Guided Implant Surgery in Edentulous and Partially Edentulous Ridges

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Examples of implant retention of the lower complete denture:

- Ball Overdenture Attachment
- O-Ring Overdenture Attachment
- Locator Overdenture Attachment
- Molloplast-B heat-cured soft liner for ball overdenture heads.
Locator retention of the complete lower denture opposed to a fixed prosthesis.
Locator Retention of the Maxillary Denture:
Locator Retention of the Obturator Denture:
Locator retention of the palate-less maxillary denture prosthesis. Metal framework provides strength and stiffness to resist occlusal forces.
Locators: An alternative to precision attachment retention of partial dentures.

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Precision and semi-precision attachments have been used to securely and esthetically retain partial denture prostheses for many years. However, their use required the additional expense of double abutting two teeth.

(Attachments pictured are semi-precision Dalbo Attachments)
Locator Retention of Partial Dentures

Locator implant abutments can be used to retain a removable partial denture without the use of clasps or precision attachments and the crowns needed to support them.
Locator Retention of Partial Dentures
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Kennedy Class IV
Locator Retention of Partial Dentures

O-ring abutment head replaced with Locator and an additional implant placed and restored with a Locator provides excellent anterior support and retention.
Traditional method of choosing site to place implant fixture used a clear duplicate of the complete lower denture. Holes were drilled by the restoring dentist to indicate where the implant fixtures should be placed.
Without a surgical guide, placement of implant fixtures requires surgical entry, removal of periosteum, and post surgical suturing and the resulting swelling and discomfort.
Pre-surgical planning that includes 3D imagery identifies potential mishaps.

Ridge appears adequately shaped to receive implant fixture.
2D projection hints at inadequate bone thickness.
3D imagery confirms very thin areas of the mandible where implant fixtures would be placed.
Guided implant surgery using 3D Cat Scan imagery:

Partially edentulous mandibular arch with failing abutment tooth.

Potential Implant Site
Potential implant sites.
Step One: Create clear duplicate of denture.

Impress intaglio surface with Sil-Tech Lab Putty by Ivoclar/Vivadent®

Lubricate putty base with petroleum jelly prior to impressing occlusal surface.

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Putty “flask” holds denture to be duplicated. Wax sprues can be added to denture border prior to making putty imprint of occlusal surface. When removed, a hole is created that allows access for pourable resin.

Remove putty to provide access for pourable resin.
Clear, pourable resin by Great Lakes Orthodontics, Ltd.

To prevent voids, slowly pour liquid resin into one hole of “flask” until resin appears in second hole.

20 minute cure in pressure pot.
Costs associated with clear duplicate denture:
Step Two: Insert radiopaque markers. (Gutta Percha points)

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- Lower Partial Dentures and Problems They Cause
- Oh Alginate! How do I Love Thee! Let me count the ways....
- Lingualized Occlusion
- Keeping Up With the Technology of Restorative Dentistry (LSU Alumni Day Lecture)
  - Gallano-Cerec Integration for Guided Implant Surgery
  - guided Implant Surgery for Removable Prostheses
  - Great Surgical Guide for Restoration of Hemi-Mandible Flap Patient
- The Implant Overdenture: Use of the Locator® Attachment
- Restoration of the Head and Neck Cancer Patient
- Implant Overdentures: Use of the O-Ring Implant Abutment
- Construction of Metal Occlusion Surfaces
- E-Max Posterior Teeth for Partial and Complete Dentures
- Palate-Less Maxillary Denture
- The Branching Technique of Denture Construction (slides)
- The Branching Technique of Denture Construction (video)
Step Two: Insert radiopaque markers. (gutta percha points)

Potential position of implants transferred to surgical stent.

Use #4 round bur to create 5 mm deep hole in acrylic. Fill with #15 gutta percha point. Cut off at tissue surface with warm instrument.

Duplicate of lower partial denture is surgical stent.

Potential position of implants.

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Step Three: Scan #1

2D version of Cat Scan shows gutta percha points over potential implant sites.

Space beneath gutta percha is tissue thickness. (Should not exceed 6 -7 mm.)
Cross sectional analysis reveals adequate bone width and depth at potential implant sites.
Step Four: Attach reference body to stent with heat-softened Hydroplastic.

Keep tissue side of reference body in contact with ridge crest.
Step Five: Scan #2 with stent and reference bodies in place intraorally.
2D image with stent in place and **round fiduciary markers** to be used by 3D imagery software to position implant bodies at potential sites.
Use Sirona Sidexis XG 3D Imagery to:

1) Analyze scan.
2) Identify position of Mandibular nerve.
3) Determine bone density at implant site.
4) Select and position appropriate implants.
5) Direct Cerec machine to mill drill bodies.

Zimmer Dental Tapered Screw-Vent
(3.5 mm X 11.5 mm)
Anatomical representation of mandible and reference bodies.
Milled Drill Bodies:

- Tissue Surface
- Implant Drill Guide Channel
- Vertical Stop
- Tissue Surface
Drill body produced in Cerec milling chamber.

Projection

Reference Body

Orientation Notch

Reference body removed.

Drill body snapped into Cerec Guide.
Cost of poured acrylic stent, two reference bodies and two drill bodies = $180

Drill bodies positioned in surgical stent.
Step Six: Guided Implant Surgery

Surgical stent seated intraorally.

Drill body positioned over implant site.
Drill sleeves are specific to implant manufacturer and size.

Sleeves fit into drill body on stent and guide drill bits to pre-determined angle and depth.
With surgical stent and drill bodies, implant site can be accessed without reflecting crestal tissue.
Drill sleeves and drill bits of progressively larger sizes are used until implant can be placed at correct angle and pre-determined depth.
Hand tighten implant to final position with torque wrench that does not exceed 50 N-cm.

Cover implant with healing head.
Healing heads.

Partial denture converted to complete denture with addition of denture tooth and soft liner.
Three months later…..

….. seat Locator abutment heads.
Final complete lower denture with Locator housings and nylon inserts.
Guided Implant Surgery
In the
Partially Edentulous Ridge

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Potential implant sites at positions #5 and #11
Step One: Fabricate acrylic baseplate:

Potential Implant Sites
Step Two: Insert Gutta Percha Markers.

- #15 Gutta Percha Point
- Hole made with #4 round bur.
- Section point and seal with warm spatula.
Step Three:

Scan #1 with baseplate and markers in place intraorally.
Gutta-percha markers
Ideal position for implant at #5 is 1.80 mm to lingual of gutta percha marker.
Ideal position for implant at #11 is 1.06 mm to lingual of gutta percha marker.
1. Corrected position of implants marked on baseplate.

2. Orientation lines added to help align reference bodies.

3. Acrylic of baseplate removed to insure tissue contact with reference bodies.

4. Reference bodies aligned over ideal implant positions.
Step Four:
Attach reference bodies to stent with softened thermoplastic material.
Step Five: Scan #2
Use Sirona Sidexis XG 3D Imagery to:

1) Analyze scan.
2) Identify position of Mandibular nerve.
3) Determine bone density at implant site.
4) Select and position appropriate implants.
5) Direct Cerec machine to mill drill bodies.
Drill body produced in Cerec milling chamber.

Reference Body

Reference body removed.

Orientation Notch

Drill body snapped into Cerec Guide.
Orientation Notch

Drill bodies “snapped” into position.

Model, baseplate, two reference bodies and two drill bodies = $150
Surgical stent with drill bodies intraorally prior to implant placement.
Zimmer® Dental Tapered Screw-Vent (3.7 mm x 10 mm) at position #5.

Zimmer® Dental Tapered Screw-Vent (3.7 mm x 11.5 mm) at position #11.
Modify temporary partial to prevent contact with implant healing head.
Modification of Temporary Partial Denture:

Soft reline eliminates contact with healing heads.
Four months later, Locator abutment heads place and Locator housings with male inserts placed in temporary partial.
Partial denture metal framework fabricated with lingual coverage of the four incisors to create an anterior occlusal stop.
Locator female housing with processing insert (black) can be seated on master cast to have technician create a metal “roof” to reduce likelihood of acrylic fractures.

Partial denture master cast.
Recess in metal framework for Locator male housing reduces likelihood of acrylic fractures.
Completed prosthesis with blue (1.5 lb.) nylon male inserts.
Initial insertion of Locator retained maxillary partial denture.
After an initial break-in period, metal occlusal surfaces were added to the prosthesis to prevent occlusal wear.
Guided implant placement in the edentulous maxillary arch:
Edentulous Maxillary Arch:

Mandibular cast metal partial denture

Particulate hydroxyapatite material placed in 1990 to preserve tuberosities.

Mandibular cast metal partial denture
Step One: Create clear duplicate of denture.

Identify potential implant sites.
Step Two: Insert radiopaque gutta percha markers at potential implant sites.
Clear duplicate of maxillary denture with radiopaque markers.
Step Three: Scan #1

Gutta Percha Markers
Potential position of implants is not within solid bone.

Using the density determining software, new locations (×) for the implants were found 6 and 7 mm distal to position of gutta percha markers.
Step Four: Attach reference body to stent.
New positions for implants are located on surgical stent by measurement.

Mark sections of stent to be removed to accommodate reference bodies.
Based on analysis of the scan, both potential implant sites were moved 6 and 7 mm to the distal to place them completely in bone of greater density.

A portion of the surgical stent is removed to expose the tissue surface of the new implant sites.
Attach reference bodies to surgical stent using thermoplastic material:

Seat reference body firmly to insure contact with palatal tissue.
Step Five: Scan #2
Fiduciary markers of reference bodies.
Use Sirona Sidexis XG 3D Imagery to:
1) Analyze scan.
2) Identify position of Mandibular nerve.
3) Determine bone density at implant site.
4) Select and position appropriate implants.
5) Direct Cerec machine to mill drill bodies.

Zimmer® Dental Tapered Screw-Vent (3.7mm x 11.5mm)

Zimmer® Dental Tapered Screw-Vent (3.7mm x 10mm)
Anatomical representation of maxilla and reference bodies.

Software positioning of implant and fiduciary markers are used by Cerec machine to mill drill bodies.
Milled Drill Bodies:

- Implant Drill Guide Channel
- Vertical Stop
- Tissue Surface
Drill body produced in Cerec milling chamber:

- Orientation Notch
- Reference body removed.

Drill body snapped into Cerec guide.

- Projection
Step Six: Guided Implant Surgery

Surgical stent with drill bodies in position.

Soft tissue access without flap and dissection.

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Drill sleeves and drill bits of progressively larger sizes are used until implant can be placed at correct angle and pre-determined depth.
Multi-purpose fixture mount/transfer coping used as implant driver, impression post and when cut down and reshaped: a healing head.

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Relieve denture base to insure no contact with implant healing heads.
Four months later

Replace healing heads with Locator abutments.

Place nylon inserts for retention.
Use of the Sicat Surgical Guide
In Reconstruction
of the
Hemi-Mandilectomy Patient

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Sarcoma of the Mandible
Sarcoma of the Mandible

Fibula Bone Graft

Non-Union
Sarcoma of the Mandible

Surgical Correction of Bony Non-Union
Wax-up of planned prosthesis

Clear duplicate of wax-up

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Extremely large tori preclude the use of a removable partial denture.

Dots indicate planned positions of five implants.

Gutta Percha inserted in each hole to act as radiopaque marker.

Holes drilled at each planned implant position.
Gutta Percha radiopaque markers at each planned implant position.
Cat scan with markers in place. Dotted yellow line indicates height of soft tissue.
Preparation of the Radiographic Template:

Partially Edentulous Arch

Wax - Up

Putty Matrix

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The use of gutta percha points and a clear duplicate of the preliminary wax-up is useful in assessing tissue thickness, bone height and width, as well as surgical screw positions. To construct a Sicat surgical guide, the manufacturer prefers a radiographic template in the shape of the planned prosthesis and made of radiopaque resin. The following slides demonstrate construction of such a template.
Preparation of the Radiographic Template:

Create replica of wax-up in radiopaque resin (Jet XR) available from Lang Dental:
Or, mix Barium Sulfate (15% by weight) with clear acrylic resin.

Sections of metal burs embedded in stone model with cold-cure resin help maintain the position of the radiographic template.
Preparation of the Radiographic Template:

Fill putty matrix with radiopaque resin.

Cure, contour and finish.
Prepare thermoformed stent (suck-down) with a minimum 1.5 mm thickness to 2.0 mm maximum thickness. Stent will hold radiopaque replica in position intraorally.

Radiopaque replica must sit flush on tissue.
Transfer midline to biteplate.
Bond biteplate to stent with self-cured acrylic, maintaining correct alignment of midline.
Fiduciaries (radiopaque markers)

Hole to receive biteplate holder to correctly orient occlusal plane.
Biteplate bonded to stent and seated on remaining teeth.
Bite Plate Holders

Maxilla

Mandible

Align occlusal plane parallel with conebeam slice.
Biteplate holder attached to scanner to properly orient occlusal plane with conebeam slice.

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Surgical screws to be removed prior to implant placement.

Fiduciaries (radiopaque markers)
Outline of proposed implant.

Surgical screw to be removed.
In consultation with the oral surgeon and using Sidexis 3D Imagery, five bone-level Straumann implants were selected and positioned to support a milled bar prosthesis.
Implant positions to be milled into Sicat surgical guide.
Sicat Surgical Guide:

Bite Plate, Prescription and 3D Imagery sent to Sicat. Milled surgical guide returned in two weeks.
Implant Surgery by Oral/Maxillofacial Surgeon using Sicat surgical guide.

Exposure of bone screws holding healed bone graft. Screws to be removed.
Surgical placement of five Straumann bone-level implants using Sicat Surgical Guide.
After eight months of healing, patient presents with well healed bone and five implants restored with healing heads. Excessive tissue thickness of skin graft seen near the tops of the healing heads presented a restorative challenge.
Skin grafts used for wound closure present a constant challenge to maintain cleanliness. Periodic flare-ups can be addressed with chlorohexidine or salt and soda rinses.
Impression posts on master cast with gingival mask.

Verification Jig
After wax try-in, master cast with implant body analogs and gingival mask sent to Global Dental Science to mill implant connector bar. Bar will include milled holes to accept plunger attachments for retention and ease of removal for cleaning.
Universal Plunger Loc Attachment (Preat Corp.)

Milled holes for plunger attachment.
Bar shortened to reduce stress on distal implant. Prosthesis to end at first molar.

Processing jigs in place to provide site for plunger attachment.
Case in processing flask, wax boiled out, undercuts blocked out and bar coated with Rubber-Sep®.

Final Wax-Up
Remove processing jigs.

Try-in plunger attachments.

Shorten attachments for flush fit.

Bond attachments to prosthesis with cold-cure acrylic resin.
Removable prosthesis provides gingival bulk and accessibility for cleanliness.

Metal occlusal surface prevents excessive wear and reduces stress on acrylic.

Universal plunger attachments provide secure retention.
Articles/Lectures

Professional Articles

- Lower Partial Dentures and Problems They Cause
- Oh Alginate! How do I Love Thee! Let me count the ways...
- What Comes After All on Four?
- Linugzled Occlusion
- Keeping Up With the Jacobs School of Dentistry (LSU Alumni Day Lecture)
- Gallion-Ciccar Integration for Guided Implant Surgery
- Guided Implant Surgery for Edentulous and Partially Edentulous Arches
- Four Survival Guide for Restoration of Hemi-Neckectomy Patient
- The Implant Overdenture: Use of the Locator® Attachment
- Restoration of the Head and Neck Cancer Patient
- Implant Overdentures: Use of the O-Ring Implant Abutment
- Construction of Metal Occlusal Surfaces
- E-Max Posterior Teeth for Partial and Complete Dentures
- Palate-Less Maxillary Denture
- The Branching Technique of Denture Construction (slides)

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