

RADIOLOGICAL
PROTOCOL

Unique
anatomies,
customized
solutions

SHOULDER



Radiological protocol

CT - Shoulder

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.

NOTE: If the patient has a previous prosthesis, it is not possible to obtain the scapular surface accurately. In these cases, the CT scan should be performed with the implant removed. If there is a spacer or any other material that generates artefacts, check the metal artefact reduction appendix.

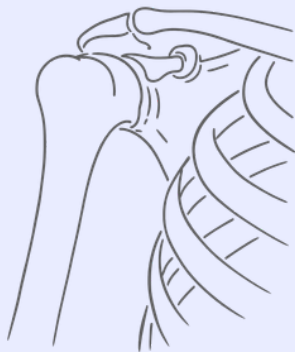
Indications

This protocol is indicated for personalised surgical planning studies of glenoid reconstruction in cases of reverse shoulder prostheses. It includes unilateral acquisition of the affected shoulder, centering the FOV on the scapula and glenoid.

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	Shoulder: Scapula and proximal humerus 
Field of view (FOV)	Adjust the FOV so that no anatomical region is cropped, ensuring inclusion of the entire scapula and the proximal humerus, from just above the acromioclavicular joint to just below the inferior angle of the scapula.
Matrix	512 x 512

Detector collimation	1.25 mm
Pitch	≤ 1
kVp	100 or 140 in obese or elderly patients, or in patients with metallic components
Automatic exposure control	Enabled
Rotation time	≤ 1 s

Reconstruction:

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

Appendix- Reduction of metal artefacts (MAR) and noise

Objective

Minimise artefacts caused by prostheses, screws or osteosynthesis in the glenohumeral joint 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	Affected shoulder (includes the entire prosthesis and 5 cm distal to the humerus)	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	0.6-1.0 (recommended 0.8)	Balance between coverage and resolution
Collimation/slice thickness	≤0.625 mm	Isotropy for MAR and 3D reconstructions
FOV	Centered on the humeral head	Prevents the prosthesis from being located at the detector edge

Patient position

Supine, arm in neutral position,
geometrically centered

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_[SHOULDER]_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: 140–160 mm centered on the humeral head