Imaging Protocols

for the Cranial, DBS, Spine, and ENT Applications

Technical Support Line
800.595.9709 or (+1) 720.890.3200

The following requirements apply to all scans taken for the Cranial, DBS, Spine, and ENT applications.

☐ Contrast agents may be injected before scanning.

☐ Scan contiguous slices.

☐ Use a constant slice thickness.

☐ Axial slices are preferred.

- CT scans: Axial/helical scans are acceptable using a pitch ratio of 1:1.

- MR scans: If 3D acquisition is used, reformat the scan to 1mm axial slices.

☐ Use a circular (or square) field of view (FOV) — the smallest FOV to encompass the region of interest.

- Cranial and ENT scans: up to 25cm (250mm) for a normal adult head size.

- Spine scans: up to 18cm (180mm) to completely encompass all vertebrae of interest, including the spinous and transverse processes.

- Stereotactic scans: usually 28-32cm (280mm to 320mm) to include AC/PC structures, target region, entry region (if desired), and stereotactic frame (if applicable).

☐ Use a square image matrix of 256 x 256 or 512 x 512.

☐ Use square pixels.

☐ Archive the scan in an uncompressed file format (exception: compressed scans from GE scanners are acceptable).

☐ If you intend to merge two or more exams using StealthMerge™ or ENT Scan Merge software, ensure that several identifiable landmarks are included to enable matching.

CT Scans Only

☐ Standard soft tissue algorithm

☐ No gantry tilt

MR Scans Only

☐ No oblique slices

☐ Single-echo, no multi-echo scans

☐ Any MR imaging sequence can be used to show anatomy/pathology.

Cranial and DBS Specific Requirements

For **Cranial and DBS scans only**, observe the following additional requirements:

☐ Use a less than 3mm slice thickness (any fractional slice thickness between 1 and 3mm is acceptable).
  - 1mm slice thickness usually produces the highest quality dataset (depending on the scanner).
  - 3mm is the largest slice thickness acceptable for use with the Cranial application.

  Note: Include the hard palate, tip of the nose, the ears, the top of the head, and all fiducial markers in the scan. For cranial scans, ensure that the tip of the nose is the most anterior point on the scan.

☐ Separate the patient's head from the scanner headrest with towels or foam.

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Fiducial Placement For Cranial Scans

Although imaging may occur at any time prior to surgery, fiducial markers must remain fixed from the time of scanning until after surgery. Instruct the patient not to remove or alter the position of the markers until after surgery. If a marker falls off after the patient has been scanned, leave it off.

1. Choose a site where the skin is taut. Shave a small patch of hair (approximately one inch square) at the site where you will place the fiducial marker.

2. Clean the site with alcohol to strengthen the marker's adhesion to the skin. Allow the site to dry thoroughly.

   Note: If the patient is diaphoretic, you may wish to apply adhesive.

3. Remove the paper from the adhesive backing on the marker, and place the marker at the prepared site.

4. Mark the skin with an indelible ink pen through the hole in the center of the fiducial marker.

5. Place six to ten additional markers in this manner.

   Distribute the markers around the surgical target such that they do not all lie in the same plane or along the same line. It may be helpful to place two markers near each other on one side of the head to help the surgeon confirm correct image orientation.

6. Ensure positioning in the scanner does not shift any of the fiducials.

7. Image the patient according to the appropriate protocol given in this document.

Spine Specific Requirements

For **Spine scans only**, observe the following additional requirements:

☐ Use a 1 to 2mm slice thickness.
  - 1mm slice thickness usually produces the highest quality exam and is preferred for imaging the cervical spine.
  - 2mm is the largest slice thickness acceptable for use with the Spine application.
☐ Scan coverage should include one-half vertebra above and below the region of interest (see "Scan Coverage Area" on page 3).
☐ When imaging the sacrum, scan past and include the sciatic notches.

ENT Specific Requirements

For **ENT scans only**, observe the following additional requirements:

☐ Use a less than 2mm slice thickness (2mm is the largest slice thickness acceptable for use with the ENT application).

☐ Scan from the superior aspect of the horizontal portion of the mandible through the top or vertex of the cranium. Include the ears, maxillary teeth, and the tip of the nose.

   Note: Ensure that the tip of the patient's nose is included in the scan and that it is the most anterior point on the scan. Also, start the scan above any dental work to avoid creating artifact.
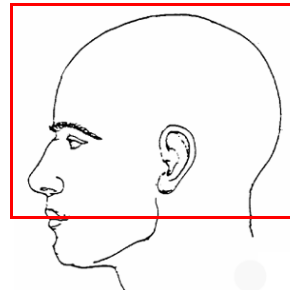
☐ Place the patient's head in a foam headrest.

   Note: If the patient cannot remain still, use a scanner cradle. Separate the patient's head from the scanner cradle with towels or a foam headrest. Make sure that the patient's ears do not touch the sides of the cradle, and that they are not pushed away from their normal position.

Scan Coverage Area

Cranial

Typical scan region for Cranial (unless the lesion is very low)
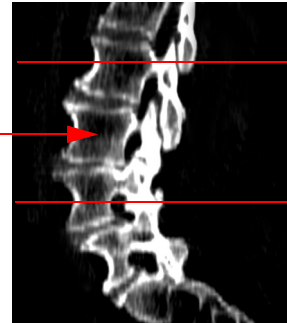
Note: Include the localizer frame in a stereotactic scan.
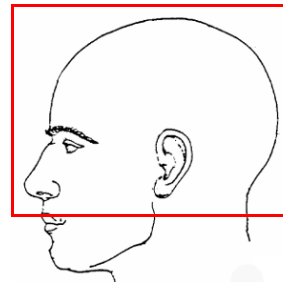

Spine

Typical scan region for Spine

Vertebra of Interest

Minimum scan region

ENT

Typical scan region for ENT (unless the procedure is lateral)

Scan Examination

The surgeon or imaging technician should examine the completed scan(s) to verify that:

☐ For stereotactic scans, all nine rods are visible and are in the correct orientation.

☐ The patient image orientation is correct.

☐ The total pathology/region of interest is visible.

☐ The planned surgical target and entry points are visible.

☐ The slice thicknesses are constant throughout the scan.

☐ No motion artifact is present.

☐ No gantry tilt or oblique slicing was used.

☐ All other aspects of the imaging protocol were followed.

Scan Transfer

Archive the exam from the scanner to a CDR or optical disk, or transfer the exam electronically to the Medtronic Computer-Assisted Surgery system via a DICOM network. Do not archive or transfer scout images.

⚠ **Caution:** A Pegboard Accuracy test may be required if exam accuracy appears compromised. Contact Medtronic Navigation to schedule a Pegboard Accuracy test.

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Assistance

For questions about the Imaging Protocols, contact your local Computer-Assisted Surgery Specialist or call technical support at (+1) 800.595.9709 or 720.890.3200.