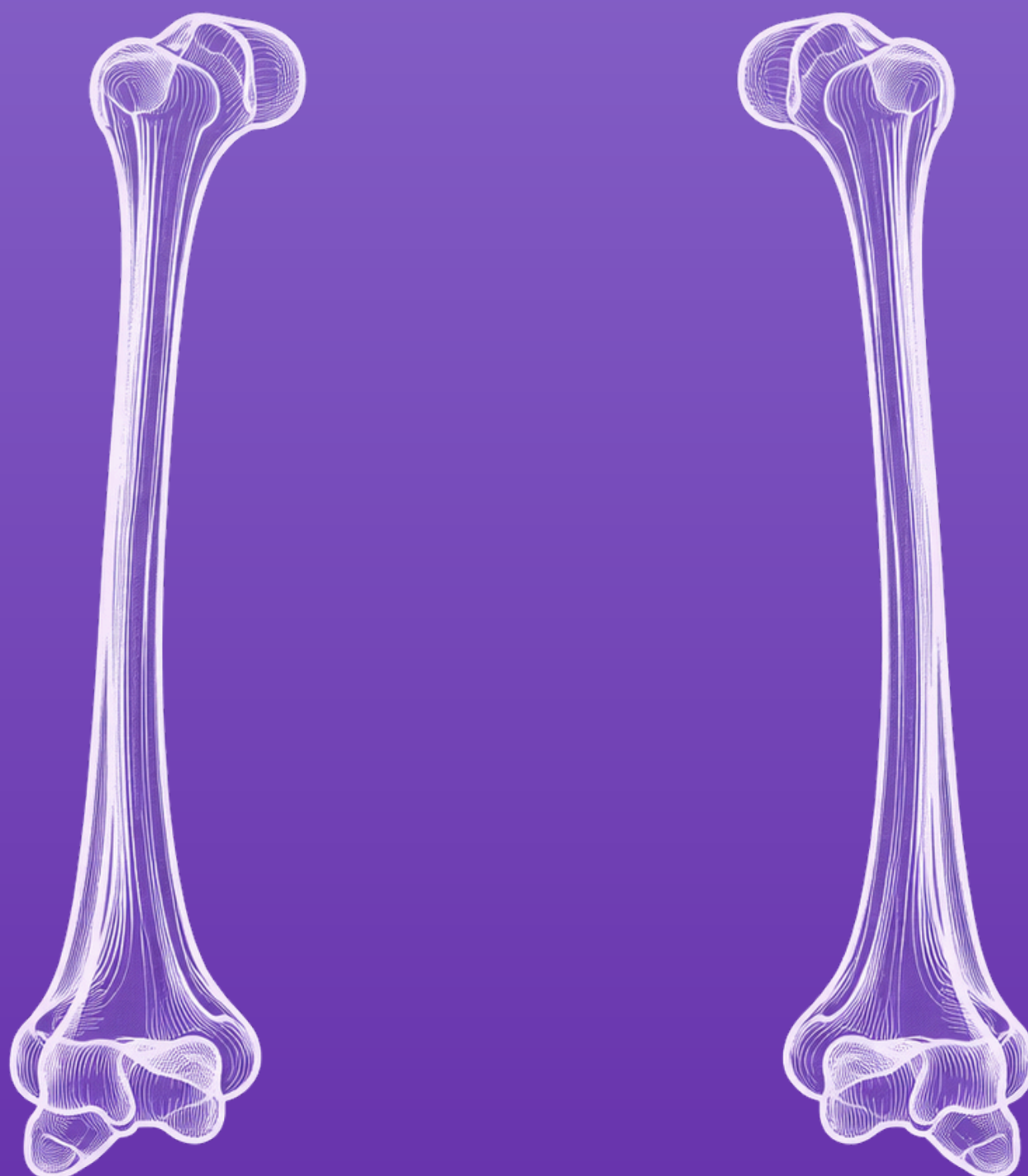


Unique  
anatomies,  
customised  
solutions

RADIOLOGICAL PROTOCOL

# CT - BILATERAL HUMERUS



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# Radiological protocol

## CT - Bilateral Humerus

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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.

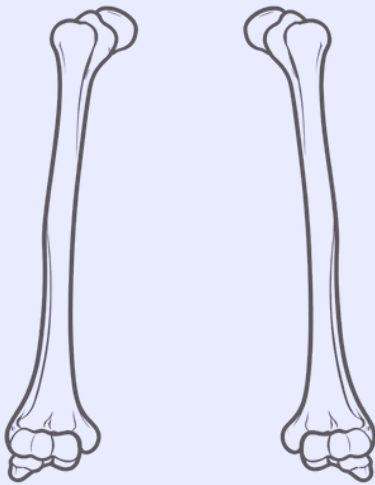
### Indications

This protocol is indicated for personalised surgical planning studies of humeral osteotomy, in which bilateral evaluation is required to determine the correction and the contralateral anatomical reference. It includes the acquisition of both humeri from the humeral head to the elbow.

### 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:

<b>Topogram</b>	Húmero, desde la escápula hasta el codo, incluyendo la totalidad del húmero 
<b>Field of view (FOV)</b>	Adjust the FOV so that no anatomical region is cropped. If it is not possible to cover the area in a single acquisition, perform one series for each side.
<b>Matrix</b>	512 x 512

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

**Reconstruction:**

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

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

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## Objective

Minimise artefacts caused by prostheses, screws or osteosynthesis along the bilateral humeral axis, 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	Both entire humeri (from the humeral head to the distal condyles). Include the elbow if distal metallic material is present	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

<b>FOV</b>	Both entire humeri	Prevents the prosthesis from being located at the detector edge
<b>Patient position</b>	Supine, neutral arm, centred with respect to 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\_[HUMERUS\_BILAT]\_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: 280–320 mm centred on both humeri