Expect the Unexpected: A Case Report on Lingual Bone Perforation During Implant Placement

Nur Zety Mohd Noh[1,*] and Farha Ariffin[2]

[1]*Periodontics Unit, Kulliyyah of Dentistry, International Islamic University Malaysia, Kuantan Campus, 25200 Kuantan, Pahang, Malaysia*

[2]*Centre of Periodontology Studies, Faculty of Dentistry, Universiti Teknologi MARA, Jalan Hospital, 47000 Sungai Buloh, Selangor, Malaysia*

Abstract: *Objective;* The incidence of lingual bone perforation during implant placement is lower than that of buccal bone perforation and is rarely reported. This case describes an anatomy related implant complication of a 53-year-old lady during implant placement of 36.

Case report; A 3.4mm implant width and 9.5mm implant length with adjunct concentrated growth factor (CGF) were planned for this patient. A full thickness flap was elevated on the edentulous ridge of missing tooth 36. By utilizing the individually constructed surgical stent, the surgery was initiated with a pilot marking drill. The drill angulation was evaluated and an intraoral periapical radiograph was taken. Prior to the implant placement, a careful inspection was conducted on the implant site preparation. However, a lingual bone fenestration was observed. Due to potential complications associated with lingual bone perforation, implant placement was deferred, and a guided bone regeneration procedure was performed. Prior to the flap approximation, a layer of CGF membrane was positioned. Afterwards, the patient was recalled regularly up to one-year post-operative. Following one-year of follow-up, the surgical area healed uneventfully with radiographic evidence of bone formation and maturation.

Conclusion; Although a case can be relatively straightforward with proper surgical planning, clinicians need to always be prepared for the unexpected event.

Keywords: Concentrated growth factor, Fenestration, Guided bone regeneration, Implant, Perforation.

1. INTRODUCTION

There is no doubt that dental implants are one of the most beneficial dental treatment options for completely and partially edentulous patients. Providing long-term function and esthetics, dental implants are considered an effective treatment option to improve oral health quality of life. To date, implant placement is prosthetically driven. To ensure a satisfactory restoration, implants should be placed aesthetically to satisfy contour parameters. From a biological standpoint, it should be placed in a way to preserve both the hard and soft tissue architectures [1, 2]. However, bone resorption, implant bucco-palatal position, and the effects of implant positioning on soft tissue stability are key factors influencing dental implant success through digital planning [3]. In addition to the treatment plan, volume and shape of the edentulous ridge, complications associated with overall treatment, cost, and patient expectations are also factors that influence an ideal positioning of an implant [4].

Complications may arise during surgical implant placement procedure. The three main types of implant complications encountered in the clinical setting are biological, surgical, and prosthetic [4, 5]. Meanwhile, intraoperative surgical implant complications can be further categorized into treatment plan, procedure and anatomy related, and others [6]. The most common treatment plan-related complications are incorrect angulations and improper implant placements. The presence of a gap between the implant and facial bone wall is a documented factor influencing the implant's survival rate [7]. Positioning the implant in three dimensions and in relation to the adjacent teeth is key to achieving an aesthetic result [8]. A diagnostic wax-up and the utilization of a surgical guide during implant placement may facilitate proper angulation and position of the implant [6]. Additionally, procedure-related complications may include a lack of primary stability and ingesting or aspirating implant components. There are several complications related to anatomy, including bleeding, nerve injury, cortical plate perforation, and devitalization of adjacent teeth [6]. Other factors are contributed by the operator skills [3, 6] and previous endodontic infection [7].

As a result of tooth removal and implant placement, it is predicted that bone defects will occur. A dehiscence, fenestration, or infrabony defect can occur in healthy anatomical situations [4]. Consequently, it is inevitable that bone defects may occur when implants are placed in the prosthetically driven position in ridges

*Address correspondence to this author at the Periodontics Unit, Kulliyyah of Dentistry, International Islamic University Malaysia, Kuantan Campus, 25200 Kuantan, Pahang, Malaysia; Tei: +6095705537;
E-mail: zety_noh@iium.edu.my

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with sufficient bone and soft tissue. It is very common to encounter cortical plate perforation, either dehiscence or fenestration on the buccal bone. In contrast, lingual bone perforation is less likely to be reported with a predicted incidence of 1.1% to 1.2% [9]. Therefore, the objective of this case report is to discuss lingual bone perforation during implant placement on lower left posterior region and its management.

2. CASE REPORT

This case describes an anatomy related implant complication in a 53-year-old lady during implant placement of 36. The patient is a controlled hypertensive and diabetic patient who is compliant with her medications and follow-up visits. As tooth 36 was extracted a few years ago due to severely unrestorable carious decay, the patient requested implant replacement. Clinical examination revealed no significant abnormality. A 3.4mm implant width and 9.5mm implant length with adjunct concentrated growth factor (CGF) were initially planned for this patient. An individual surgical stent was constructed and cone beam computed tomography (CBCT) radiograph was taken as part of pre-implant surgery planning (Figure **1**).

Prior to surgery, 6ml of blood was drawn and immediately centrifuged to form CGF. A full thickness flap was elevated on the edentulous ridge of missing tooth 36. By utilizing the individually constructed surgical stent, the surgery was initiated with a 2mm pilot marking drill up to 7.5mm in depth. The drill angulation was evaluated and an intraoral periapical radiograph was taken (Figure **2**). Drilling was then performed sequentially to 9.5mm depth. Prior to the implant placement, a careful inspection was conducted on the implant site preparation. However, a lingual bone fenestration was observed (Figure **3**).

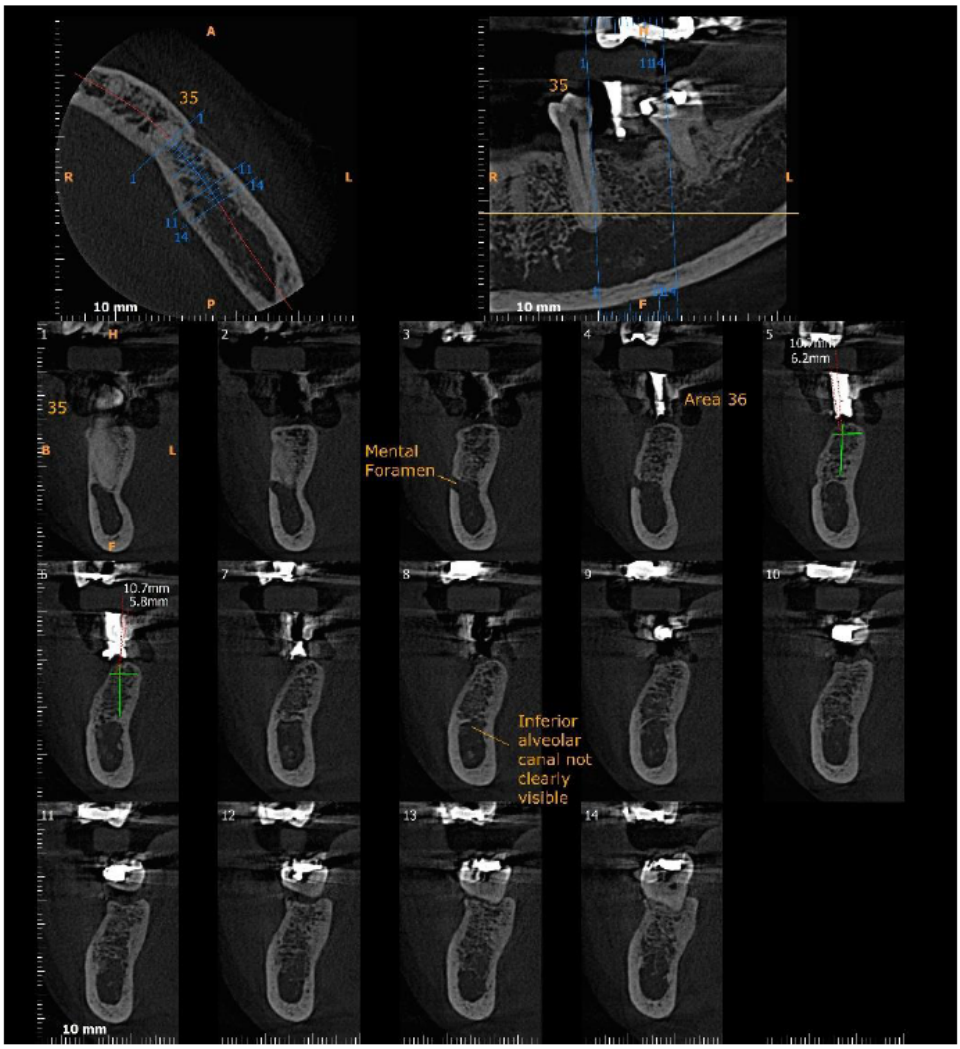

Figure 1: Cone beam computed tomography on the ridge of 36.

Figure 2: Evaluation of drill angulation.

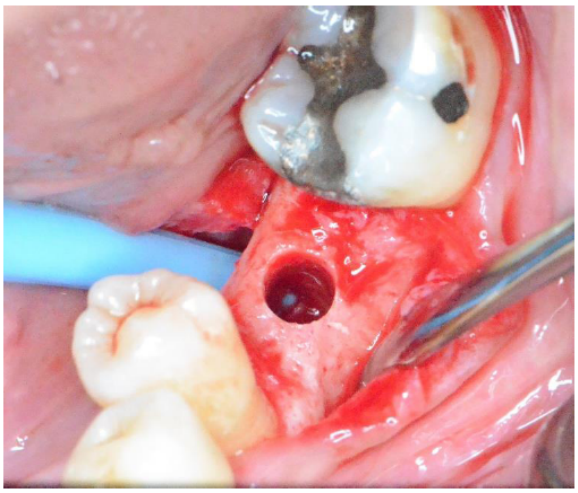

Figure 3: Lingual bone fenestration observation.

In view of the potential complications associated with lingual bone perforation, implant placement was deferred, and a guided bone regeneration procedure was performed. Bone substitutes were condensed into the implant cavity and covered with a layer of collagen membrane (Figure **4**). Prior to the flap approximation, CGF membrane was positioned on top of the collagen membrane (Figure **5**). Afterwards, the patient was recalled at three-day, weekly for two weeks and monthly up to one-year post-operative (Figure **6a – 6d**). Following one-year of follow-up, the surgical area healed uneventfully with radiographic evidence of bone formation and maturation (Figure **7a – 7b**).

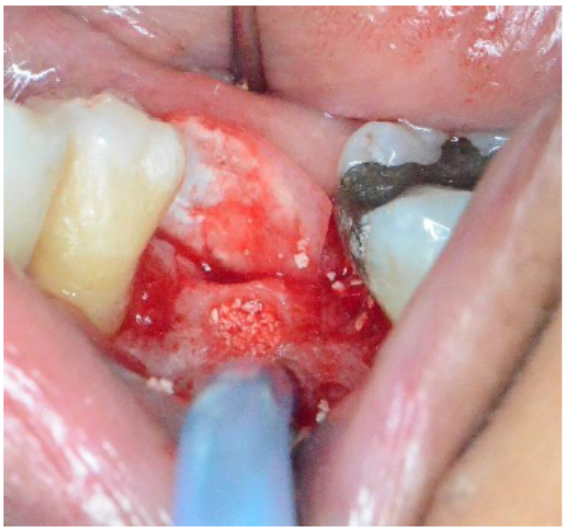

Figure 4: Guided bone regeneration was performed.

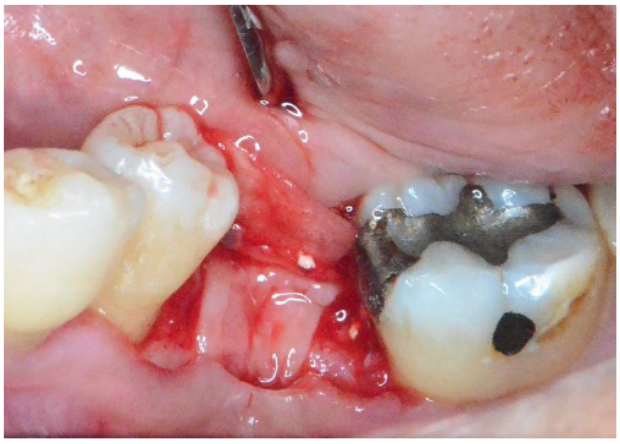

Figure 5: Placement of CGF membrane.

3. DISCUSSION

Compared to lingual perforations, buccal perforations are more visible and can be easily managed with bone grafting [10]. Therefore, careful evaluation of the lingual bone area is also crucial during implant placement. Although lingual bone perforation during implant placement is rare, complications could be serious. According to previous literatures, lingual perforation is associated with life-threatening complications due to the risk of hemorrhage in the floor of the mouth, which may then lead to hematoma, respiratory distress and airway obstruction [10-12]. Airway obstruction can occur from a fatal hemorrhage if a hematoma forms in the submandibular space and expands into the pharynx. Warning signs of a hematoma, such as sudden swelling of the floor of the mouth or submandibular

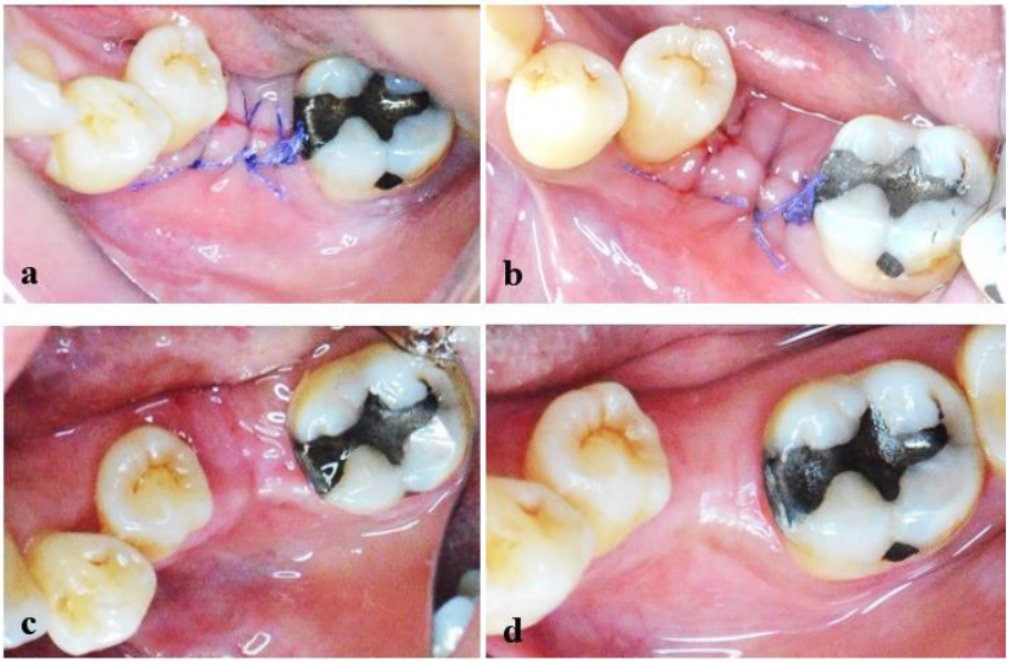

Figure 6: Review at (**a**) three-day (**b**) one-week (**c**) two-week (**d**) two-month.

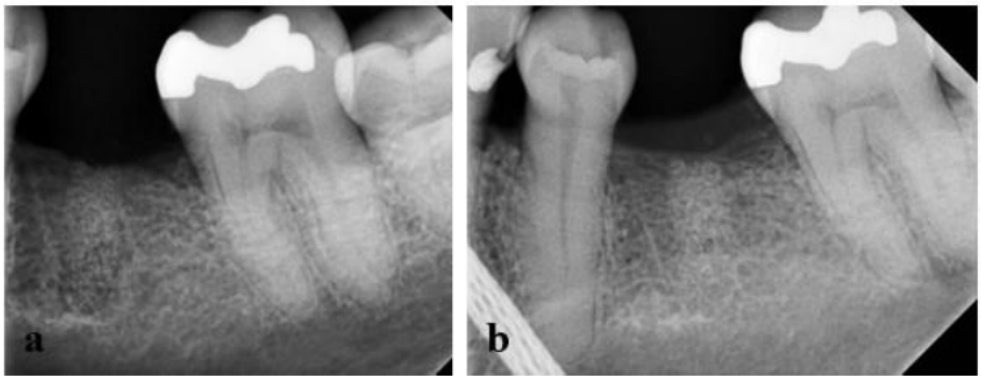

Figure 7: Intraoral periapical radiograph at (**a**) two-month and (**b**) one-year review.

area accompanied by dysphagia and dyspnea, should be closely monitored [13]. Lingual bone perforation also poses a risk of lingual nerve injury, and an extruded implant may lead to inflammation of surrounding tissue or even infection [10].

Lingual bone perforation can be caused by several anatomical factors. As a result of the deep lingual concavity of edentulous posterior mandibles, the lingual cortical plate is at an increased risk for fenestration or perforation. The human cadaver study revealed that when a regular 3.7mm diameter tapered implant is used in an edentulous posterior mandible, there is a 0.053% risk of lingual cortical plate fenestration or perforation due to lingual concavity [14]. In this area, the cortical bone is particularly thin, making it prone to accidental rupture, which can result in bleeding episodes that are difficult to identify [13].

Lingual undercuts also increase the risk of lingual bone perforation, particularly in the premolars and molars of the mandible [4]. While P-type bone presented the highest risk of lingual perforation [10], another recent radiographic study also revealed that a U-shaped cross section of the implantation site increases the risk of lingual plate perforation in the posterior mandible [15]. With cone beam computed tomography (CBCT), a total of 181 implants were virtually placed at mandibular molar sites to assess the cross-section of the implantation site. It has been shown that the undercut or U-type cross section of the implantation site is more likely to cause lingual plate

perforation in the posterior mandible when compared to the parallel or convex cross section. However, although the implant was placed with 3.4mm implant width and with the aid of a radiographic stent during implant placement, lingual bone fenestration was encountered in this patient. The CBCT of the patient revealed that the implantation site had a U-type cross-section, which may have contributed to this unforeseen occurrence.

A study on lingual bone perforation during immediate implant placement in lower canines, first, and second premolars revealed that the risk of this complication also increases with implant diameter and the implant's posterior location [10, 16]. Additionally, implant length increases the risk of lingual bone perforation [16]. To minimize perforation risk, it is suggested that practitioners can use shorter, wider, or tapered implants, or adjust surgical techniques. Angulating implant positioning can also help avoid undesirable lingual bone morphology [10].

Even though it is still inconclusive, the utilization of concentrated growth factor (CGF) showed a promising outcome on implant stabilization, osseointegration and enhanced bone regeneration [17-19]. Concentrated growth factor is the third generation of platelet concentrates. It is autologous and used as an adjunct to facilitate healing due to its enrichment with various growth factors [20-22]. It enhanced dental implants with a biocompatible, biologically active surface, significantly improving endothelial cell adhesion on CGF-coated implants compared to controls. These CGF-permeated implants also demonstrated better osseointegration and fewer post-surgical complications [23]. This justifies the initial plan of utilizing CGF for implant placement in this patient. However, an unexpected lingual bone fenestration created a dilemma regarding implant placement or deferral. Due to the potential complications associated with lingual bone perforation, it was decided to defer implant placement [11, 12, 24]. Guided bone regeneration was therefore performed with the adjunct CGF. It was also reported that application of CGF in various regeneration strategies resulted in greater bone defect fill [25, 26].

CONCLUSION

The present case report highlights an anatomical complication during implant placement and its management, and the benefits of adjunct application of concentrated growth factor (CGF). It also highlights that a complication is not a failure; rather, it is an opportunity for learning and improving. It is important for clinicians to always be prepared for unforeseen circumstances despite a case may appear straightforward with proper surgical planning.

CONFLICT OF INTEREST

None.

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