improper angulation are all possible complications. Anatomic structures such as the cortical plate, particularly the buccal cortical plate, neighboring tooth roots, vital nerves, and the sinus are all susceptible to damage. Low visibility makes it difficult to assess the bone crest and detect anomalies such as dehiscences or fenestrations that could jeopardize the implant's proper intraosseous implantation.[24]

Prosthetic or Mechanical complications

Screw loosening or fracture: Overloading implants might result in loosening or fractures of the implant component. Severe vertical bone loss, undetected or recurring screw loosening, smaller diameter implant, and abutment screw fracture and loosening are all risk factors for implant fracture. Screw loosening or fracture was more common with prosthetic screws than abutment screws (Goodacre et al). Screw loosening is more common in single-crown implants than in multiple-crown implants with multiple restored units, and screw loosening is more common in mandibular molar implant restorations than in maxillary ones.[25]

Implant Fracture

Implant fracture is caused by biomechanical stress and peri-implant vertical bone loss.[25] The risk factors for fracture have been grouped by Sanchez Perez et al into three categories: patient variables, implant-related factors, and prosthetic factors. Diameter, crown implant ratio, and implant design are all aspects to consider when it comes to implants. Cantilevers or screw loosening are examples of prosthetic factors.[26] The least likely causes of implant fracture are faults in the manufacturer's design and production (Balshi and Piattelli et al). Most fractures during loading, according to Morganm et al and Linkow et al, were caused by metal fatigue rather than overload.[27] Bruxism has been identified as an etiological component that leads to mechanical overload and implant fracture.[28] Implants inserted in severely atrophic mandibles enhance the risk of fracture, particularly when monocortical grafts and ridge-splitting procedures are performed.[29]

Fracture of Restorative Materials

Another typical problem related with single implant restorations is veneering ceramic fracture. At a mean follow-up of 5 years, Sadid Zadeh et al found that 172 of 5052 ceramic and porcelain fused to metal restorations failed due to chipping off, accounting for 3.4 percent of the problems.[25]

Aesthetic and Phonetic Complications

Aesthetic complications: Because the implant repair and surrounding tissues will be seen when the patient smiles fully, the aesthetic zone is difficult to achieve. Facial recession, gingival asymmetry, papillary deficit, and gingival tissue greying are among the most commonly documented pink-tissue failures. Poor implant placement, an overly coronal existing ridge, and a thin gingival biotype are all factors that affect the aesthetics. When implants are placed by hand without surgical guidance, the likelihood of cosmetic failure is increased. When numerous teeth are replaced, the inter-implant crestal bone may be compromised, resulting in resorption and soft-tissue loss. Thin biotypes with lower tissue thickness and scalloped gingival architecture are less attractive than thick biotypes in terms of aesthetics. Gingival recession will occur if an implant is placed in a location with a facial bone deficiency. Aesthetic failure can also be caused by poor implant selection. The amount of bone between the implants is reduced with wide-necked

implants, which might lead to bone resorption and cosmetic failure.[30]

Phonetic problems

One of the teeth and oral cavity's tasks is to provide articulation surfaces for phonetic function and speaking. Phonetic difficulties or decreased speech would result from the major rapid changes to the teeth and supporting tissues.[23] Horizontal bone loss in the premaxilla frequently results in the palatal location of dental implants, with the prosthesis covering the incisive papilla. Full restorations with titanium frames allow for a smaller quantity of material in this area, which can reduce phonetic difficulties. Phonetic issues have been documented in three implant studies, involving fixed complete dentures, overdentures, and fixed partial dentures, but not with single crowns. The maxilla suffers from these issues more commonly than the mandible. In the resorbed anterior maxilla, fixed implant-supported prostheses frequently enable an airway escape passage, causing speech difficulties. According to some experts, this is a time-related issue, and patients typically adapt by raising lip pressure to avoid air leaks.[31]

Complications Associated with Systemic Diseases and Medications

Bleeding Disorders: A rare but potentially life-threatening consequence of dental implant insertion is upper airway obstruction caused by significant bleeding in the mouth floor.[32] Anticoagulants (such as warfarin) and antiplatelet medications can increase the risk of bleeding during implant surgery. According to a comprehensive review by Madrid and Sanz, OAT should not be adjusted for minor oral surgery procedures because results from RCTs and CCTs showed that OAT patients (INR 2-4) who did not quit their medication did not have a higher risk of post-operative bleeding than those who did.[33]

Bone Disease

It is scientifically possible, but still debatable, that reduced bone metabolism in osteoporotic patients can compromise bone repair around dental implants and impact osseointegration. Eder et al. found 1.38 mm of peri-implant bone resorption in a patient with osteoporosis and polyarthritis after four years, which was slightly more than expected in a healthy subject.[33] Anti-resorptive medications, such as bisphosphonates (BP) or denosumab, may interfere with bone turnover at the dental implant interface, lowering implant success and increasing the likelihood of developing osteonecrosis of the jaws in osteoporotic patients (ONJ).[33]

Cancer Patients

Radiotherapy can have a big impact on dental implant outcomes, especially during the healing process, and it can even cause endarteritis obliterans. As a result, osteoradionecrosis of the jaw is a possibility. Radiotherapy inhibits cellular and vascular growth, which can make it difficult for dental implants to Osseo integrate and raise the risk of problems. The success rates of 643 dental implants placed in adult patients who had received radiotherapy were lower in 12 investigations, ranging from 40% to 100%. In irradiated individuals, Chambrone et al observed a mean implant survival rate ranging from 46.3 to 98 percent and an elevated implant failure risk (RR 2.74) in the maxilla (RR 5.96).[32]

Corticosteroid Therapy

Reduced bone density, increased epithelial fragility, and immunosuppression are all side effects of corticosteroids. As a result, systemic glucocorticoids may impair osseointegration and peri-implant healing of dental implants.[32] Implant osseointegration may be harmed by

long-term high-dose glucocorticoid medication, which can lead to bone loss. The use of glucocorticoids on a long-term basis has been described as an absolute contraindication to implant insertion.[34]

Diabetes Mellitus

Diabetic patients are more vulnerable to periodontitis due to the unfavorable impact of diabetes on inflammatory mechanisms and apoptosis.[35] Hyperglycemia, according to Retzepi and Donos, has been linked to decreased bone mineral density, higher fracture risk, decreased bone mechanical characteristics, impaired endochondral and intramembranous bone development, and poor micro architectural quality of bone.[33] In a retrospective examination of 215 implants implanted in 40 diabetic patients, 31 implants failed, with 24 (11.2 percent) occurring in the first year of functional loading.[36]

Iatrogenic Complications

Iatrogenic problems most commonly occur during stage I surgery, however they can also occur during stage II surgery. Wrong indications, a lack of experience or neglect during implant selection, insufficient equipment or staff, and neglect during and after follow-up are all operator-related factors. Preventing iatrogenic ally induced harm during implant treatment requires careful patient selection and treatment planning. Iatrogenic injuries on the mouth's floor, caused by misdirected dental burs and discs, can potentially cause severe bleeding.[37] Implants placed near the maxillary sinus provide a path for infection to spread from the mouth after inadequate oral care. Sinusitis is readily caused when a maxillary dental implant becomes infected due to the spread of inflammation. During sinus lift procedures, the membrane lining of the maxillary sinus is frequently perforated.[38]

Radiographic Complications

The introduction of computed tomography (CT) and cone beam computed tomography (CBCT) has ushered in a new era in all aspects of the radiographic imaging assessment of implant patients.[1] The only predictors of implant diagnosis and treatment planning were periapical radiographs, occlusal radiographs, and panoramic pictures. Because the periapical area cannot be evaluated with bitewing radiography, approximation with surrounding essential structures is a serious constraint. Because of the distortion, occlusal radiography is not effective in the maxillary arch, and it only captures the widest section of the jaw, with low reproducibility. Their limited size makes them ineffective for evaluating vast edentulous areas and associated maxillary and mandibular structures, distortion of the generated picture, anatomic constraints, and image receptor flexibility, as they are a 2D perspective of 3D anatomy. The accuracy of buccal peri-implant bone thickness in two CBCT devices was underestimated by 0.3 mm due to artefacts (blooming), resulting in an artificial rise in implant diameters (Vanderstuyft et al., 2019). Metal artefacts can cause bright radiating streaks that degrade image quality and cause dark areas surrounding these things or even a full loss of visual information between dense objects (Pauwels et al., 2013, Pauwels, Araki, Siewerdsen, & Thongvigitmanee, 2015).[39]

Conclusion

It is important to stay up to date with the latest treatment modalities, as this is a constantly changing field of dentistry, and it is important for us to learn from all the complications that have been recorded so far. The ultimate aim of any implant treatment should be patient satisfaction without compromising on the functionality and the durability.

References

1. Resnik RR, Misch CE. Avoiding Complications in Oral Implantology. 1st ed. China: Elsevier Health Sciences Press; 2018.
2. Limongelli L, Tempesta A, Crincoli V, Favia G. Massive Lingual and Sublingual Haematoma Following Postextractive Flapless Implant Placement in The Anterior Mandible. Case Reports in Dentistry, Vol 4, 2015.
3. Schiegnitz E, Moergrel M, Wagner W. Vital Life – Threatening Hematoma after Implant Insertion in the Anterior Mandible: A Case Report and Review of the Literature, vol 4, 2015.
4. Niamtu J. Near-fatal airway obstruction after routine implant placement. Oral Surgery Oral Medicine Oral Pathology Oral Radiology Endodontology, vol 92, 2001, p 597-600.
5. Newman MG, Takei H, Klokkevold, Carranza FA. Newman and Carranza's Clinical Periodontrology. 13th Edition. Philadelphia: Elsevier Health Sciences; 2018.
6. Shenoy VK, Bhat SG, Rodrigues SJ. Iatrogenic Complications of Implant Surgery. Journal of Indian Prosthodontics Society, vol 6, no 1, 2006.
7. Kluppel LE, Santos SE, Olate S, Filho FW, Moreira RW, Moraes M. Implant migration into maxillary sinus: description of two asymptomatic cases. Oral Maxillofacial Surgery, vol 14, 2010; p. 63-66.
8. Laureti M, Ferrigno N, Daniel R, Papi P, Mencio F, Angelis FD, Pompa G, Carlo SD. Unusual Cases of Osseointegrated Dental Implant Migration into Maxillary Sinus Removed 12 Years after Insertion. Case Reports in Dentistry, vol 6, 2017.
9. Diago MP, Lopez AB, Mira BG. Inflammatory Implant Periapical Lesion: Etiology , Diagnosis, And Treatment – Presentations Of 7 Cases. J Oral Maxillofac Surgery, vol 67, 2009, p. 168-173.
10. Chang M, Chronopoulos V, Matteos N. Impact of excessive occlusal load on successfully Osseo integrated dental implants: A literature review. Journal of Investigative and Clinical Dentistry, vol 4, 2013, p. 142-150.
11. Kim YK, Yun PY. Risk factors for wound dehiscence after guided bone regeneration in dental implant surgery. Maxillofacial Plastic Reconstruction Surgery, vol 36, no 2, 2014, p. 116-123.
12. Hsu YT, Mason SA, Wang HL. Biological Implant Complications and Their Management. Journal of the International Academy of Periodontology, vol 16, no 1, 2014, p. 9-18.
13. Flanagan D. Apical (Retrograde) Peri-Implantitis: A Case Report of an Active Lesion. Journal of Oral Implantology, vol 28, 2002, p. 92-96.
14. Lang LA, Hansen SE, Olvera N, Teich S. A Comparison of Implant Complications and Failures between the Maxilla and the Mandible. Journal of Prosthetic Dentistry, 2018.
15. Sakkas A, Wilde F, Heufelder M, Winter K, Schramm A. Autogenous bone grafts in oral implantology—is it still a "gold standard"? A consecutive review of 279 patients with 456 clinical procedures. International Journal of Implant Dentistry vol 3, no 23, 2017.
16. Motamedi MHK. Textbook of Advanced Oral and Maxillofacial Surgery. Volume 3. Crotia. Intech Open; 2015.
17. Abraham S, Dhanya BN, Arunima PR, Reeja MK. Guided Bone Regeneration; A Predictable Augmentation Procedure in Implantology-An Overview. Acta Scientific Dental Sciences, 2018, p. 61-66.

18. Kim J, Jang H. A Review of Complications of Maxillary Sinus Augmentation and Available Treatment Methods. J Korean Assoc Oral Maxillofac Surg, vol 45, 2019, p. 220- 224.

19. Casado PL, Donner M, Pascarelli B, Derocy C, Duarte ME, Barboza EP. Immediate Dental Implant Failure Associated with Nasopalatine Duct Cyst. Implant Dentistry, vol 17, no 2, 2008.

20. Al-Sabbagh M. Implants in the esthetic zone. Dental Clinics of North America. 2006; 50:391–407.

21. Bell CL, Diehl D, Bell BM, Bell RE. The Immediate Placement of Dental Implants into Extraction Sites with Periapical Lesions: A Retrospective Chart Review. J Oral Maxillofac Surg, vol 69, 2011, p. 1623-1627.

22. Vidhya Dharan A, Hanawa Y, Godfrey S, Resmi PG. Immediate Implants and Immediate Loading in Full Arch Maxilla and Mandible of a Bruxer - A Case Report. Journal of Dental and Medical Sciences, vol 13, no 10, 2014, p. 62-67.

23. Froum SJ. Dental Implant Complications. 2nd Edition. New Jersey: Willey Blackwell; 2016.

24. Romero-Ruiz MM, Mosquera-Perez R, Gutierrez-Perez JL, Lagares DT. Flapless implant surgery: A review of the literature and 3 case reports. J Clin Exp Dent, vol 7, no 1, 2015, p. 146-52.

25. Hanif A, Qureshi S, Zeeshan S, Rashid H. Complications in implant dentistry. Eur J Dent, vol 11, 2017, p. 135-40.

26. Rani S, Devi J, Verma M. Implant Success Lies in Complications Management: A Report of Two Cases. Contemporary Clinical Dentistry, vol 7, 2016, p. 226-8.

27. Green NT, Machtei E, Horwitz J, Peled M. Fracture of Dental Implants: Literature Review and Report of a Case. Implant Dentistry, vol 11, no 2, 2002.

28. Albiol JG, Neito MS, Capablo JL, Garces MA, Urgell J, Escoda C. Endosseous dental implant fractures an analysis of 21 cases. Med Oral Patol Oral Cir Bucal, vol 13, no 2, 2008; p. E124-8.

29. Misch K, Wang HL. Implant Surgery Complications: Etiology and Treatment. Implant dentistry, vol 17, no 2, 2008.

30. Fuente alba R, Jofre J. Esthetic Failure in Implant Dentistry. Dent Clin N Am, vol 59, 2015, p. 227–246.

31. Goodacre CJ, Kan JYK, Rungcharassaeng K. Clinical complications of Osseo integrated implants. The Journal of Prosthetic Dentistry, vol 81, 1999, p. 537-52

32. Diz P, Scully C, Sanz M. Dental implants in the medically compromised patient. Journal of Dentistry, vol 41, 2013, p. 195–206.

33. Donos N, Calciolari E. Dental implants in patients affected by systemic diseases. British Dental Journal. 2014; 217:425-430.

34. Ouanounou A, Hassanpour S, Glogauer M. The Influence of Systemic Medications on Osseointegration of Dental Implants. J Can Dent Assoc, vol 82, 2016, g7.

35. Bornstein MM, Dent M, Cionca N, Mombelli A. Systemic Conditions and Treatments as Risks for Implant Therapy. The International Journal of Oral & Maxillofacial Implants, vol 24, 2009.

36. Valero AM, Garcia JC, Ballester AH, Rueda CL. Effects of diabetes on the osseointegration of dental implants. Med Oral Patol Cir Bucal, vol 12, 2007, p. E38-43.

37. Niamtu J. Near-fatal airway obstruction after routine implant placement. Oral Surgery Oral Medicine Oral Pathology Oral Radiology Endodontology, vol 92, 2001; p.597-600.

38. August M, Chung K, Chang Y, Glowacki J. Influence of Estrogen Status on End osseous Implant

Osseointegration. Journal of Oral Maxillofacial Surgery, vol 59, 2001, p. 1285- 1289.

39. Cone beam computed tomography artefacts around dental implants with different materials influencing the detection of peri-implant bone defects. Clin Oral Impl Res, vol 31, 2020, p. 595–606.

Legend Figure

Figure 1