CT-Scan Acquisition Protocol

For ExactechGPS Shoulder Application

EN

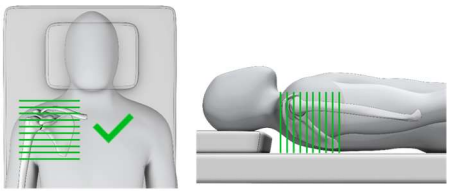
This document details the radiology instructions for a CT scan for use with the ExactechGPS Shoulder Application.

Date

CT exam should be performed **less than 6 months** prior to the surgery and must be representative of patient anatomy (ex: no fracture, no surgery between the CT examination and the GPS surgery).

Patient Preparation

- Do **NOT** use injectable contrast, as it can occlude visualization of the bony anatomy.
- The patient must not move during the exam.
- Lay the patient supine on the scanner table with his/her head orientated toward the scanning tube. Place the patient's indicated arm neutral to his/her side with 0 degrees of internal/external humeral rotation.

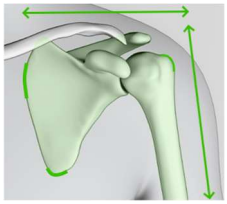


CT Scanner Settings

- Images **must** be acquired in **axial** format with no rotation (gantry tilt = 0°)
- Set modality = **CT**
- Use Hounsfield encoding
- Recommended peak kilovoltage : 120kVp or higher
- Recommended mA: 240 mA or higher
- Set pitch ≤ 1
- Reconstruction Kernel/Window/Algorithm: Bone, with an HD Acquisition setting if available
  Recommended manufacturer settings:

GE: BONE	Toshiba: FC30
Siemens: B41	Philips: L

- The slice thickness (collimator/detector width) and slice spacing (slice increment or recon interval) **MUST be ≤ 1.25mm**. Keep both the slice thickness and spacing equal and constant for the entire exam, with no overlap.
  Please note that this section must be followed when scans are originally taken and not in reconstruction of the images post scan.
    - Minimum distance: 0.3 mm
    - **Maximum distance: 1.25 mm**
    - **Recommended distance: 0.625mm**
- Keep pixels square and constant for all images.
- Resolution
  The display field of view (DFOV) should contain the **entire indicated scapula**, including the medial border and distal tip of the bone. It should also contain at least the proximal portion of the **humerus** - humeral head and half the shaft. Do NOT scan bilateral shoulders in one scan as the field of view will be too large.



The DFOV should be approximately 25 to 30 cm i.e. 10 to 12 inches for a matrix size 512x512.

- The **minimum** resolution for an image is 0.3 x 0.3 mm/pixel
  (i.e. 512 pixels represent at least 15 cm/6'')
- The **maximum** resolution for an image is 1.0 x 1.0 mm/pixel
  (i.e. 512 pixels represent no more than 51 cm/20'')

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Images Format

- Images must be exported in uncompressed, non-encrypted DICOM Format
- The exported images should contain only the **axial** series
  Please do not include any additional series (sagittal or coronal)
  Please do not include 3D reconstructions.
  Do **NOT** include scout images or duplicate images.
- Images must be exported and named in sequential numerical order, with no gaps or duplicates in the DICOM file names.
- The CT-scan will typically contain between 200 and 450 images. The followings tags and included values must be present in the exported CT images in order to be used with the ExactechGPS Shoulder Application:

DICOM Tag	Name	Accepted Values
(0002,0010)	Transfer Syntax	1.2.840.10008.1.2 (Implicit VR Endian) 1.2.840.10008.1.2.1 (Explicit VR Little Endian) 1.2.840.10008.1.2.2 (Explicit VR Big Endian)
(0008,0018)	SOP Instance UID	1.2.840.10008.5.1.4.1.1.2 (CT Image Storage) 1.2.840.10008.5.1.4.1.1.2.1 (Enhanced Image Storage)
(0020,0052)	Frame of Reference UID	Not empty
(0028,0030)	Pixel Spacing	Only one value for all images
(0028,1054)	Rescale Type Attribute	HU

Metal Artifact Reduction

*The recommendations in the section below should be followed **ONLY** if a patient contains existing metal shoulder hardware. All preventative measures to both reduce metal artifact in the scapula and keep the dose low for the patient should be taken.*

- Single energy CT is recommended.
- Recommended peak kilovoltage: 140 kVp
- Recommended mA: 330 mA (do not use auto-mA or dose reduction)
- Apply available iterative metal artifact reductiona algorithms to the scan. Any necessary pre-scan settings should be followed to allow the use of manufacturer specific MAR algorithms:
  - GE: SmartMAR
  - Siemens: IMAR
  - Toshiba: SEMAR
  - Philips: OMAR

Exam can be rejected if images quality is altered. This can be caused by:

- Patient motion during examination
- Metallic artifacts
- Poor images quality

Contact Information

Please email ct.protocol@exac.com with any questions.

INFORMATION

ExactechGPS was CE approved in 2010. Total Shoulder Application system was CE approved in 2016. CE 0459

For additional product information, please contact:

Manufacturer:
Blue Ortho
22 chemin du Vieux Chêne
38240 Meylan – FRANCE
e-mail: service@blue-ortho.com