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SURGICAL PLAN

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1 Pre-Surgical Patient Assessment

Patient Identification

Patient Name:	Evelyn J. Vance
DOB:	April 18, 1968
Age / Gender:	58 / Female
Record ID:	MRN-2026-8942
Planned Date:	August 12, 2026

Clinical Team

Lead Surgeon:	Dr. Thomas Synapse
Restorative MD:	Dr. Marcus Sterling
Anesthesiologist:	Dr. Sarah Jenkins
Facility:	Vertex Dental Clinic
Plan Version:	v2.4 (Approved)

1.1 Chief Complaint & Surgical Indications

The patient presents with a history of missing tooth #19 (lower left first molar), which was extracted approximately 14 months ago due to severe endodontic failure and vertical root fracture. She reports localized masticatory insufficiency and a desire for permanent fixed restoration. Initial clinical exam shows adequate mesiodistal space (approx. 11.5 mm) and normal occlusal relationships with opposing tooth #14, though mild crestal ridge collapse is visible buccotangentially. The primary objective is surgical placement of a dental implant followed by a screw-retained crown to restore masticatory function and arch stability.

1.2 Systemic Medical History & Contraindications

A detailed medical history review was conducted. The patient has a history of mild, well-controlled essential hypertension (managed with Lisinopril 10 mg daily; resting BP is 122/78 mmHg) and osteopenia. She is a non-smoker and has no history of bisphosphonate therapy or other bone-metabolism modifying medications. There are no systemic contraindications to elective outpatient oral surgery under local anesthesia.

Risk Factor Matrix

Risk Factor	Clinical Assessment	Risk Level	Mitigation Strategy
Systemic Health	Controlled hypertension	Low	Pre-operative BP check; limit epinephrine
Bone Density	Mild osteopenia (T-score -1.2)	Moderate	Under-preparation of osteotomy; preserve bone
Anatomical Sites	Proximity to Inferior Alveolar Nerve	High	Computed surgical guide; 3D safety margins
Compliance	Good hygiene, regular recall history	Low	Standard post-op protocol and antiseptic rinse

2 Radiographic & Bone Quality Assessment

A Cone Beam Computed Tomography (CBCT) scan of the mandible was acquired using the Vertex Imaging System to assess bone volume, density, and local anatomical structures at the proposed implant site #19 [1].

2.1 Alveolar Ridge Dimensions

Cross-sectional analysis of site #19 indicates a relatively well-preserved bone height, but moderate resorption of the buccal plate.

- **Crestal Width:** 6.8 mm (measured 1.0 mm apical to the crestal margin)
- **Mid-Radicular Width:** 7.9 mm
- **Available Vertical Height:** 14.7 mm (from crestal margin to the superior border of the Inferior Alveolar Canal)
- **Mesiodistal Space:** 11.2 mm (available between root outlines of #18 and #20)

2.2 Bone Density & Quality

Bone density was evaluated across three regions of interest (ROI) in Hounsfield Units (HU) to classify bone quality according to the Misch scale:

Table 1: Bone Quality and Density Readings

Region of Interest	Mean Density	Classification	Clinical Implications
Crestal Cortical Plate	950 HU	D2 (Thick Cortical)	Excellent primary stability anticipated
Cancellous Core (Mid-Ridge)	420 HU	D3 (Fine Trabecular)	Moderate bone density; requires careful drilling
Basal Bone	1100 HU	D1 (Dense Cortical)	Highly mineralized; high heat generation risk

2.3 Anatomical Considerations

The superior boundary of the Inferior Alveolar Canal (IAC) is clearly defined on the parasagittal views. The course of the mental nerve and anterior loop was mapped; the anterior loop extends 1.2 mm anteriorly from the mental foramen. A safety buffer of at least 2.0 mm must be maintained from the apex of the implant to the superior cortical border of the IAC to prevent paresthesia.

3 Implant Specification & Visual Setup

Based on the CBCT dimensions, a tapered implant system has been selected to optimize primary stability in the D3 cancellous bone while preserving the thin buccal plate.

3.1 Implant Specifications

The surgical plan specifies the following implant componentry:

- **Brand / Line:** Nexa Dental Systems – ActiveTaper Grade 5 Titanium
- **Diameter:** ⌀ 4.3 mm (platform size: 4.5 mm)
- **Length:** 11.5 mm
- **Connection Type:** Conical internal hex (11° taper, 2.5 mm depth)
- **Surface Treatment:** Sandblasted, large-grit, acid-etched (SLA)

3.2 Virtual Planning Visualization

The diagram below shows the virtual placement path of the implant body at site #19 relative to the bone envelope, the crestal margin, and the inferior alveolar nerve boundary.

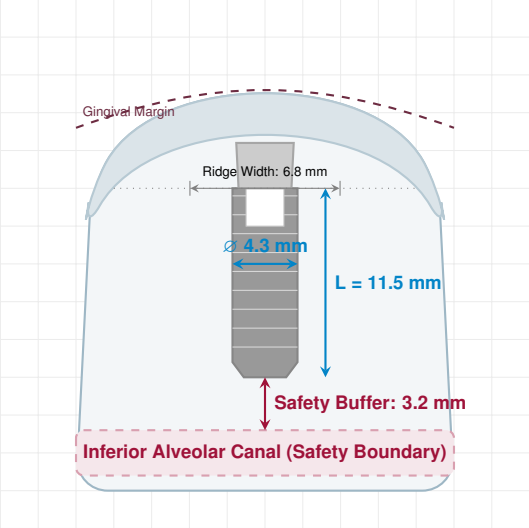

Figure 1: Cross-sectional schematic of virtual implant planning at site #19 (looking mesio-distally). Scale 1:1 schematic representation.

4 Surgical Protocol & Bone Grafting Plan

The surgical intervention will be executed under local infiltration anesthesia (Articaine 4% with 1:100,000 epinephrine) using a guided, minimally invasive approach.

4.1 Osteotomy Sequence

Due to the presence of D2 cortical bone at the crest and D3 cancellous bone in the core, the drilling sequence will be adjusted to avoid thermal necrosis while ensuring optimal insertion torque:

1. **Initiation:** Use the 2.0 mm pilot drill through the surgical template guide key to a depth of 11.5 mm. Verify position and depth radiographically if required.
2. **Expansion 1:** Deploy the 2.8 mm twist drill to full working depth at a speed of 800 rpm under copious external sterile saline irrigation.
3. **Expansion 2:** Use the 3.5 mm twist drill. In the event of high bone resistance, a brief pause is required to cool the site.
4. **Final Preparation:** Use the 4.3 mm profiling drill at low speed (400 rpm). Cortical tapping at the crest is indicated if insertion torque exceeds 45 Ncm to prevent localized microfractures.

4.2 Bone Grafting & Ridge Augmentation

Although the vertical bone height is sufficient, a localized buccal dehiscence is anticipated during flap reflection due to previous ridge collapse. Guided Bone Regeneration (GBR) will be performed concurrently with implant placement:

- **Graft Material:** NexaBone Particulate Allograft (cortical-cancellous blend, particle size 0.25–1.0 mm, 0.5 cc volume).
- **Barrier Membrane:** Vertex Collagen Membrane (15x20 mm, resorbable porcine pericardium, expected resorption time 16–24 weeks).
- **Fixation:** The membrane will be tucked subperiosteally under the lingual and buccal flaps to ensure immobility.

4.3 Closure & Post-Operative Management

A healing abutment of 4.5 mm height will be connected (one-stage protocol, torque to 15 Ncm) if insertion torque exceeds 30 Ncm. If insertion torque is lower, a cover screw will be placed (two-stage protocol). The surgical site will be closed with 4-0 PTFE non-resorbable sutures using interrupted loop techniques to achieve primary tension-free closure.

Post-Surgical Pharmacotherapy

- **Antiseptic:** Chlorhexidine gluconate 0.12% oral rinse, 15 mL twice daily for 10 days starting 24h post-op.
- **Analgesic:** Ibuprofen 600 mg every 6 hours as needed for moderate pain (maximum 2400 mg/day).
- **Antibiotic Prophylaxis:** Amoxicillin 500 mg, three times daily for 5 days.
- **Suture Removal:** Scheduled for 10–14 days post-operatively.

5 Surgical Guide & CAD/CAM Specifications

To ensure precise transfer of the 3D virtual plan to the clinical environment, a CAD/CAM surgical template will be fabricated based on the patient's CBCT and intraoral optical scans.

5.1 Guide Fabrication Parameters

The surgical guide will be modeled using Synapse Dental CAD (v4.2) and fabricated via stereolithography (SLA) using biocompatible resin:

- **Guide Type:** Tooth-supported, fully guided. Anchored on teeth #18, #20, #21, and #22 to guarantee three-dimensional stability.
- **Sleeve System:** Meridian Guided System – 4.3 mm diameter guide sleeve.

- **Planned Offset:** 9.0 mm (distance from the implant platform to the top of the guide sleeve).
- **Fabrication Material:** Clear surgical guide resin (Class I medical device, sterilized via autoclave at 121°C for 15 minutes).

5.2 Pre-Surgical Inspection Checklist

The clinician must verify the following parameters prior to the patient encounter:

1. **Fit Verification:** Place the template intraorally and verify intimate adaptation. Inspect through the inspection windows to confirm full seating on the occlusal surfaces.
2. **Stability Check:** Confirm there is no rocking or displacement under alternating digital pressure.
3. **Sleeve Integrity:** Check that the metallic guidance sleeves are securely bonded to the resin body and show no signs of micro-fractures.

5.3 Prosthetic Plan

Following a healing phase of 12–16 weeks, osseointegration will be assessed clinical-radiographically. The prosthetic phase will consist of:

- **Restoration Type:** Screw-retained monolithic zirconia crown.
- **Abutment:** Nexa Custom Ti-Base abutment (transgingival height: 2.0 mm).
- **Retention:** Occlusal screw access hole sealed with composite resin.

References

[1] Daniel Buser, Vivianne Chappuis, Thomas Kuchler, Dieter D Bosshardt, and Robert K Schenk. Modern implant dentistry based on alveolar ridge preservation and contour augmentation. *Periodontology 2000*, 73(1):7–21, 2017.

[2] William R Laney. Glossary of oral and maxillofacial implants. *International Journal of Oral & Maxillofacial Implants*, 25, 2010.

[3] Dennis P Tarnow, Sang-Choon Cho, and Stephen S Wallace. The effect of inter-implant distance on the height of inter-proximal bone crest. *Journal of Periodontology*, 71(4):546–549, 2000.