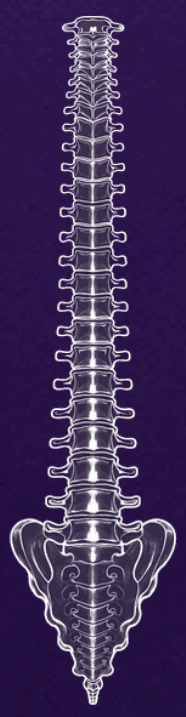
RADIOLOGICAL PROTOCOL

Unique anatomies, customized solutions

# COLUMN



VALOR IMPLANT

# Radiological protocol CT - Column

The basic requirement for digital surgical planning is a high-quality computed tomography scan with clear and well-defined bone edges. These qualities are essential for the correct design of personalised instruments and implants.

**Indications**

This protocol is indicated for personalised surgical planning studies of thoracic-lumbar and cervical spinal fusion.

**Recommendations**

The X and Y centres should be not modified between scans, nor should the table be raised or lowered between slices. The scan should be performed using the same field of view and reconstruction centre.

**Acquisition:**

| | |
|---|---|
| **Locator** | As needed to identify the vertebrae and avoid bone cutting  |
| **Scan acquisition** | Continuous axial acquisition of the entire region of interest (ROI) |
| **Scan type** | Helical/spiral |
| **Slice thickness** | Must not exceed 1.25 mm |

| | |
|---|---|
| **Slice spacing** | Same as slice thickness |
| **Field of view** | Minimise the DFOV to include only the ROI. Do not exceed 50 cm (500 mm) |
| **Matrix** | 512 x 512 |
| **Recommended kVp** | Adults: 120-140 kVp<br>Use higher kVp for patients with greater body weight<br>Pediatrics: According to  body habitus |
| **Helical pitch** | Do not exceed 1<br>Set as close to 1 as appropriate |
| **Gantry tilt** | 0º |
| **Series** | Original images reconstructed from raw data.<br>Do not apply lossy compression  to DICOM images.<br>No reformats, screenshots or multiplanar reconstructions (MPR). |
| **Recommended kernel** | Soft tissue, B40 or equivalent |
| **File type** | Uncompressed DICOM |
| **Send to PASC** | The slice thickness must not be grater than 1.25 mm with contiguous spacing |

# Appendix- Reduction of metal artefacts (MAR) and noise

**Objective**

Minimise artefacts caused by prostheses, screws or osteosynthesis along the spine, while preserving bone and soft tissues diagnostic image quality and enabling valid reconstructions for 3D planning and STL export.

**Acquisition settings (add without modifying the original ROI)**

| Parameter | Recommended | Notes / Justification |
|---|---|---|
| **Region** | From the most cranial vertebra indicated to the sacrum | Prevents implant truncation |
| **kVp** | 140 kVp (fallback 120 kVp) | Reduces beam hardening from metallic materials |
| **mA / AEC** | Automatic with an upper limit 20–30% above standard | Compensates for increased noise due to MAR and high kVp |
| **Rotation time** | 0.5-1.0 s (prioritise 0.5 s) | Minimises motion artefacts |
| **Pitch** | 0.7-1.0 (recommended 0.8) | Balance between coverage and resolution |
| **Collimation/slice thickness** | ≤0.625 mm | Isotropy for MAR and 3D reconstructions |
| **FOV** | Adjusted to the patient's anatomy (max 50 cm / 500 mm). Centred on the spinal axis | Prevents the prosthesis from being located at the detector edge |

| | | |
|---|---|---|
| **Patient position** | Supine or prone, legs flat. Geometrically centred at the isocentre | Centring the metal reduces asymmetrical streaks |

**ALWAYS generate paired series with and without MAR.**

- Reference (without MAR): Soft/moderate kernel, FBP or mild IR; slices 0.6 mm / 0.4 mm increment.
- MAR activated: Soft/moderate kernel + manufacturer algorithm (iMAR/O-MAR/Smart MAR/ SEMAR).
- DECT / Spectral (if available): VMI 100–140 keV (save at least 100, 120, and 140 keV); consider 70 keV for soft tissues if artefact saturation is absent.
- 3D volume (planning): Use the series without MAR, isotropic 0.6 mm, intended for STL export.

**Post-processing and verification**

- Check bone and soft tissue windows; confirm cortical continuity near metal.
- If streak artifacts persist, increase VMI keV (120 → 140 keV) and/or compare with the series without MAR.
- Confirm implant centering and absence of truncation before sending to PACS.
- Always export STL from the series without MAR (MAR can alter geometries).

**Console setup sheet**

```
Name: ORTO_[COLUMNN]_MAR
 kVp: 140 (fallback 120)
 mA (AEC): ON, upper limit +20–30%
 Rotation: 0.5–1.0 s
 Pitch: 0.8 (≤1)
 Collimation: 0.6 mm (recon 0.6 / inc. 0.4)
 Kernels: B40s (suave) + B70f (óseo)
 Series:
    1) Standard IR (B70f)
    2) MAR ON
    3) VMI 100–140 keV (if DECT)
    4) 3D export (withhout MAR)
```

FOV: 140-160 mm centred on the spinal axis, max 500 mm