

# Precision dentistry

From planning to preparation and placement



  
NAVIDENT

## PROCEDURE BOOKLET

A step-by-step guide to help clinicians and their teams maximize the benefits of dynamic guided surgery in everyday practice

CONTENTS

# About this booklet

**This booklet provides specific guidelines for the use of dynamic navigation in dentistry. It serves to set and maintain the very highest professional and clinical standards, improve practice performance and empower the whole dental team.**

The manual is designed for use by clinicians who have been introduced to dynamic guided surgery and have undergone basic in-clinic training with a Navident representative. The clinician is responsible for keeping up to date with the latest treatment techniques in implant and endodontic dentistry through continued education.

Please note that all products may not be regulatory cleared, released or licensed in all markets. It is the clinician's responsibility to refer to the local Navident sales team for information about current product range and availability.

Links to online video explainer tutorials are also provided in the booklet. These are designed to complement the procedures described in each chapter and are intended for use in conjunction with the Navident User Manual.

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## Targeting perfection

The digital revolution is changing the world around us. Computers and digital devices are delivering easier, faster, more cost-effective and predictable outcomes for what were previously manual tasks.

Even in dentistry, digital technologies are rapidly advancing: intraoral scanners, cone beam computed tomography (CBCT), software for computer-assisted-design/computer-assisted-manufacturing (CAD/CAM) and fabrication procedures such as milling and 3D printing are affecting the way patients around the globe are treated.

Against this backdrop, dynamic navigation is resolving the challenge of transferring a clinical plan to the patient's mouth in a safe, accurate and predictable manner.

## Navident and the digital workflow

A breakthrough in computer-aided surgery, for almost a decade Navident has been offering dental surgeons an easy-to-use, accurate, highly portable and affordable method of planning the desired restoration and implant placement on a virtual patient, and executing the plan. Nowadays, Navident is also available for endodontic procedures.

A virtual copy of the patient's jaw is created from a cone beam CT scan and optional digital impression (STL) data, such as from a 3D intraoral scanner. The plan, which can include crowns, abutments and implants or bone cutting area, is prepared in a few minutes and can be modified at any time, even during surgery.

Navident displays a simple-to-follow guidance graphic and shows the advance of the drill tip or implant in the patient's jaw, relative to surrounding structures and the plan in real time. Customer clinicians have reported negligible operator stress, improved time efficiency and an increase in patient acceptance.

Navident has been validated by several leading universities worldwide. Further information about published research studies can be requested from your local representative.

# Unleash your clinical and surgical potential

More and more clinicians around the globe are discovering the benefits of dynamic guided surgery:

- The technology strengthens practice competitive advantage, improves the patient experience and raises treatment acceptance
- More complex cases can be tackled with increased confidence and certainty
- Navident widens the potential for more immediate, more accurate, and less invasive treatment options
- Navident takes away the requirement for a physical guide to control drill position, angle and depth
- Drilling is carried out unimpeded and completely freehand, with no loss of tactile feedback
- Running costs are lower compared to fabrication of a surgical guide

## Helping you succeed

### **Worldwide customer service**

Our team has a 360° focus on customer service. We train and support clinicians and their teams from our offices in Canada, Europe and Asia and through our international network of local distributors.

### **Installation**

For you to meet your patients' needs, it is our responsibility to meet yours. That means assisting you on-site with installation and guiding you through every step of the implementation process. If something goes wrong, you can rest assured that we'll be there to help – in person, over the phone, or online.

### **Onboarding**

Navident has assembled a network of team members and clinicians who work with our navigation system every day. This means you benefit from a strategic partner at your side, helping you master Navident and make the most of the system for the widest range of cases possible.

### **Patient marketing**

Don't keep the benefits of Navident to yourself. We have an extensive range of marketing materials aimed at patients which can be easily integrated into your practice communications strategy.

### **Navident explained**

The video "Navident explained" will answer your patients' most important questions regarding dynamic navigation. Available in English language, the video can be easily integrated in your practice website.

### **Waiting room presentation**

Raise awareness and arouse your patients' interest in the waiting room with our presentation slides to introduce the dynamic surgery concept and stimulate chairside conversations with the clinician.

### **Posters and flyers**

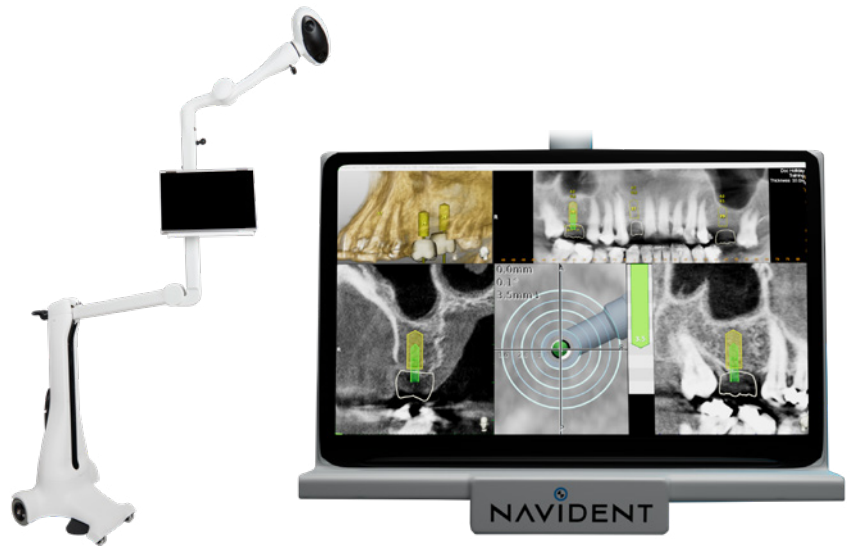
Marketing collateral such as posters and flyers can be ordered from your dealer for dressing the practice waiting room and public areas.

# Getting started

## Main system components

The Navident system consists of a laptop computer with proprietary software, a MicronTracker stereoscopic camera box and LED light panel, and a mobile cart with a foldable arm for easy storage.

The laptop and camera box are mounted on the mobile cart and can be repositioned throughout surgery for optimal visibility.



## Motion-tracking accessories

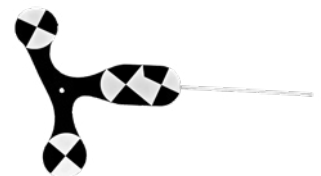
To maintain the registration between the jaw and corresponding CT image throughout each procedure, the patient's jaw position needs to be continuously tracked. To ensure this, an optically marked part, or **tag**, is affixed to the jaw upon which the surgery is being performed. The assembly, which includes both the tag and the jaw attachment mechanism, is called a **Jaw Tracker**.

An additional tracking tag, or **Head Tracker**, is available for use in the maxilla.

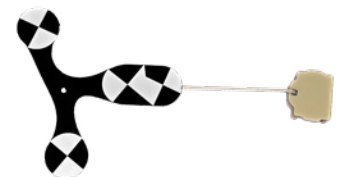
**Jaw Tracker-T:** comes in three types for sextants 1 and 4, 2 and 5, and 3 and 6. The trackers are reusable and have an identical inner surface to that of the NaviTray. The coordinate mapping between the jaw tracker optical marker and the fiducials in the scan, is pre-calibrated to provide instant registration.



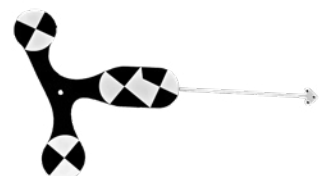
**Jaw Tracker-C:** is designed to be temporarily attached to the jaw using a dual-cure composite resin material. The wire is temporarily attached to a tooth by the composite, without being etched. This is accomplished by placing the wire on a tooth, or between two teeth, covering it with paste-like composite resin, then light-curing the composite (typically for 20 to 50 seconds). This immobilizes the wire relative to the tooth.



**Jaw Tracker-U:** is identical to version C, apart from a U-shaped clip at the end of the wire, which is filled with bite-registration material. It is then placed over two adjacent premolars, molars or both, and held in place until the bite registration material is fully cured.



**Jaw Tracker-B:** is identical to version C, except that it is anchored directly to the jawbone using bone fixation screws. For this purpose, the wire ends in a small triangle with three 1.6mm diameter screw holes at the jaw end.



**Head Tracker:** tracks movements of the patient's skull, providing coordinate space reference for the upper jaw only. It may be used with partially or fully edentulous patients. It is quick and easy to install and remove and facilitates access to the entire surface of the jaw during treatment.



## Registration accessories

**Navimpresion:** provides a stable and repeatable attachment of the NaviTray to the jaw during CT scanning, and to the Jaw Tracker-T during guided treatment.



**NaviTray:** is a plastic (PEEK and Teflon) component containing an aluminum fiducial, which can be clearly identified in the CT scan and is used for automated registration of the jaw with the CT image. During surgery the NaviTray, which was previously seated tightly over the Navimpresion, is replaced with the Jaw Tracker-T, which has an identical inner surface to that of the NaviTray.



**Tracer:** is a ball-tipped stylus used to mark locations and trace paths over the jaw surface during registration. The stainless-steel ball tip has a precise diameter of 1mm. The handle and tail of the Tracer-4 are made of black-anodized, laser-marked, aluminium-alloy and high-temperature plastic (polyether ether ketone, or PEEK) and the tip is made of stainless steel. The optical markings face in many directions, enabling optical tracking in virtually any orientation.



**Bone Screw Fiducials:** bone fixation screws are inserted in the bone through a small incision in the gums. The screws are localized in the CT scan. Registration is achieved by momentarily touching the screw heads with the Tracer ball tip. Bone Screw Fiducials are available from third-party manufacturers.



## Instrument motion-tracking accessories

**Handpiece Tracker:** is made of aluminum and can be attached to a surgical handpiece, a high-speed handpiece or a Piezotome handpiece, to allow tracking and navigation of the instrument. It is marked with optical tracking targets and is rigidly attached to the handpiece through a permanently glued aluminum ring.



**Calibrator:** is a passive, hand-held appliance, made of an aluminum-alloy, high-temperature plastic (polyether ether ketone, or PEEK). It is black anodized and laser marked. The high-contrast pattern marked on the Calibrator's front facet is tracked by the Navident camera. The upper facet of the Calibrator holds two calibration pins (marked 1R and 1L), a dimple (marked 2) and a channel (marked 3). The precise location of the pins, dimple and channel relative to the X-points marked on the front facet, is pre-programmed to be recognized by the Navident software.



**DrillTag:** is designed to be attached to a dental handpiece or drill, or any other instrument that needs to be tracked or navigated. It is marked with the optical tracking targets on three sides or facets. When rigidly attached to a handpiece by an adapter (as explained below), it enables the position of the handpiece and tooltip to be continuously tracked during the procedure. The DrillTag is a single-use item made from glass-filled polycarbonate.



**Low-speed and high-speed Tag Adapters:** provide a rigid mechanical interface between the optically trackable DrillTag and the handpiece holding the tool. Low-speed and piezo handpieces have a rear diameter of 20mm, while high-speed handpieces are 15mm in diameter. The Tag Adapter is rigidly secured to the handpiece using a silicone strap. It is reusable and autoclavable and can also be covered by a reusable silicone sleeve to improve the appearance and protect the silicone tape, which is disposed of after each use to allow cleaning and sterilization of the handpiece and adapters.



**Optional Fixed Tag Adapter WI-75 T:** is an optional Tag Adapter to fit a W&H WI-75 E/KM low-speed handpiece. It is permanently attached to the handpiece by the user, thereby simplifying the pre-surgical workflow and providing improved visual appeal.



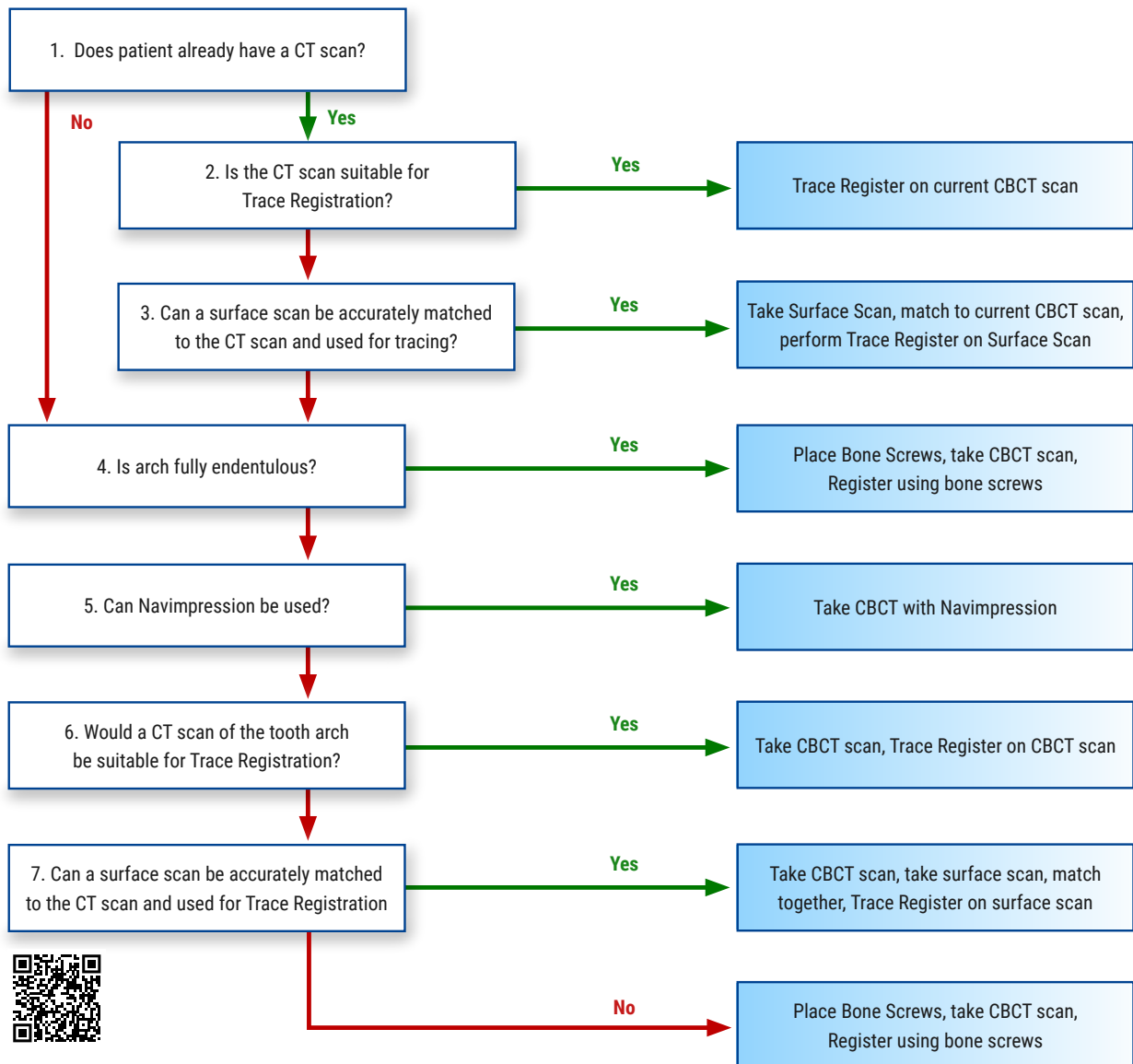
# Patient registration

In the dynamic navigation workflow the patient’s jaw needs to be registered with its CBCT image. Three registration methods are available: impression, trace and bone-screw registration.

1. The default registration method is Impression Registration, where the patient is scanned with a radiological marker, called NaviTray.
  - a. Prior to the scan, the Navimpression is pressed and molded into the fitting of the NaviTray.
  - b. During the scan, the NaviTray remains on the Navimpression, seated on the jaw to be treated.
  - c. Once the scan has been imported into Navident, the system automatically identifies the radiological marker of the NaviTray, and performs the registration.
2. Trace registration is performed with an existing CBCT scan and can be used for patients who have at least three remaining teeth. The registration of the jaw is achieved by tracing the existing teeth as natural fiducial markers.
3. With bone screw registration, three or more small bone screws are temporarily inserted in the jaw bone prior to the scan. Registration is carried out by marking the screw heads on the CBCT image.



## Decision Tree





# Setting up the Navident cart and camera

## Setting up the Navident cart and camera

**Quadrants Q1/Q4:** position cart so camera can aim from the center or left of dental chair.



**Quadrants Q2/Q3:** position cart so camera can aim from the center or right of dental chair.



**Laptop:** hover just above the patient's chest, with screen facing the clinician

**Camera:** direct at the patient's mouth; maximum distance of 1 meter

On-screen instructions for adjusting the camera's position are provided once it identifies the Jaw Tracker or Head Tracker. Alternatively, use the motorized camera option. The surgical light might interfere with tracking, resulting in intermittent or interrupted navigation. In this case, adjust the light source's position or turn it off.

### Warning!

- Positioning the cart to facilitate the tracking of all parts should be considered and decided prior to treatment commencement.
- Optimal positioning of the camera and Jaw Tracker depends on several factors: the jaw and side of the surgical site, the clinician's dominant hand which affects the approach direction, and other practical considerations such as the dental assistant's position.



# An introduction to the Navident workflow

**Dynamic navigation with Navident enables drills and dental implants to be precisely positioned and oriented. Achieving proficiency with the Navident system requires training and practical experience with a range of cases and clinical indications.**

The following chapters illustrate a range of surgical workflows assisted by dynamic navigation. Clinicians and their assistants are advised to develop their knowledge and skills by beginning with simple cases before tackling more challenging scenarios.

Chapter 1 begins by explaining the procedure for simple, partially edentulous cases, with helpful notes to indicate approximate timings. Dental teams should be able to master the steps in this chapter with confidence before moving on to complete the procedures described in subsequent chapters for more complex, fully edentulous cases and advanced clinical protocols using multiple instruments.

The content of each chapter builds on the instructions set out in the previous pages.

Many of the steps are supported with helpful video tutorials.

Clinicians and their teams are also advised to refer as necessary to the latest Navident User Manual.



# Chapter 1. The partially edentulous patient; the workflow for simple cases using Impression Registration

## Indications

For use in a partially edentulous arch, where three stable teeth which can support the Navimpression are available, preferably next to the surgical site or no more than two teeth away.

## Clinical benefits

- Prosthetically driven implant treatment
- Fewer surgical preparations with minimal loss of chair time
- Precise implant placement

## Prerequisites and considerations

- A region used for the Navimpression and Jaw Tracker-T connection should be available
- The CBCT scan should be carried out using the Navimpression and NaviTray

## Contraindications

- Careful psychological and physiological evaluation followed by clinical and radiological examination must be carried out prior to surgery to determine the patient's suitability for treatment
- When using a new device/treatment method for the first time, working with an experienced colleague is advisable to help avoid possible complications. Navident has a global network of mentors available for this purpose. To find a Master Clinical Trainer near you, please refer to your local Navident representative.

Please refer to Appendix II for CBCT scanning protocol.

## Case selection (after CBCT scan)

Load the case into Navident and verify that the fiducials of the NaviTray have been correctly delineated. They should be fully contained within their green or blue delineation frames. If the delineation is correct, proceed to the next step.

## Navident planning

When a CBCT scan taken with the NaviTray is imported and registered, Navident automatically detects the jaw centerline curve.









## Instrumentation

- Calibrator
- Surgical handpiece with DrillTag
- Jaw Tracker-T and an optional Head Tracker

Ensure there are sufficient Navident licenses on the laptop prior to getting started.

See Appendix III for cleaning and sterilization.

## Surgical preparations

1. Switch on the Navident laptop and load the case 
2. Install Jaw Tracker-T using the Navimpression 
3. Adjust camera position and aim (this happens automatically using the motorized camera option) 
4. Verify onscreen tags are detected by camera 
5. Calibrate the handpiece - Axis, Drill tip 
6. Accuracy check with the drill tip 

## Conduct guided surgery

- Continue with freehand implant placement and carefully apply all relevant clinical guidelines and protocols associated with the procedure
- Calibrate drill tip whenever a drill is changed in the handpiece
- Perform accuracy check prior to each insertion of drill into bone

### Warning!

- Care should be taken to ensure that suctioning or any other motion does not block the camera's line of vision to the trackers
- Avoid hitting the Jaw Tracker after installation. Alternatively, verify its stability on the jaw and perform an accuracy check
- The clinician's hands should be monitored during the procedure to ensure they avoid touching or moving the Jaw Tracker wire during surgery

### Don't forget!

All of the key steps are covered in detail in our easy-to-follow video tutorials. Head online:



### Teamwork

Many of these tasks can be completed by a dental assistant with appropriate support and training.



Please refer to Appendix I to access our simple delegation planning tool.



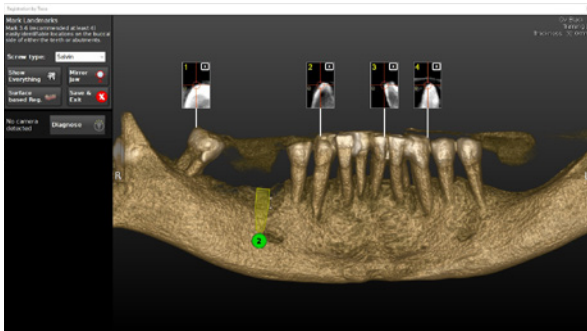
# Chapter 2. The partially edentulous patient; the workflow for simple cases using trace registration

## Indications

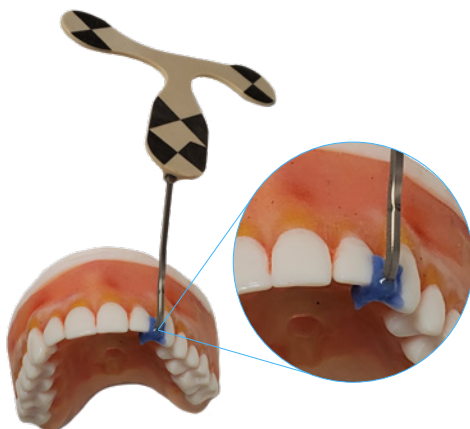
Cases are categorized as simple for trace registration when there are plenty of natural landmarks to be traced. Teeth are clearly visible in the CBCT scan and are firm and stable.

## Prerequisites and considerations

- A recent CBCT scan is available
- At least four landmarks are available for trace registration, and are well spread mesially and distally to surgical site



- A region used for the JawTracker connection cannot be used for trace registration



- When there are insufficient traceable landmarks in the jaw due to artifacts or mobile teeth and an accurate match between the surface scan (STL file) and the CBCT scan cannot be achieved, the patient should be CBCT-scanned with the NaviTray, following the Impression Registration procedure



## Case selection (before CBCT scan)

The patient should have no or very few metal-containing crowns.

**Only repeat the CBCT scan if any of the following conditions apply:**

- The most recent scan is more than 30 days old
- Changes in the dental/alveolar anatomy have occurred since the last scan, such as orthodontic movement, extractions, restorations etc.
- Motion artifacts are present
- The resolution of the previous scan is lower than 0.3mm

**Please refer to Appendix II for CBCT scanning protocol.**

## Case selection (after CBCT scan)

Load the case into Navident and verify sufficient landmarks are available for tracing. If the case is accepted, proceed to the next step.

## Navident planning

After the restoration and implant placement plan is created using the CBCT data, landmarks for trace registration must be selected.

This process involves selecting and marking the tracing starting points on anatomical structures, on either the CBCT scan or on a surface scan matched to it.



## Instrumentation






- Calibrator
- Surgical handpiece with DrillTag
- Tracer
- Jaw Tracker or Head Tracker

Ensure there are sufficient Navident licenses on the laptop prior to getting started.

**See Appendix III for cleaning and sterilization.**

## Surgical preparations

The initial surgical preparations are similar to the Impression Registration procedure. The following steps relate to trace registration after verification on screen that all tags are detected by the Navident camera.

- |  |   |
|--|---|
| 1. Calibrate tracer  |  |
| 2. Trace or touch landmarks*   |  |
| 3. Accuracy check with tracer tool to verify the registration accuracy |  |
| 4. Calibrate the handpiece - Axis, Drill tip                           |  |
| 5. Accuracy check with the drill tip                                   |  |

\* NOTE: Landmarks are always numbered from the patient's right to left. This is also the sequence in which they are traced.

## Conduct guided surgery

The process is similar for Impression Registration and trace registration.

### Don't forget!

All of the key steps are covered in detail in our easy-to-follow video tutorials. Head online:



### Teamwork

Many of these tasks can be completed by a dental assistant with appropriate support and training.



Please refer to Appendix I to access our simple delegation planning tool.



# Chapter 3. The partially edentulous patient; the workflow for complex cases




## Indications

A case becomes more complex if any of the following apply:

- A tooth set-up visualization is required
- Teeth need to be extracted
- Immediate restoration is required
- Impression Registration is not providing the desired result, and should be combined with trace registration with one or multiple landmarks
- There are fewer than three traceable structures visible

## Selecting the Navident protocol for treatment

After the clinical examination and before taking the CBCT, careful selection of the registration method needs to be carried out. The registration method should be optimized for the specific case. As well as suited to the clinician's personal preferences, the choice of registration needs to be the least intrusive method possible.

Impression registration	Traces to CT scan	Traces to surface scan	Bone screws registration
<ul style="list-style-type: none"><li>• Three stable teeth which can support the Navimpression</li><li>• CT scan made with NavITray available</li></ul> 	<ul style="list-style-type: none"><li>• CT scan shows at least 3 easily visualized structures</li><li>• Structures are firm and stable</li><li>• Structures have a clear visible external surface</li></ul> 	<ul style="list-style-type: none"><li>• When the surfaces of at least 3 traceable structures are not easily visible</li><li>• The match of the surface scan should be verifiably accurate</li></ul>	<ul style="list-style-type: none"><li>• Compatible brands: Salvin, Truffix, Ustomed</li><li>• To be used in more complex cases, i.e. edentulous ones</li></ul> 

## Instrumentation

The appropriate tracking tag should be chosen prior to surgery, based on the case and the selected registration method.

## Navident planning - landmark selection

Landmark selection requires more attention in complex cases. Based on the number and location of the landmarks, a prediction is computed of the registration deviation at the location of the planned implant.



The lower the deviation, the greater the potential for more accurate implant placement. Moving the locations of landmarks, or adding new ones, immediately updates the deviation magnitude values. It is important to aim for the best accuracy prediction for the case.

In certain cases, it is advisable to combine Impression Registration with trace registration to achieve optimum accuracy.

## Surgical preparations

The surgical protocols for simple and complex cases are similar.

### Warning!

- **Teeth immediately adjacent to a recent extraction might not be suitable for tracing, due to minor location changes**
- **Careful consideration is needed to decide whether to extract a tooth or raise a flap before or after trace registration**

### Need more help?

Head online to access all our video tutorials



# Chapter 4. The workflow for full-mouth cases using Impression Registration

## Indications

Cases are categorized as edentulous when there are not enough available natural landmarks for tracing and installing a Jaw Tracker-C or Jaw Tracker-U.

Such cases are often prosthetically driven. The workflow below incorporates all the steps for prosthetically driven cases; however, some may be optional.

## Preparation of a well-fitting final denture or intermediate replica

The suitability of the existing full denture needs to be evaluated. Criteria include tooth selection, tooth position, fit, tongue space, and border contour and positions. Prior to the scan, decisions need to be made about relining, rebasing or refabricating the denture.

## Registration preparations

Impression Registration can be used in cases where a NaviTray can be placed on a well-fitting denture.

For preparation of intra-oral landmarks for registration using bone screws please refer to chapter 5.

## Preparation of denture or replica for CBCT scan and for surface scan

The purpose of this step is to provide a digital replica of the denture (STL) accurately placed on the patient's jaw (DICOM), to allow for the top-down planning of the supporting implants in Navident, based on both the denture and the available underlying alveolar bone.

This is accomplished by introducing physical, radiopaque landmarks onto the denture, which can be clearly seen in both the surface scan and the CBCT scan and used to match the two. As the denture is CBCT-scanned when accurately placed on the patient's jaw, the result is an accurate digital match of the replica of the denture (STL) with the patient's DICOM.

Two options are available:

1. Adding a minimum of three radiopaque markers to the denture. The denture and the radiopaque markers should consist of a material that will cause no scatter which could lead to inaccuracies in the scan. A commonly used material is gutta-percha or glass/ceramic markers, which are highly radiodense, but do not generate scatter artifacts.

**Important:** The markers should be added **onto the surface** of the denture, so they will also be apparent in the surface scan.

With a superficial cavity, glass markers can be easily glued and removed after the scanning procedure.



2. 1.0 mm Suremark Clearmarkers (<https://www.suremark.com/catalog/dentalmark>) are recommended. These peel-and-stick, artifact-free radiopaque markers are very effective and simple to use. They are affixed to the denture with a special adhesive and are easily removed after completion of the scan.

**Important:** Ensure a pressure-free fit of the denture.

## CBCT scan acquisition

- The patient is CBCT scanned, wearing the denture with radiopaque landmarks. The NaviTray must be fitted on the denture
- Check the denture is accurately seated on the patient's jaw
- The patient should be stabilized in the CBCT scanner, preferably seated



### Warning!

- Extra caution should be taken to avoid exerting force on the NaviTray before or during CBCT scanning

- Stabilize the patient's head using a chin rest. Cotton rolls should be placed between the two arches for the patient to bite, to avoid direct biting on the NaviTray
- CBCT-scan the patient
- Remove the NaviTray and Navimpression. The NaviTray is a reusable part. **See Appendix III for cleaning and sterilization instructions**
- Wash the Navimpression in cold water and allow to dry in a safe cool place. When dry, store in the attached plastic bag. Complete the patient's details and anchoring teeth numbers on the sticker and store until time of surgery
- Evaluate the denture to confirm complete seating and ideal positioning (if incomplete seating occurs, a radiolucent airspace will be seen in the CBCT scan)

### Surface scan of the denture

A surface scan of the denture is performed when it is outside of the patient's mouth. It can be taken using a laboratory or intra-oral scanner, subject to the make and model.



The surface scan can be either of the denture's polished surface or may also include the denture's tissue surface. It is necessary to have the landmarks included in the surface scan to allow for the DICOM matching.

**Important:** The CBCT and surface scans should ideally be taken **at the same appointment** in order to ensure the stickers are in the exact same position. They may be removed after both scans are captured.

### Planning supporting implants in Navident

The CBCT scan is imported into Navident, followed by import of the surface scan. The Navident software will enable accurate matching of the denture surface scan with the CBCT scan, based on the reference landmarks. The clinician plans the supporting implants based on the denture surface scan and underlying bone, displayed as matched on the Navident screen.


### Denture fabrication (optional)

An immediate or provisional denture may be fabricated by the laboratory. The lab may fabricate an accurate digital or plaster cast that incorporates the soft-tissue anatomy along with ideal implant position. An immediate denture may also be fabricated, to be fitted at the time of implant placement. Caution should be exercised with this technique, and the clinician should be aware of the complications that may arise in immediate loading cases.

### Surgical appointment


1. Secure the Jaw Tracker-T in position with the Navimpression
2. Navident allows switching to a different jaw tracking tag. To do so, a window should be made in the provisional prosthesis to allow the positioning of Jaw Tracker-B using bone screws, while ensuring Jaw Tracker-T is kept in place
3. Make sure that both tracking tags are visible to the Navident camera. Navident will detect the newly installed tag and will transform the registration automatically
4. Wait for the transfer to complete and remove the prosthesis
5. Perform an accuracy check to verify the registration

In maxillary cases, the Head Tracker may be used instead of Jaw Tracker-T.



**Need more help?**

Head online to access  
all our video tutorials





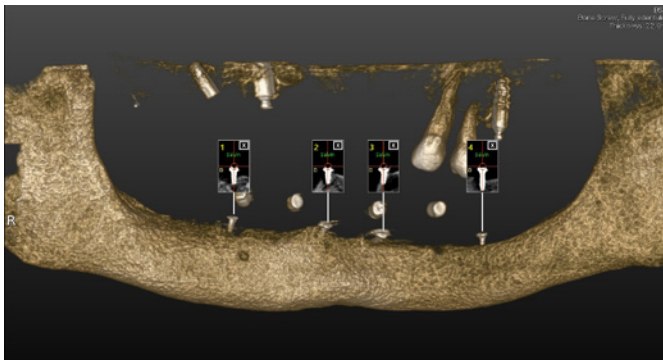
# Chapter 5. The workflow for edentulous cases using bone screws

Please refer to the introduction in Chapter 4 for indications, and preparation of a well-fitting final denture or immediate replica.

## Preparation of intra-oral landmarks for registration using bone screws

Bone screws provide easy-to-use registration landmarks. These are landmarks that are apparent both in the patient's mouth and the CBCT scan and serve as reference points for joint registration for the purpose of surgical navigation.

At least four bone screws (approved for use with Navident) should be inserted prior to taking the CBCT scan. The bone screws may be placed either buccally or occlusally at mucosa level.



See Chapter 4 for preparation of denture or replica for CBCT scan and for surface scan.

## CBCT scan acquisition

- The patient is CBCT scanned, wearing the denture with radiopaque landmarks
- Check the denture is accurately seated on the patient's jaw
- The patient should be stabilized in the CBCT scanner, preferably seated
- Stabilize the patient's head using a chin rest, not a bite stick, which may cause slight dislocation of the denture
- Evaluate the denture to confirm complete seating and ideal positioning (if incomplete seating occurs, a radiolucent airspace will be seen in the CBCT scan)

Refer to Chapter 4 for surface scan of the denture and planning supporting implants.

### Need more help?

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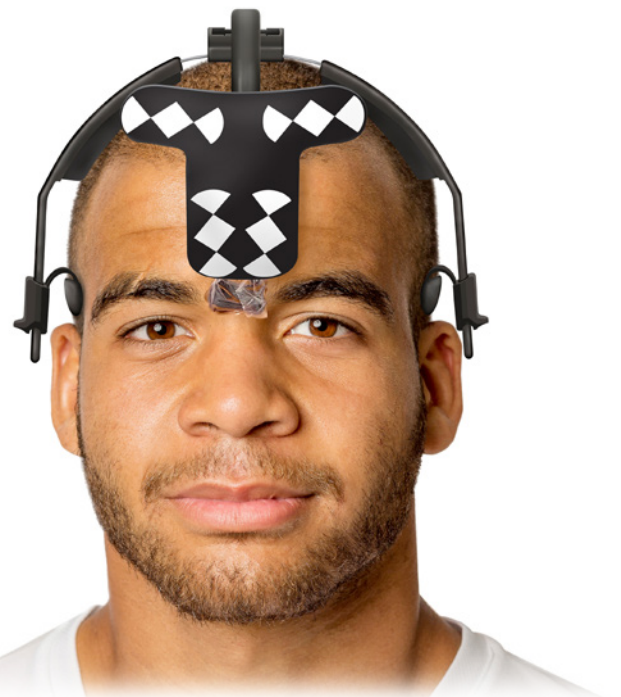


## Surgical appointment

Option 1: Jaw Tracker-B is secured in position with bone screws.



Option 2: In maxillary cases, the Head Tracker may be used instead.



Registration of the CBCT scan with the patient's jaw is performed by Pair-Point registration using the bone screws placed in the patient's jaw prior to taking the CBCT scan.

An accuracy check must be performed prior to surgery. In this case it can be done by touching the attached gingiva or preferably exposed bone crest. Bone screws should be removed after implant placement.

# Chapter 6. The workflow for the atrophic maxilla

## Indications

Atrophic maxilla cases involve pterygoid or zygomatic treatments with the use of a straight handpiece. The workflow is similar as for edentulous cases, although prosthetic considerations may vary.

## Instruments

The Tag Adapter is connected to the instrument in the same way as to the surgical handpiece. Both a contra-angle handpiece and a straight handpiece may be prepared prior to treatment, depending on which instruments are expected to be used. Both the Handpiece Tracker and the DrillTag can be used for straight handpieces.

## Calibration

1. In the side panel, select Tip only. Once both the Jaw Tracker and Handpiece Tracker or DrillTag are being tracked by the Navident camera, the drill tip should be calibrated.
2. Hold the drill tip perpendicular and place the tip in the dimple marked 2 on the Calibrator while holding both in front of the camera. The system indicates the progress, as the tip is being calibrated.

**Note:** Some straight handpieces are compatible with axis calibration, which can be done in the same way as a contra-angle handpiece. A combination of axis and tip calibration is always preferable compared to tip-only calibration.

## Tip-only accuracy check

After the tip has been calibrated, it can be visualized on the CBCT image as an arrow. The tip position then needs to be verified. Next, an accuracy check is performed in the same way as with the drill tip.



After accuracy is confirmed, proceed to navigation. The drill tip is represented by a blue 3D arrowhead on the screen.

**Note:** The intersection of the blue and green dashed lines in the axial view is representative of the tip of the arrowhead.



## Resetting calibration

Resetting calibration is required if an instrument needs to be changed during the surgical procedure i.e. from a straight to a contra-angle handpiece, or vice versa.

To recalibrate, click "Reset Calibration" in the side panel. Resetting the calibration will initiate the process from the beginning.

# Chapter 7. Locating calcified canals and root end resection; the workflow for endodontics

## Indications

Navigation through a calcified pulp chamber of a tooth crown is made easy with Navident, facilitating access to the orifice of the canal. In the same manner that a straight path for the preparation of an implant osteotomy is planned and prepared using Navident, a similar approach can be taken to plan and prepare the straight access cavity to the canal orifice.

Root end resection can be performed using trephine drills, piezoelectric saws or surgical drills such as Zekrya or Lindemann burs. This chapter describes the Navident protocol using a surgical drill and high-speed handpiece.

For procedures using piezoelectric saws, please refer to Chapter 8.

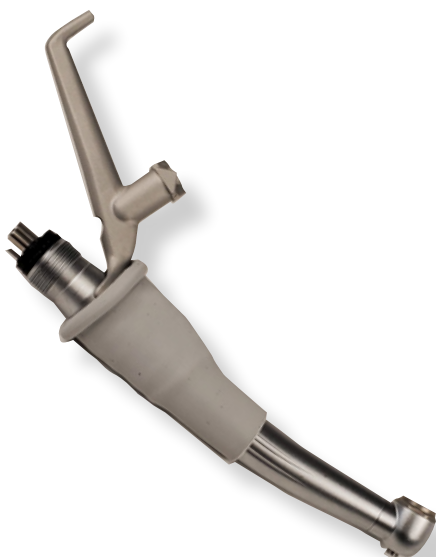
The basic principles that apply to CBCT scan acquisition and importation, planning, registration and navigation, also apply here. However, the workflow differs, as described below.

## Clinical benefits

- Precision guidance to preserve tooth structure
- Bevel of a root end resection and depth of cut can be planned and controlled

## Instrumentation

A high-speed Tag Adapter should be connected to a high-speed handpiece.



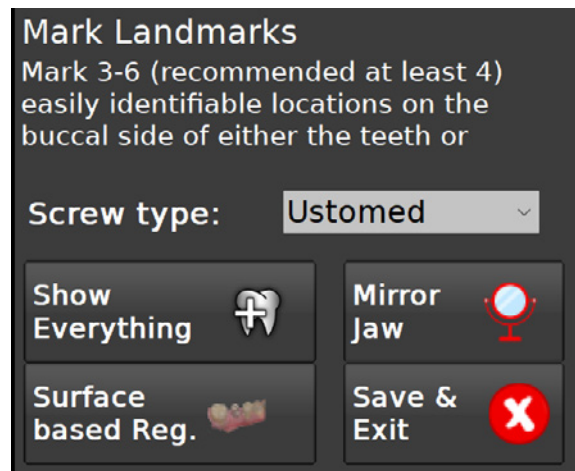
## CBCT scan acquisition

A CBCT scan taken for endodontic treatment is usually with a small field of view (FOV).

## Registration

Any registration method can be used. Usually, the CBCT scan will be registered to the patient using Impression Registration. In the case of trace registration, one of the following ways should be adopted:

1. Directly on the CBCT scan – the preferred option for a large FOV
2. Using an intraoral scan matched with the CBCT scan, subject to an accurate matching

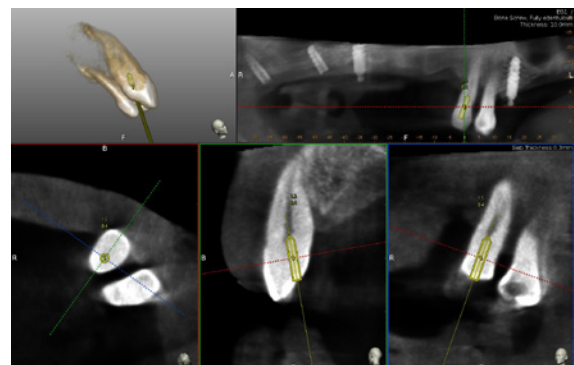


**Note:** If the tooth and the neighboring restorations are porcelain-fused-to-metal crowns, the default method should be Impression Registration.

## Navident planning - landmark selection

A planned implant shape is used as the access cavity. The image of the implant is placed over the tooth and adjusted so that the collar is placed at the entry point on the tooth's surface, and the apex is at the orifice of the canal.

The minimum diameter that can be set is 1.0mm. In the case of trace registration, landmarks are marked as usual.



## Surgical preparations

- Any tracker may be used as long as it is compatible with the chosen registration method. It is important to ensure the endodontic microscope does not impede the line of vision from the patient's tracking tag to the Navident camera.
- The patient tracking tag and/or trace registration, should be performed prior to placement of the rubber dam.
- In the case of trace registration, an alternative method is to place the rubber dam prior to tracing to avoid moving the Jaw Tracker during isolation. It is important to consider the number of teeth needing to be isolated, as clamps may interfere with trace registration.
- Make sure that the rubber dam, once installed, does not exert any force on the Jaw Tracker, which may cause dislocation of the tag.
- A registration accuracy check should be performed as usual.

## Drill calibration and accuracy check

Drill calibration is performed as usual. After the drill axis and tip have been calibrated, the diameter of the on-screen drill model overlaid on the cross section during navigation can be set to match with the actual surgical drill diameter. This can be particularly effective for locating calcified canals.

# Chapter 8. The workflow for piezoelectric surgery

## Indications

The use of dynamic navigation in combination with a piezoelectric instrument can be advantageous for a range of procedures including:

- Bone decontamination
- Bone graft harvesting
- Surgery in the maxillary sinus floor
- Orthognathic jaw surgery
- Endodontic microsurgery

Integration of dynamic navigation with piezo surgery requires skill and experience and should not be undertaken until the clinician has undertaken several hours of practice.

## Instrumentation

A universal Tag Adapter should be connected to the piezo instrument.



Then:

- First connect the piezo tip to the instrument and, according to the position of the tip, attach the Tag Adapter for Navident. The clinician then decides how both should be aligned for optimum ease of use during treatment.



- The tip and connector are aligned in many cases but this is dependent on the procedure and area to be treated.
- Autoclave the instrument after both tip and Tag Adapter are connected, to ensure everything is prepared prior to the treatment.

## Registration

Impression Registration or trace registration is carried out as usual. Following registration, proceed with calibration of the piezo instrument by selecting **Tip Only** or **Saw** calibration.

## Tip calibration

1. In the side panel, select the **Tip Only** option.
2. To calibrate the tip, hold the tip perpendicular to the calibrator's top plane on position 2.



3. After calibration, carry out an accuracy check. As there is no axis calibration, Navident will indicate that the angle is not completely accurate.

## Saw calibration

1. In the side panel, select the **Saw** option.
2. Hold the Calibrator and the piezo handpiece with the DrillTag in the tracking camera's field of view.



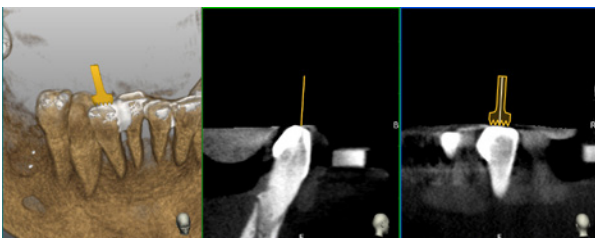
3. Insert the piezo saw tip into the channel marked 3 on the Calibrator.



4. Position the tip against the metallic wall while holding it pressed against the bottom of the channel.
5. Insert the saw blade into the channel marked 3, slightly pressed against the bottom of the channel. The blade is centered against the white line and is leaned against the white marked wall, to keep it perpendicular to the top plane of the Calibrator.
6. Wait for the calibration process to end.
7. The saw blade image width should then be set to match the saw width. This is performed in the same way as the surgical drill image is set.

An accuracy check is carried out after calibration.

If the accuracy check results are satisfactory, proceed to navigated surgery.



## Resetting calibration

The saw blade needs to be recalibrated in the following cases:

- Accuracy check has failed
- The saw blade has been replaced
- The instrument needs to be changed during surgery to a low- or high-speed handpiece
- The calibration process does not start, for instance, if there is a second DrillTag in view

To recalibrate, click **Reset Calibration** in the side panel, which will initiate the process from the beginning.



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# Chapter 9. The workflow for use of multiple instruments

## Indications

When multiple instruments are navigated or guided during the same procedure, there are additional steps to take in the Navident protocol. Examples of cases requiring multi-instrument workflows are:

- Alveolar ridge splitting
- Implant site preparation
- Partial extraction therapy

## Clinical benefits

- Good surgical practice for complex cases

## Contraindications

- Guiding multiple instruments during the same treatment impacts on the surgical preparation and the treatment itself. It is recommended clinicians gain some experience with single-instrument workflows before proceeding to more advanced guidance cases.

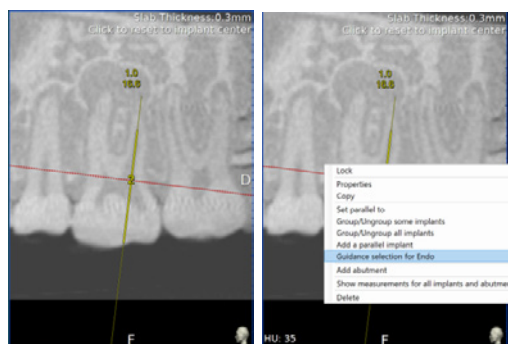
## Instrumentation

- Multiple instruments are used during the same treatment. Each of these instruments must be prepared with a tag adapter prior to treatment
- It is recommended only one procedure kit is used and thus one DrillTag, which will be barcode-scanned prior to treatment
- The barcode needs to be scanned each time a DrillTag is changed

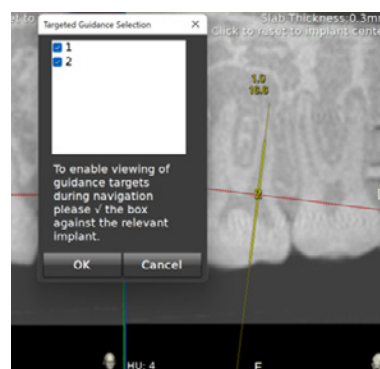
Please refer to your Navident representative for guidance on the use of multiple Handpiece Trackers during a single treatment.

## Warning!

- The Navident camera may need to be adjusted when changing instruments.
- Reset the calibration when changing instruments.
- Several osteotomies planned and performed in close proximity can result in an undesirable, automatic back-and-forth guidance switch between the adjacent planned osteotomies. To prevent this from happening and keep navigation focused on one planned osteotomy at a time, disable the guidance function:



- Right click on any of the planned osteotomies; in the drop-down menu select Guided Implants and then the Guided Implants selection menu.
- In the Targeted Guidance Selection form, uncheck all osteotomies and leave marked only the osteotomy for which guidance is required.



- After completion, repeat the above sequence, uncheck the cavity and move on to check the following one.

# Chapter 10. The workflow for immediate loading implant cases

## Indications

Under certain conditions, a range of implant-supported prostheses may be fitted on the same day as surgery.

## Clinical benefits

- Reduced chair time
- Accurately fitting provisional restoration

## Contraindications

Clinical experience with Navident is required and implant placement accuracy is critical. Any conditions such as bone quality that might prevent accurate positioning of the implant should be carefully considered.

## Procedure

1. Carry out CBCT scanning and optical scanning of plaster models or intra-oral scan (IOS) in STL format. **Please refer to Chapters 4 and 5 for more information on preparing for and taking scans for edentulous cases.**
2. Prepare a virtual wax-up of the prosthetic solution with CAD/CAM software.
3. Import the CBCT (in DICOM) and virtual wax-up (in STL format) into Navident to create the prosthetically driven virtual implant plan.
4. Export the plan containing prosthesis and implants/abutments in STL format, and send to the dental laboratory for fabrication of a temporary crown or prosthesis.
5. Perform the treatment fully guided using Navident.

## File import and export using Navident

An IOS in STL format is used to match the implant position and DICOM when exporting from Navident into other planning software, and vice versa.

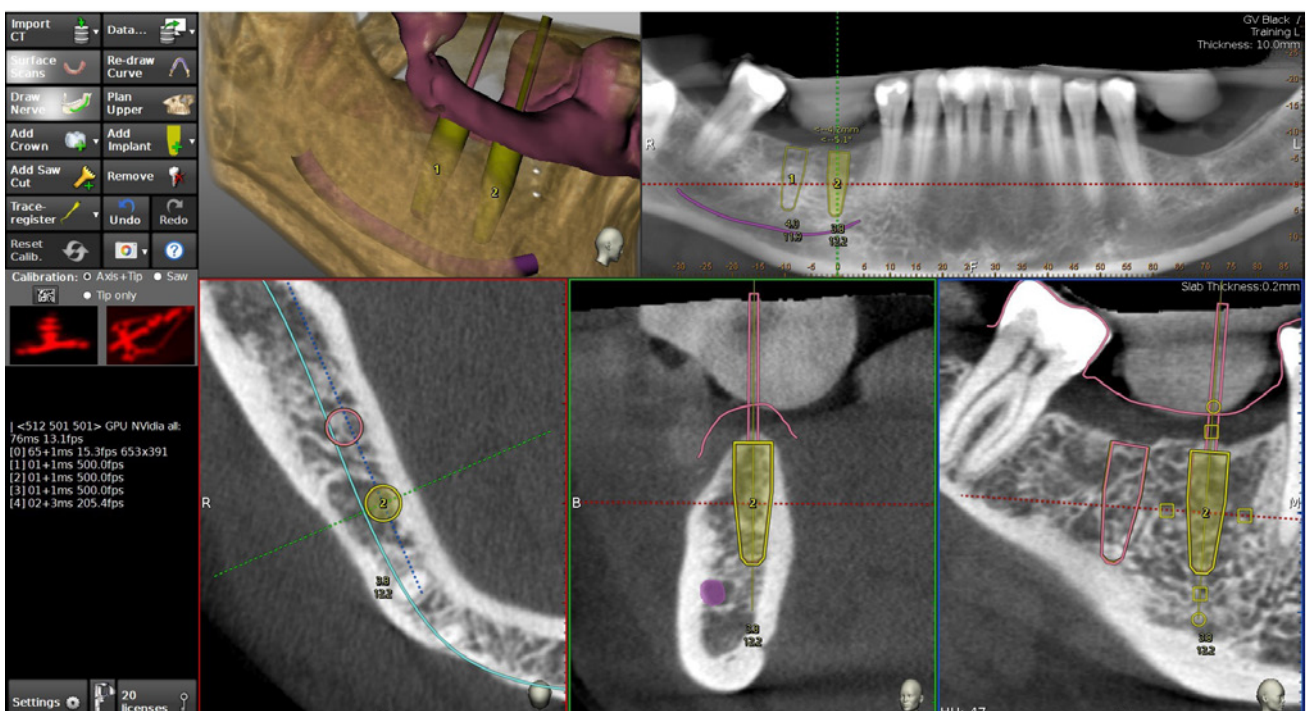
The IOS can be imported into Navident and matched with the DICOM. The implants can then be planned.

The implants and IOS must be exported together. The IOS with implants can be matched again to the DICOM in the planning software.



## Warning!

Since the timing of the implant cannot be planned or navigated, additional communication between the clinician and the dental technician is necessary to gain a comprehensive understanding of the surgical, prosthetic and biological requirements that need to be met by the digitally designed immediate temporary prosthesis.





# Appendix I. Team approach

Many tasks can be easily handled by properly trained team members. As tasks are delegated, the clinician's workflow becomes more streamlined, leading to more efficient use of the diary and chair and freeing up clinical time for more specialized or high-end work. The framework below can be adopted for effective delegation.

## Install a management system with your team in mind

With well-designed systems and step-by-step scripts for team members to follow, clinicians can define protocols and ensure they are followed correctly, with peace of mind that tasks are being carried out to a high and consistent standard.

## Team training for optimal performance

As employees take on new responsibilities, they'll need new skills. Building in time to equip team members with the necessary competence will ensure assistance is optimized for every Navident case.

## Delegation as team building

Delegation can empower team members to take initiative, make decisions and improve practice performance.

Task	Clinician	Dental assistant	Comments
<b>Planning</b>			
Navimpression and NaviTray			
CBCT scanning			
Planning preparation			
Lab communication			
<b>Pre-surgery</b>			
Preparing instrumentarium			
Positioning the Navident cart			
Installing the tracker(s)			
Barcode-scanning			
Trace registration			
<b>Post-surgery</b>			
Disassembly and cleanup			
Sterilization			

# Appendix II. CBCT scanning protocol

## Considerations

- For optimal results, the spacing between voxels should be 0.4mm or less in any dimension.
- Check for 'smearing' or 'double-edge' artifacts, indicating patient motion. Patient motion may severely degrade navigation accuracy.
- Navident only supports a single frame per DICOM file format i.e. each slice is stored as a separate .dcm file.

## CBCT scan with NaviTray

1. Prepare the NaviTray with Navimpression as recommended.
2. Without removing the NaviTray, proceed to scanning the patient.
3. Place patient and stabilize their head in the CBCT device.
4. Extra caution should be taken to avoid exerting force on the NaviTray before or during CBCT scanning.
5. Chin rest: Cotton rolls should be placed between the two arches. The patient should bite on them to avoid biting on the NaviTray.
6. CBCT-scan the patient.
7. Remove the NaviTray and Navimpression. The NaviTray is a reusable part. For reprocessing instructions, see cleaning and sterilizing instructions in Appendix III.
8. Wash the Navimpression in cold water and allow it to dry in a safe, cool place. When dry, store it in the attached plastic bag. Complete the patient's details and anchoring teeth numbers on the sticker and store until time of surgery.

## Warning!

**Caution should be taken to avoid locking the Navimpression on the anchoring teeth. This can occur as a result of molding over gaps between teeth, where the material can get trapped. If the Navimpression gets locked, the NaviTray should be removed and the material cut with scissors and/or with a high-speed FG diamond drill used for composite resin polishing. This helps to avoid damage to teeth enamel.**

**Clinical judgement should be exercised when molding the Navimpression on restored teeth. Thin enamel walls surrounding large restorations are susceptible to breakage when the Navimpression is removed from the teeth.**

## CBCT scan with bone screws

1. Stabilize the patient's head in the CBCT device using either the chin rest or a bite-stick.
2. CBCT-scan the patient, making sure that all inserted bone screws are within the FOV.

**Please refer to the Navident User Manual (990-09001) for a complete list of Warnings and Cautions.**

# Appendix III. Cleaning and sterilizing instructions

## Single-use items (to be disposed of after surgery)

- DrillTag
- Thumb screws
- Head Tracker nose pad
- Bone screws

## Reprocessing the Head Tracker

- Use two to three fresh disposable disinfecting wipes to thoroughly clean all surfaces. Contact time should be at least five minutes.
- Moisten a sterile lint-free cloth with distilled water and wipe all surfaces for 30 seconds.
- Use a dry sterile lint-free cloth to dry the surfaces.

## Reusable parts

- Tag Adapter
- Jaw Tracker-B
- Jaw Tracker-C
- Jaw Tracker-U
- Jaw Tracker-T
- Calibrator
- Tracer-4
- NaviTray

## Cleaning procedure

All instruments should be cleaned after each use.

Clean all component surfaces with mild soap or detergent using a soft-bristled brush. Rinse components with running tap water while inspecting for cleanliness.

After components have been cleaned, the following steam autoclave guidelines are recommended:

- Always place components in autoclave bags with the barcode facing upwards (if any)
- Sterilizer type - Gravity
- Temperature - 121° C
- Time - 30 mins
- Drying time - 50 mins

All reusable accessory parts have been tested to remain fully functional for 50 usage and reprocessing cycles.

**Please refer to Navident User Manual (990-09001) for further details.**

## Appendix IV. Additional support

Please refer to Navident's library of helpful online video tutorials.

- Performing an accuracy check
- Attaching the tag adapter
- Barcode scanning
- Calibrating instruments
- Drilling and implant navigation
- Fitting the Head Tracker
- Impression Registration
- Handpiece Tracker (Rocket) installation
- Patient preparation with Impression Registration
- Using Jaw Tracker-B
- Using Tracker-C
- Using Jaw Tracker-U
- Landmark selection
- Tag installation
- Trace registration
- Importing and exporting planned cases



### Further details

**Need further help?** For further guidance and support to help maximize the benefits of dynamic guided surgery, call us on +1 (647) 951 1525, email [info@claronav.com](mailto:info@claronav.com) or contact your local Navident representative.

## ABOUT US

Navident is manufactured by ClaroNav Inc., a Toronto-based company with a long heritage in CT-based navigation and optical tracking technology for the fields of neurosurgery, ENT and dentistry.

ClaroNav trains and supports customers from its offices in Canada, Europe and Asia, and through its worldwide network of local distributors.



The Dynamic Navigation Society is a community of internationally renowned experts focused on optimizing implant and endodontic treatment techniques. All levels of dynamic navigation training are delivered by the Society's global network of Master Clinical Trainers.

**Email [dns@claronav.com](mailto:dns@claronav.com) for details of our upcoming events.**

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Navident is cleared by the FDA for sale in the United States and approved for commercial sale in Canada and the EU.





**NAVIDENT**  
by 

V2 issued  
Spring 2023

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