

RADIOLOGICAL
PROTOCOL

Unique
anatomies,
customized
solutions

HAND



Radiological protocol

CT - Hand

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 trapeziometacarpal (TMC) and schafo-trapezio-trapezoid (STT) interposition implants. Acquisition is performed unilaterally, unless otherwise indicated by the surgical team.

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:

Topogram	The entire hand, from the fingertips to the distal third of the radius and ulna. 
Field of view (FOV)	Adjust the FOV so that no anatomical region is cropped
Matrix	512 x 512

Detector collimation	0.625 mm. Continuous slice increment
Pitch	≤ 1
kVp	90-120 if the patient is obese, elderly or has metallic components
Automatic exposure control	Enabled
Rotation time	≤ 1 s

Reconstrucción:

Multiplanar reconstruction (MPR)	Reconstruction of the complete study in all three planes
Algoritmo de reconstrucción	Soft tissue/moderate algorithm. Do not use the bone algorithm. Use a single window
Grosor de corte MPR	0.625 mm

Appendix- Reduction of metal artefacts (MAR) and noise

Objective

Minimise artefacts caused by metallic material (prostheses, screws or osteosynthesis) in the hand region, 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	Include the entire area including implants and the complete bone structure	Prevents implant truncation
kVp	140 kVp (fallback 120 kVp)	Reduces beam hardening from metallic materials
mA / AEC	Automatic with upper limit +20–30% over 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	0.6-1.0 (recommended. 0.8)	Balance between coverage and resolution
Collimation/slice thickness	≤0.625 mm	Isotropy for MAR and 3D reconstructions

FOV	100–160 mm centred on the hand	Prevents the prosthesis from being located at the detector edge
Posición del paciente	Prone o supine with arms extended forward, hand in a neutral position and geometrically centred	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_[HAND]_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 (soft) + B70f (bone)
Series:
1) Standard IR (B70f)
2) MAR ON
3) VMI 100–140 keV (if DECT)
4) 3D export (without MAR)

FOV: 100–160 mm centred on the hand