Preoperative Simulation With 3D-Printed Models for Bilateral Inferior Alveolar Nerve Lateralization: A Case Report With 6.5-Year Follow-Up and Literature Review

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Inferior alveolar nerve lateralization (IANL) is a viable treatment option for managing severely atrophic posterior mandibles with dental implants. However, this approach is frequently accompanied by postoperative neurosensory disturbance (NSD). This report described a procedure for bilateral IANL with simultaneous implant placement using 3D printing in preoperative planning and concentrated growth factor (CGF). 3D printed models enabled surgeons to gain a detailed understanding of the underlying anatomy and improve the precision of the surgical path. CGF was wrapped around the neurovascular bundle to promote the recovery of nerve function. The case revealed complete neurological recovery 2 months after surgery and stable implant osseointegration with regenerated inferior alveolar nerve wall at 6.5 years of follow-up. In addition, a literature review was performed to evaluate the outcomes of IANL and the incidence of NSD. With careful preoperative planning, appropriate procedure, and precise surgical technique, IANL can be successfully used for implant placement in the severely atrophic posterior mandibular regions.

Key Words: dental implants, inferior alveolar nerve lateralization (IANL), concentrated growth factor (CGF), 3D printing

INTRODUCTION

Significant ridge atrophy is one major challenge in placing dental implants in edentulous posterior mandibular regions, which increases the risk of damaging the inferior alveolar nerve.[1,2] To mitigate this risk, various treatment strategies have been employed, including short implants,[3,4] bone grafts,[5,6] guided bone regeneration (GBR),[7] and inferior alveolar nerve (IAN) reposition techniques.[8,9]

There are 2 main surgical approaches for inferior alveolar nerve repositioning: the inferior alveolar nerve lateralization (IANL) technique and the inferior alveolar nerve transposition (IANT) technique. The IANL technique was first proposed by Jenson and Nock in 1987.[10] This method involves exposing the inferior alveolar nerve (IAN) during osteotomy and gently deflecting it laterally while inserting implants into the basal bone. The technique offers several advantages, including enhancing implant stability, optimizing crown-implant proportions, shortening treatment time, and achieving a high success rate. The IANL technique proves insufficient when multiple implants are required over a larger area, leading to the development of an alternative approach: the IANT technique. This procedure includes severing the incisive nerve and performing a corticotomy near the mental foramen to displace the inferior alveolar nerve posteriorly, enabling the placement of longer, more stable implants. The IANT technique broadens implant site options but demands higher technical precision.[8] Many studies indicate that both IANL and IANT techniques carry significant risks of postoperative neurosensory disturbance (NSD) and mandibular fractures. These complications may arise at various stages of the procedure, including osteotomy, traction, and direct contact between the neurovascular bundle and the implant.[11–14] Therefore, they are challenging and technically sensitive surgical procedures. Effective preoperative planning and precise surgical techniques significantly influence outcomes. A thorough assessment of the patient's anatomical structure and individual differences can reduce the risk of complications and ensure the surgical success rate.

The application of 3D printed models in the medical field is becoming increasingly widespread, especially in complex surgeries and delicate procedures. 3D printed models are created using 3D printing technology based on computed tomography (CT) scan data, accurately reflecting the patient's anatomy. With printed models, surgeons can develop a surgical plan, including surgical methods, the type of implants, and their positions and orientations. In addition, 3D printed models are also used for pre-surgical simulations, helping surgeons explore the anatomy of the surgical area and identify possible risks during the procedure.[15] These advantages of 3D printed models can help optimize the IANL surgical path and reduce the risk of unexpected IAN injury during osteotomy.

CGF is a new generation of platelet concentrate derived from the centrifugation of venous blood and contains a fibrin matrix

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Figure 1. Severe alveolar bone atrophy with a knife-edge ridge. (a) Teeth 30 and 31 were absent. (b) Anterior occlusal view. (c) Teeth 20, 19, and 18 were absent.

rich in platelets, white blood cells, and growth factors. Studies indicate that CGF promotes Schwann cell proliferation and increases the secretion of nerve growth factor (NGF) and glial cell line-derived neurotrophic factor (GDNF), benefiting peripheral nerve recovery.[16,17] Wrapping CGF around the neurovascular bundle helps prevent direct contact between the implant and the nerve, enhancing nourishment and reducing sensory disturbances. However, research on the effectiveness of CGF in promoting the clinical recovery of the inferior alveolar nerve remains limited.[18,19]

This article describes a procedure for bilateral IANL with simultaneous implant placement using 3D printing in preoperative planning and concentrated growth factor (CGF). The study aimed to evaluate the role of 3D printing technology and CGF in IANL. We also performed a literature review to investigate the effectiveness of IANL and discussed the factors associated with surgical risk and neurological recovery.

Case Report

A 60-year-old female patient had experienced bilateral mandibular molar loss for over 20 years. Clinical examination revealed the absence of teeth 18, 19, 20, 30, and 31 with significant vertical and horizontal alveolar ridge atrophy (Figure 1). Preoperative cone beam computed tomography (CBCT) revealed knife-edge alveolar ridges, with residual bone heights above the IAN ranging from 6.5 mm to 9 mm. The inferior alveolar canal was approximately 5 mm wide in the mental foramen region and about 4 mm posteriorly. The buccolingual width of the mandibular base was approximately 8 mm (Figure 2). The patient was in good health and had no allergies or chronic diseases. The patient provided informed consent for this study according to the Declaration of Helsinki.

Preoperative planning and practicing

The mandible reconstruction was based on CBCT data, and a 1:1 model was printed using a 3D printer. The 3D model clearly showed the alveolar bone's morphological characteristics and the mental foramen's location. The bone window edge was designed on the 3D model according to the IAN canal measurements obtained from the CBCT. The anterior boundary was located 2 mm distal to the mental foramen, the superior boundary was 2.0 mm above the upper cortex of the mandibular

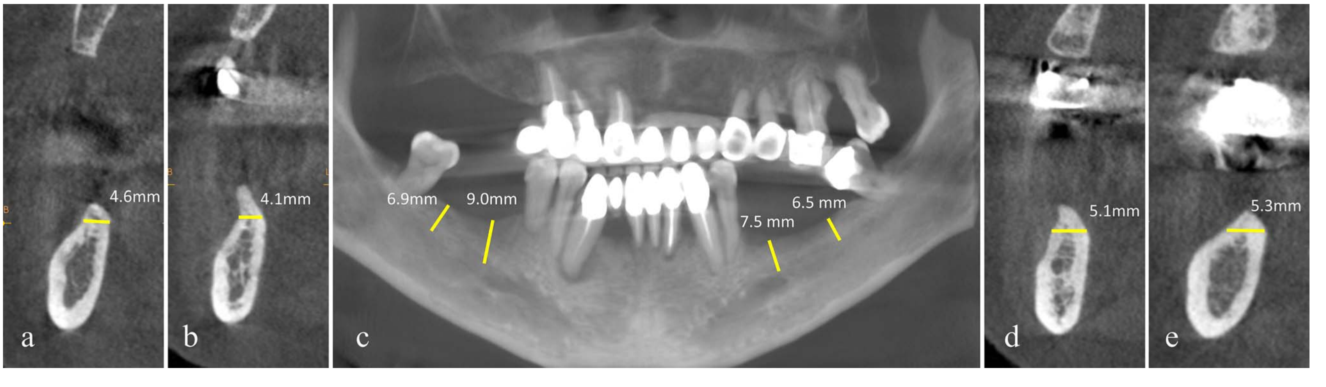

Figure 2. Preoperative CBCT image. Alveolar ridge height was severely inadequate at tooth positions (a) 31, (b) 30, (d) 20, and (e) 18. (c) The bilateral mandibular nerve canals were close to the crest of the alveolar ridge.

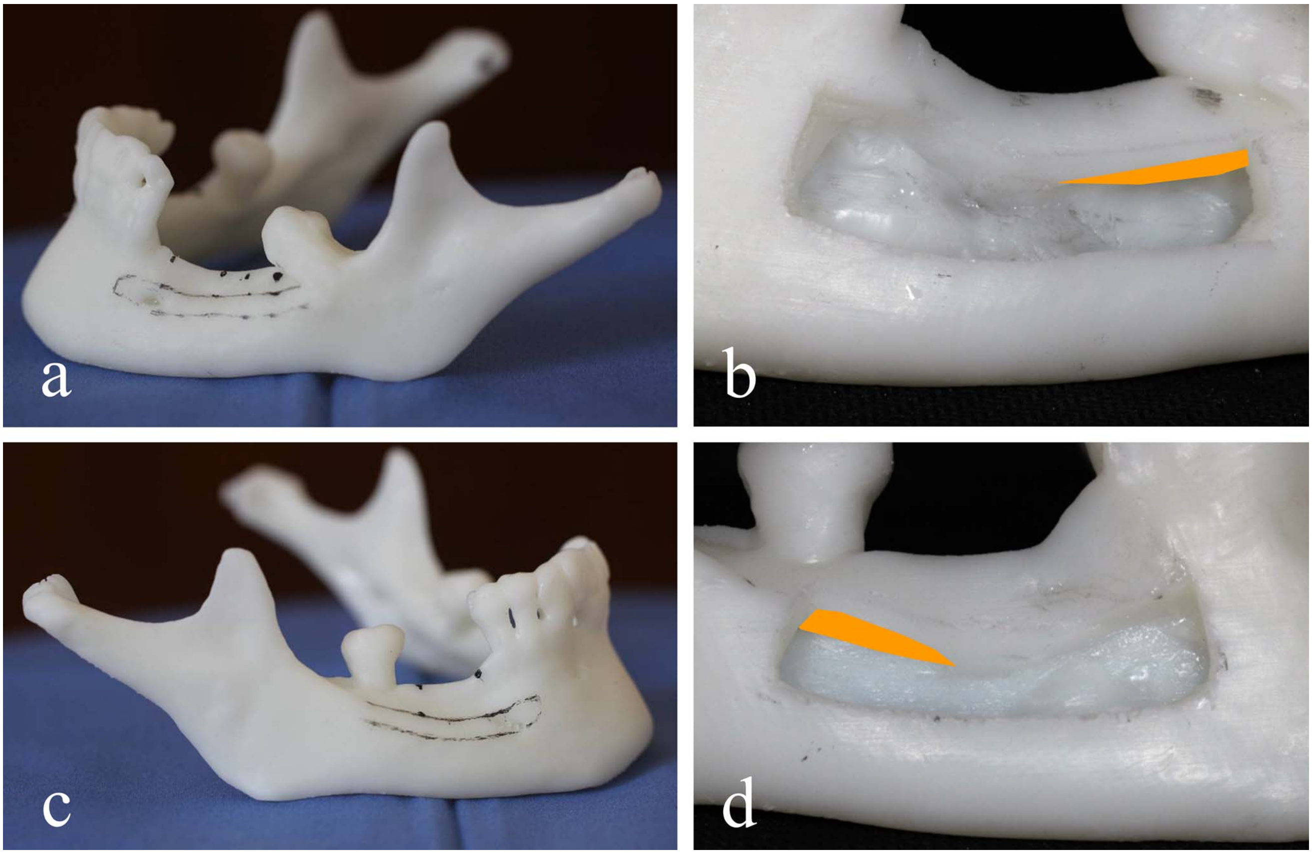

Figure 3. 3D model for surgical planning and practice. (a) (c) Marked the mandibular nerve canal on the 3D model. (b) (d) The yellow signs showed that the canal width was considerably wider on 3D model than on CBCT measurement in posterior segments.

canal, the posterior boundary was at the mesial of the distal tooth 17, and the inferior boundary was 2.0 mm below the lower cortex of the mandibular canal. The surgery was rehearsed on the 3D model. Unexpectedly, we found a discrepancy between the radiographic image and the model regarding the inferior alveolar canal. The canal width was significantly more expansive on the 3D model than the CBCT measurements in the posterior segments. The buccal/lateral bone window positions were adjusted according to the 3D model (Figure 3).

Surgical procedure

The procedure was performed under local anesthesia. A crestal incision was made in the edentulous region of the right mandible. Vertical releasing incisions were made at the distal side of tooth 32 and the mesial site of tooth 28. A full-thickness mucoperiosteal flap was raised to visualize the lateral aspect of the mandible and the mental foramen. A piezoelectric surgical device created a buccal bone window following the preoperative layout established on the 3D model. The inferior alveolar nerve was accurately exposed after fenestration without damage. The neurovascular bundle was then gently retracted buccally using an elastic band for bone drilling and implant placement. Two implants (30/31: 3.3 × 12 mm, SLA, SP, RN, Straumann, Switzerland) were inserted with good initial stability, leaving the implant platform at the tissue level. Subsequently, the neurovascular bundle was repositioned and wrapped with a CGF membrane. A bioresorbable collagen membrane (Bio-Gide, Geistlich Biomaterials, Wolhusen, Switzerland) was placed to cover the nerve, and a guided bone regeneration procedure was then performed. Particles of deproteinized bovine bone mineral (DBBM) (Bio-Oss, Geistlich Biomaterials) were placed in the bone window and covered by a collagen membrane (Bio-Gide, Geistlich Biomaterials) and CGF. The overlying tissue was closed with intermittent sutures tension-free (Figure 4). The same procedure was performed on the left mandible (20/18: 3.3 × 12 mm, SLA, SP, RN, Straumann, Switzerland).

Postoperative CBCT revealed that the implant position was consistent with the preoperative design, and the buccal bone fenestration position was filled with bone grafts (Figure 5).

Actual outcome

Nerve function was evaluated weekly post-surgery until full recovery using the static light touch test (SLT), the pinprick test (PP) with a sharp instrument, and the 2-point discrimination test (TPD) with sharp calipers. SLT tested the patient's ability to detect light touch by gently brushing a tiny brush over the skin. PP involved using sharp instruments to prick the skin's surface, assessing the patient's response to painful stimuli. TPD involved applying two tips to touch the skin, gradually reducing the distance between them, recording the minimum distance at which the patient can

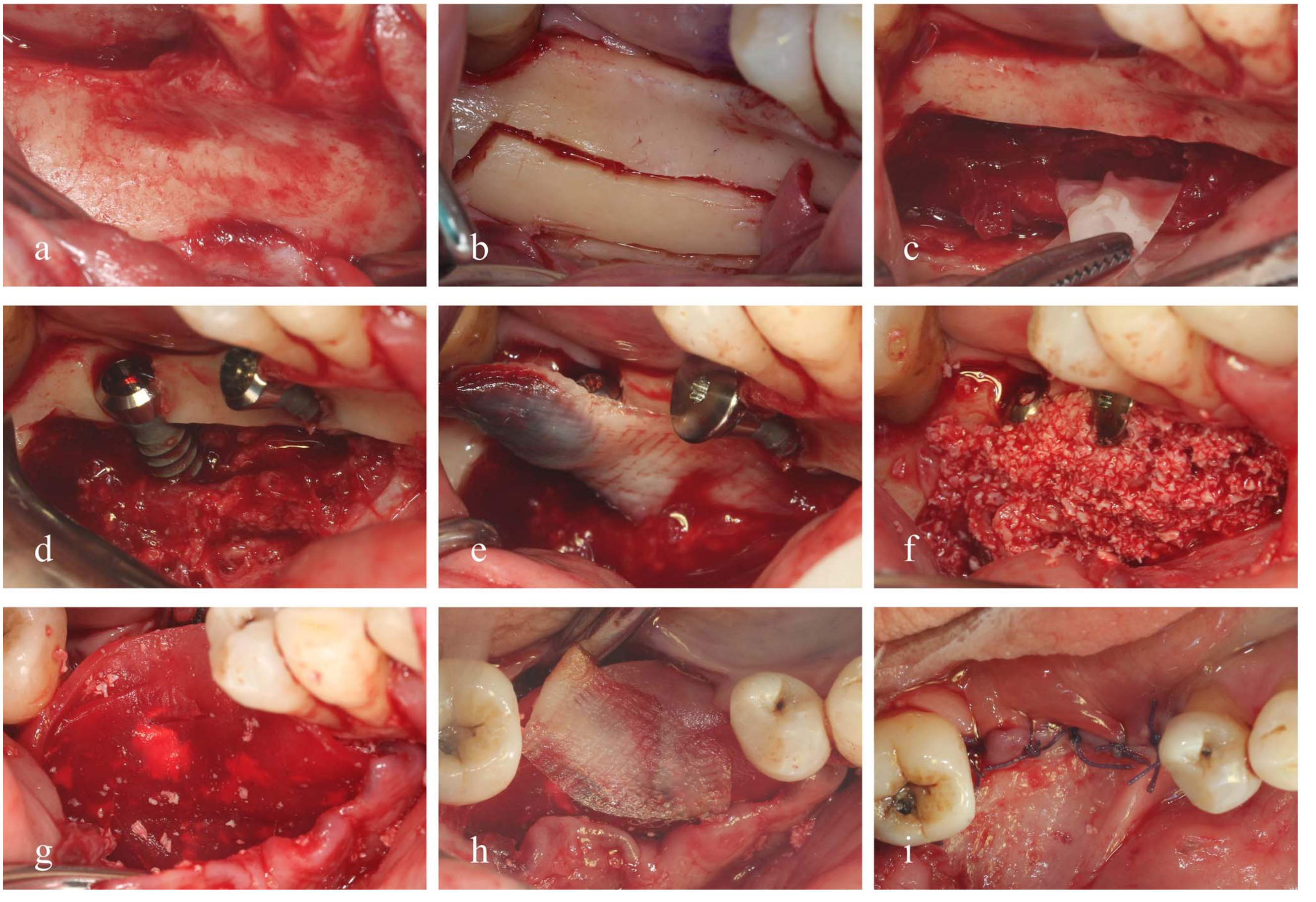

Figure 4. IANL on the right mandible (same procedure as on the left mandible). (a) A crestal incision and anterior releasing vertical incisions. (b) Buccal/lateral bone window. (c) The neurovascular bundle was moved. (d) Bone drilling and implant insertion. (e) The CGF clot was wrapped. (f) Placed the bone graft. (g) Cover with collagen membranes. (h) The CGF clot was placed over the membrane. (i) Tension-free suturing.

distinguish the points to assess tactile sensitivity. Three independent examiners performed the evaluation.

Two weeks after surgery, the wound had healed well with minor soft tissue swelling. One week after surgery, the static light touch test indicated dysesthesia. Four weeks later, the light touch sensation on the lips had nearly returned to normal, with slight dysesthesia on the chin. Substantial recovery of the light touch sensation was noted after approximately 2 months. Additionally, the pinprick test showed dysesthesia in the first week, and the sensation in both the chin and lip areas had nearly fully recovered after 4 weeks.

Regarding the 2-point discrimination test, the patient responded at a distance of 17 mm 1 week after surgery. Two weeks later, she could react to a 15-mm distance, and by 2 months,

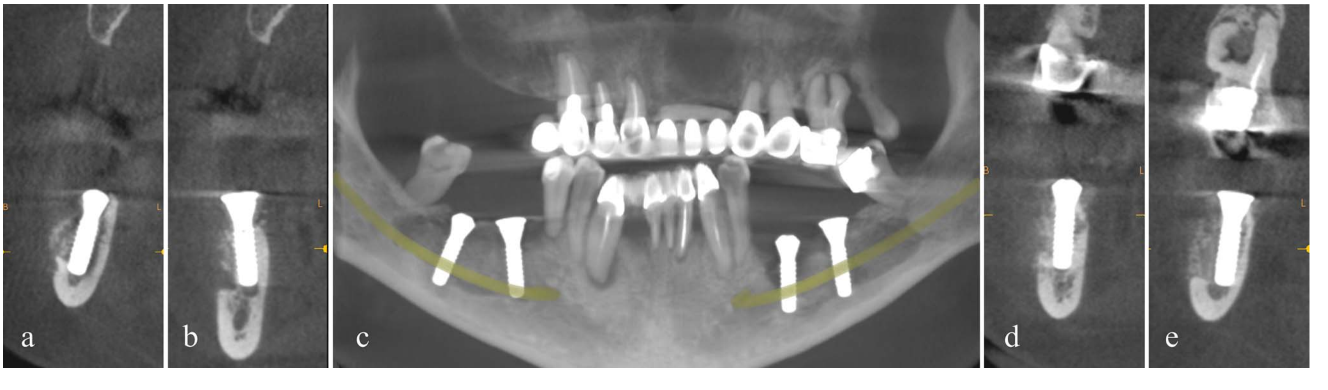

Figure 5. Postoperative CBCT image. Implants at sites (a) 31, (b) 30, (d) 20, and (e) 18 were well-positioned in three dimensions, with apical tips located 5–6 mm from the mandibular lower border.

Table 1

Nerve function testing after operation*

	Lower Teeth Sensation	Lower Lip and Chin Sensation		
		SLT	PP	TPD (mm)
1-wk	N	D	D	17
2-wk	N	SD	SD	15
4-wk	N	Lower lip: AN Chin: SD	AN	11
8-wk	N	AN	N	10

*N indicates normal sensation; AN, approximately normal; D, dysesthesia; SD, slight dysesthesia.

her response was normal at 10 mm. No dysfunction of the lower teeth was reported (Table 1).

Six months after surgery, the patient reported no symptoms of neurological disturbance, and the implants demonstrated successful osseointegration. Zirconia crowns were fabricated after the implant-level impression and fixed to the abutments (RN synOcta, Cementable Abutment, Straumann, Switzerland) by cement (Figure 6). At the 6.5-year follow-up, all the implant prostheses showed good function. The radiologic examination showed stable implant osteosynthesis and new neural canals formed around the neurovascular bundle (Figure 7).

Literature Review

In October 2024, a PubMed search was performed using the keywords “inferior alveolar nerve transposition,” “inferior alveolar nerve lateralization,” “inferior alveolar nerve transportation,” and “inferior alveolar nerve translocation.”

The selection process aimed to identify relevant research articles that met specific data collection and analysis criteria. Two independent reviewers conducted an initial screening of articles based on their titles and abstracts, followed by full-text reviews of studies meeting the inclusion criteria. The inclusion criteria covered studies on inferior alveolar nerve transposition, dental implant survival rates, and complications related to inferior alveolar nerve sensory disturbances. Study types considered for inclusion were case reports, case series, and prospective and retrospective clinical studies. Exclusion criteria included technical reports, biomechanical studies, animal studies, in vitro studies, and review articles. Studies without full-text availability were excluded. A manual search of dentistry, oral and maxillofacial surgery, implantology, and periodontology journals was performed to gather relevant articles. Figure 8 shows the flowchart of literature inclusion and exclusion.

By October 2024, a search yielded 1215 results, of which 241 duplicates were removed, leaving 964 documents. The remaining 964 papers were preliminarily screened by title and abstract, resulting in 59 relevant articles retained. A full-text review was then conducted, resulting in the inclusion of 46 articles. Table 2 summarizes the research types, sample sizes, follow-up times, and data on neurological sensory disturbances from the relevant literature. The included studies comprised 13 retrospective studies, 17 prospective studies, and 16 clinical reports or case series. Among 891 patients and 1138 surgical sites, there were 408 IANT and 730 cases of IANL. The median recovery time for 96.9% of patients was within 6 months, while 3.1% had longer than 6-month recovery durations. Twenty-five patients experienced permanent neurosensory dysfunction. The study analyses were

Figure 6. (a) (c) Bilateral soft tissue healing was good. Permanent restoration was completed at sites (b) 30, 31, (d) 20, 19, and 18.

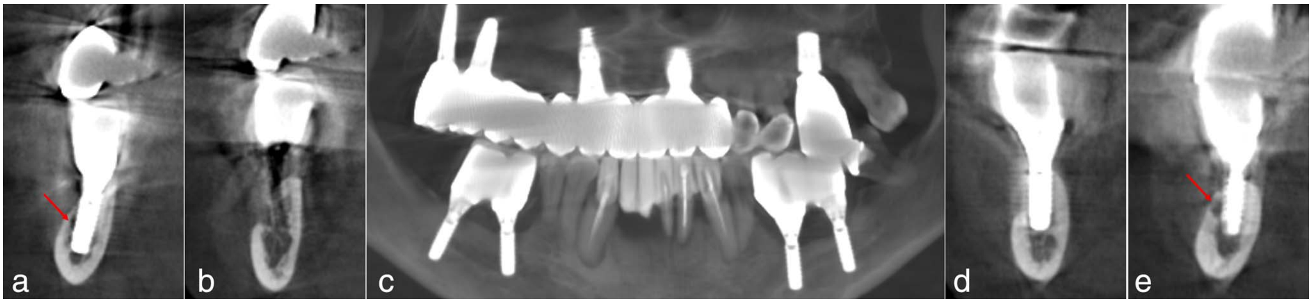

Figure 7. 6.5 years postsurgery CBCT image. Red arrows at positions (a) 31, (b) 30, (d) 20, and (e) 18 indicate the formation of a new nerve canal.

performed by independent statisticians using SPSS software version 27.0.

Discussion

In this case, the patient presented with an extensive vertical defect in the posterior region of the mandible. Urban recommends block bone grafting for cases with both vertical and horizontal bone defects, followed by delayed implantation.[20] However, the patient exhibited a knife-edge ridge, with cortical bone extending 5 mm below the alveolar ridge crest. The IAN further limited the implant depth. This type of defect leads to poor blood supply for bone grafting, resulting in unpredictable outcomes—the staged bone grafting approach results in a more extended treatment period. IANL is an efficient solution for addressing bone defects in the mandibular posterior region. This approach enables immediate implant placement following nerve retraction and optimally utilizes the basal bone beneath the neurovascular bundle to place longer implants. Therefore, this case was planned to perform IAN repositioning with simultaneous implantation. Since the surgical site did not involve the mental foramen, the IANL approach was preferred.[8]

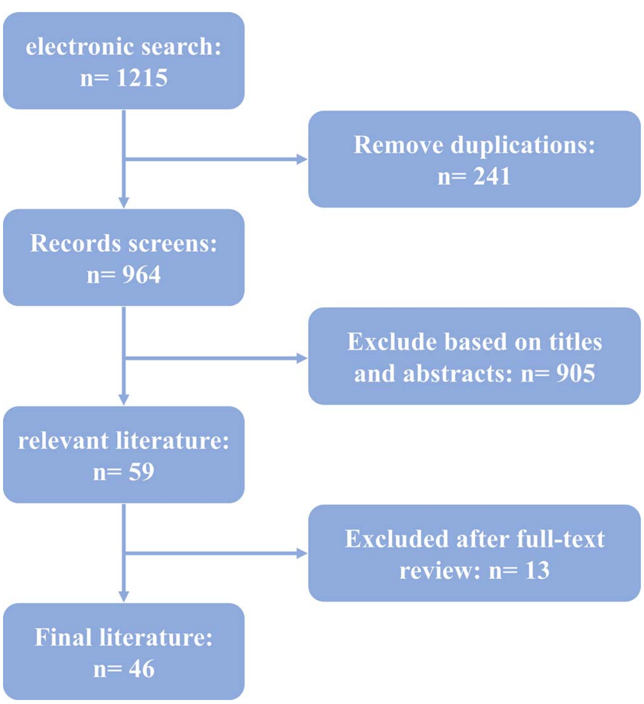

Figure 8. Screening strategy.

The common complication of IANL is neurosensory disturbance. A systematic review found that 95.9% of patients undergoing lateralization initially had neurosensory disturbances, with 3.4% still experiencing symptoms at the end of the study.[14] A 1-year evaluation of neurological dysfunction from 139 IANL surgeries revealed that 95% of patients experienced NSD postoperatively, decreasing to 70% after one month. After 6 months, 26 patients remained affected, and by the 1-year follow-up, all had fully recovered.[12]

Although the risk of permanent nerve damage is low, its occurrence can significantly impact a patient's quality of life. Reducing NSD depends on an appropriate preoperative plan and precise, minimally invasive clinical procedures. Due to the anatomical complexity of the surgical site, conventional virtual images are insufficient to reveal detailed structures. 3D printed anatomical models have been widely used in dental implant surgery and tissue reconstruction for preoperative planning and the prefabrication of surgical instruments, such as titanium plates.[21] They help surgeons visualize anatomical and pathological structures more clearly, significantly reducing surgical risks and complications.[22] Additionally, 3D-printed models facilitate communication between doctors and patients, allowing for a more intuitive explanation of the surgical process and potential risks.[23] Therefore, the 3D printed model was used for preoperative planning and practice. During preoperative practice, we found a significant difference between the 3D model and the CBCT measurements regarding the posterior width of the neural canal. The discrepancy might result from clinical interpretation and inaccurate image projection variability. Clinicians might misjudge the position or shape of the neural canal in regions with complex and closely located anatomical structures. The neural canal in CBCT images may be inaccurately projected onto the buccal plate, leading to discrepancies between the actual measurements and the 3D structure. This difference highlights the unique advantages of using 3D-printed models in optimizing preoperative planning and surgical technique.

Mandibular fractures are a rare complication associated with IANL, with only seven cases reported according to Losa.[24] The fracture may result from the implant disrupting the continuity of the mandibular basal bone or the lingual cortical bone. Removal of the buccal cortical bone may compromise the strength of the mandible.[25] Preoperative planning with 3D models allows

Table 2

Implant Survival Rate and Incidence of Neurosensory Dysfunctions* Following Inferior Alveolar Nerve lateralization

First author, year [Ref.]	Type of Study	No. of Patients	No. of Treated Sites	No. of Implants	IAN Repositioning Performed	Average Follow-Up (mo)	Implant Outcome	Permanent NSD (median NSD duration)
Kim et al, 2023[31]	CS	2	2	6	L (n = 1) T (n = 1)	5 and 72	100% SR	0 (4.5 mo)
Kablan et al, 2023[32]	R	31	46	149	T	12	98.6% SC	1 (3 mo)
Göçmen et al, 2023[33]	P	20	20	50	L	12	100% SC	0 (6 mo)
Yoshimoto et al, 2022[34]	CR	1	1	2	L	4	100% SR	0 (4 mo)
Garoushi et al, 2021[27]	P	18	30	43	L	6	100% SC	0 (6 mo)
Deryabin et al, 2021[13]	R	15	23	48	L (n = 17) T (n = 6)	61.2	95.8% SR	2 (3 mo)
Tomazi et al, 2021[35]	CS	4	8	8	L	36 and 64	100% SR	0 N/A
Kablan et al, 2020[36]	R	11	18	N/A	T	49.18	100% SC 100% SR	0 N/A
Al-Almaie et al, 2020[37]	P	8	10	20	T	47.1	100% SR	0 (1 mo)
Van et al, 2020[38]	CR	1	1	4	T	84	100% SR	0 (2 mo)
Rathod et al, 2019[39]	P	10	N/A	N/A	L	4	N/A	0 (3 mo)
de Campos et al, 2019[26]	P	34	34	82	L	12	97.56% SR	0 (70 d)
Castellano-Navarro et al, 2019[40]	R	123	139	337	L	12	N/A	0 (6 mo)
Naves Freire et al, 2019[41]	CR	1	1	3	L	4	100% SR	0 (2 mo)
Martínez-Rodríguez et al, 2018[42]	P	40	48	129	L	60	98.44% SR	0 (6 mo)
Atef et al, 2018[43]	CS	7	7	N/A	L	6	100% SR	0 (3 wk)
Sethi et al, 2017[44]	R	78	121	308	L + T = 121	84.5	95% SR	0 (3 mo)
Nishimaki et al, 2016[45]	R	7	8	22	T	49	100% SR	0 (6 mo)
Martínez-Rodríguez et al, 2016[46]	P	27	27	74	L	60	98.6% SR	1 (3 mo)
Khojasteh et al, 2016[18]	R	14	23	51	L	12	N/A	1 (6 mo)
Khojasteh et al, 2016[47]	R	69	N/A	184	T	18.51	98.74% SC 94.56% SR	7 N/A
de Vicente et al, 2016[48]	P	13	13	N/A	L	12	N/A	0 (3 mo)
Dursun et al, 2016[49]	P	7	N/A	25	L	12	100% SR	0 N/A
Pimentel et al, 2016[50]	CS	2	3	7	L (n = 2) T (n = 1)	3	100% SR	0 (3 mo)
Gasparini et al, 2014[51]	R	35	49	N/A	L	54.2	100% SR	0 N/A
Barbu et al, 2014[52]	CS	7	11	32	T	35.71	100% SR	0 (2 mo)
Lorean et al, 2013[53]	R	57	79	232	L (n = 11) T (n = 68)	20.62	99% SR	0 N/A
Khajehahmadi et al, 2013[54]	P	21	28	65	L (n = 14) T (n = 14)	34.2	100% SR	2 (2 mo)
Fernández Díaz et al, 2013[55]	P	15	19	38	L	24	97.36% SR	1 (3 wk)
Suzuki et al, 2012[56]	CR	1	1	2	L	6	100% SR	0 (1 mo)
Hashemi et al, 2010[57]	P	87	110	N/A	L	12	N/A	2 (1 mo)
Chrcanovic et al, 2009[58]	CS	15	18	25	T	6	88% SC	0 (5 mo)
Felice et al, 2009[59]	CR	1	1	4	T	24	100% SR	0 (1.25 mo)
Vasconcelos et al, 2008[60]	CR	1	1	2	T	7	100% SR	0 (7 mo)
Sakkas et al, 2008[61]	CR	1	1	2	T	8	N/A	0 (2 mo)
Proussaefs, 2005[62]	CR	1	1	2	T	36	100% SR	0 (3 mo)
Ferrigno et al, 2005[63]	P	15	19	46	T	49.1	95.7% SR	1 (6 mo)
Morrison et al, 2002[64]	R	15	26	30	T	16	100% SR	N/A (1 mo)
Peleg et al, 2002[65]	R	10	N/A	23	L	29.8	100% SR	N/A (1 mo)
Hori et al, 2001[66]	CS	6	8	17	T	36	100% SR	3 (39 mo)
Nocini et al, 1999[9]	P	10	18	N/A	T	12	N/A	N/A
Kan et al, 1997[67]	R	15	21	64	L (n = 12) T (n = 9)	41.3	93.8% SR	N/A
Rugge et al, 1995[68]	CR	1	1	N/A	L	12	N/A	0 N/A
Hirsch et al, 1995[69]	P	18	24	63	T (n = 10) L (n = 14)	36	92.1% SR	3 (T 5.7 wk) (L 3.8 wk)
Jensen et al, 1994[70]	P	6	10	21	T	23	100% SC	1 N/A
Friberg et al, 1992[71]	P	10	13	23	T	10	86.95% SR	2 (6 mo)

*CS indicates case series; CR, case report; NSD, neurosensory dysfunction; P, prospective; R, retrospective; SR, survived; SC, success; L, inferior alveolar nerve lateralization (IANL); T, inferior alveolar nerve transposition (IANT).

for precise design of the bone window size and position, as well as implant placement and depth, potentially reducing the incidence of fractures.

Previous reports have shown that CGF promotes Schwann cell proliferation, migration, neurotrophic factor secretion, and functional nerve recovery in vivo.[16,17] Wang et al[19] performed a prospective study showing that covering the mental nerve with CGF accelerated the recovery from lower lip hypoesthesia after mental osteotomy. Three months postsurgery, the proportion of lower lip hypoesthesia in the CGF group was significantly lower than in the non-CGF group. Six months after surgery, both groups had recovered from lower lip hypoesthesia. Khojasteh et al[18] conducted a retrospective study to explore the effect of platelet-rich fibrin (PRF) on accelerating neural symptom recovery. Patients in the PRF group showed higher TPD and SLT scores 6 months after IANL than those without PRF coverage on the IAN surface. No significant difference was observed between the 2 groups after 12 months. These findings support the potential of autologous platelet concentrates in enhancing early neural recovery and improving patient outcomes. However, related studies are limited, and the effects of autologous platelet concentrates still require further validation. We used a 3D model for preoperative planning and path optimization in this case, significantly reducing the operation time. The fenestration was accurately positioned during the operation, and the IAN bundle remained intact. CGF helped buffer external stimuli, protecting the IAN. Although the patient experienced NSD postoperatively, the sensory function of the nerve fully recovered within two months, which is consistent with the findings in the report.

Interestingly, at the 6.5-year postoperative follow-up of this case, we observed the formation of a new neural canal on the buccal side of the implant. There are limited reports on nerve canal reformation after IANL, and the factors influencing the reformation process remain unclear. De Campos et al[26] carried out a randomized controlled study in which the experimental group placed a bone graft between the implant and the IAN after nerve lateralization, while in the control group, the IAN was directly in contact with the implant. CBCT imaging revealed the formation of new neural canals around the IAN in the experimental group, whereas no such canals were observed in the control group. The prospective study by Garoushi et al[27] demonstrated that the placement of a collagen membrane and bone graft between the implant and the IAN facilitated the formation of dense cortical bone around the nerve. We observed the formation of new neural canals in CBCT data 6.5 years after surgery, which may be related to the intraoperative placement of CGF and bone grafts. CGF can induce osteogenic differentiation of human bone marrow stem cells (hBMSC), promoting bone regeneration and osseointegration around dental implants.[28–30] The CGF clot and collagen membrane might act as a barrier, preventing nerve irritation caused by the implant and graft while promoting early osteogenesis and facilitating the formation of new canals.

A limitation of this case report is that conclusions drawn from a single case lack sufficient persuasive strength. Additional clinical trials are necessary to validate the roles of CGF and 3D-printed models. We have observed the formation of a neurovascular canal. Further studies are needed to explore the factors influencing its formation and whether it affects postoperative complications.

Conclusions

IANL may be a viable treatment option for severely resorbed mandibles requiring dental implants. A 3D-printed model can help determine the safest surgical corridor and reduce the risk of nerve damage. The IANL technique presented in this study accelerated neural symptoms recovery. More patients are required to validate this clinical procedure definitively.

Abbreviations

CBCT: cone beam computed tomography
CGF: concentrated growth factor
CT: computed tomography
GBR: guided bone regeneration
GDNF: glial cell line-derived neurotrophic factor
hBMSC: human bone marrow stem cells
IAN: inferior alveolar nerve
IANL: Inferior alveolar nerve lateralization
IANT: inferior alveolar nerve transposition
NGF: nerve growth factor
NSD: neurosensory disturbance
PP: pin prick test
PRF: platelet-rich fibrin
SLT: static light touch test
TPD: 2-point discrimination test

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Note

The authors declare no conflicts of interest related to this article.

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