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Hip Scanning Overview

CTXA Computed Tomography X-Ray Absorptiometry

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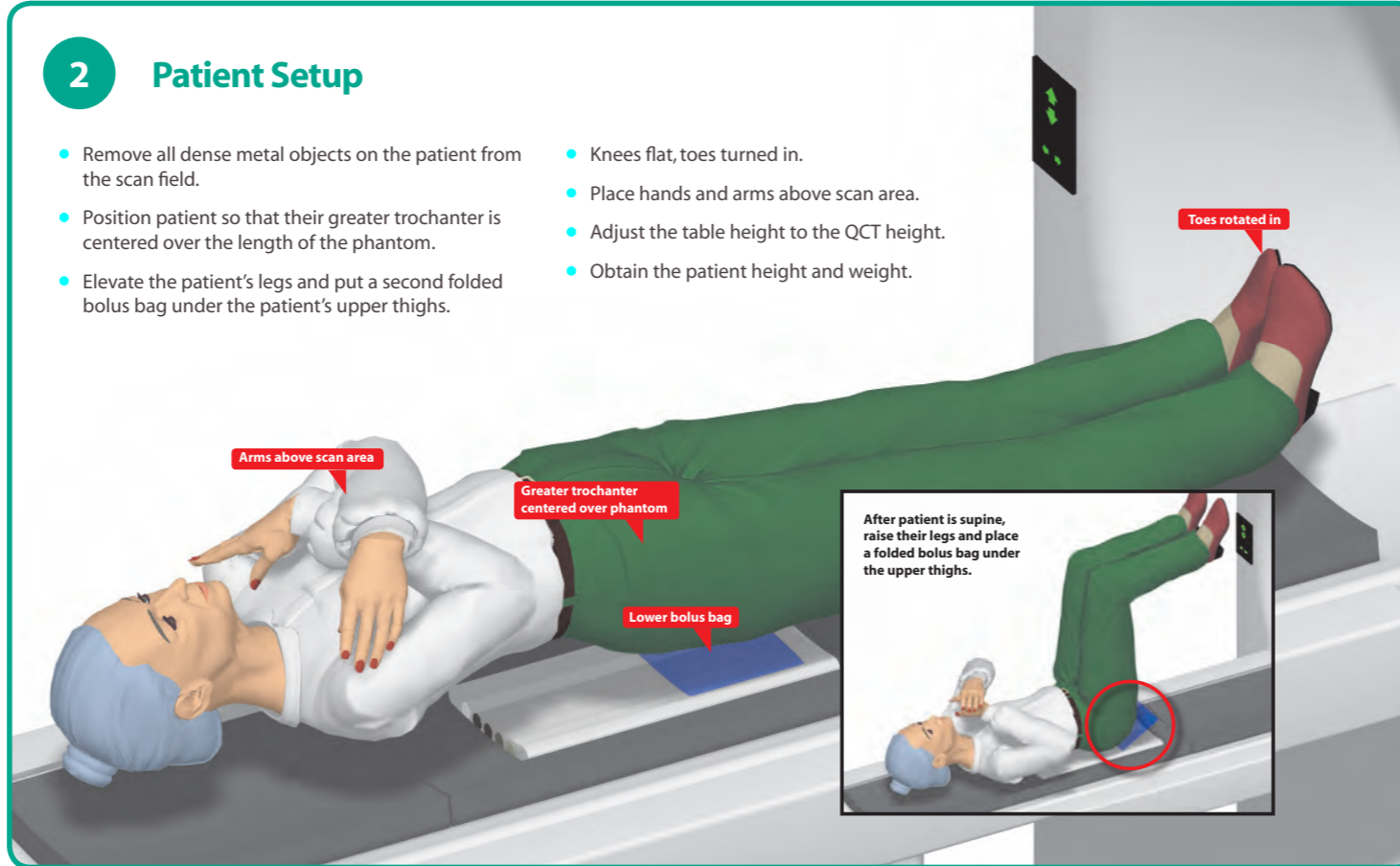Email: support@qct.com
www.qct.com

1 Phantom Setup

- Place the cutout pad and extenders on the CT table.
- Orient the "head" end of the phantom to correspond with the patient and place it within the cutout pad.

Position phantom head end to correspond with patient

2 Patient Setup

- Remove all dense metal objects on the patient from the scan field.
- Position patient so that their greater trochanter is centered over the length of the phantom.
- Elevate the patient's legs and put a second folded bolus bag under the patient's upper thighs.
- Knees flat, toes turned in.
- Place hands and arms above scan area.
- Adjust the table height to the QCT height.
- Obtain the patient height and weight.

Toes rotated in

Arms above scan area

Greater trochanter centered over phantom

Lower bolus bag

After patient is supine, raise their legs and place a folded bolus bag under the upper thighs.

3 Scanner Setup

- Use a stored scan protocol for consistency.
  - Always use the same table height, kVp and SFOV for all BMD patients.
  - Exposure requirements may vary due to patient size. Increase mAs for obese patients—2X to 3X increase may be necessary.
  - Include as much of the following information as possible:
    - Last name
    - First name
    - Date of birth
    - Gender
    - Medical record number

- Protocol Rules

  ☐ Always use these or the closest available parameters.

  ☐ Insufficient exposure can result in images that cannot be analyzed. Use exposure tables to determine minimum mAs.
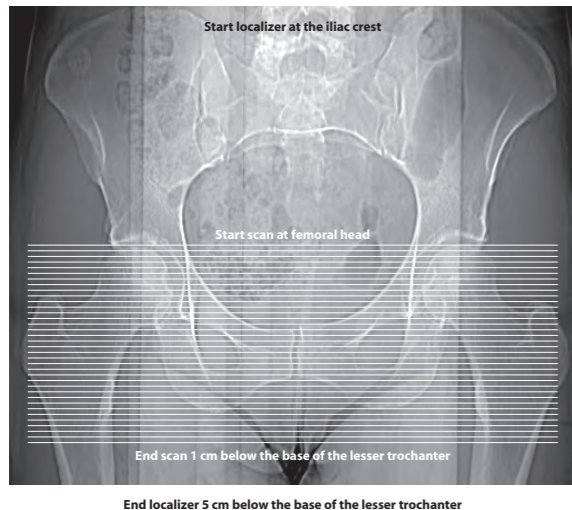
Recon

DFOV (cm)	R/L Center (mm)	A/P Center (mm)	Recon Type	Matrix Size	Peris.
40	0.0	0.0	Stand.	512	N

Scan

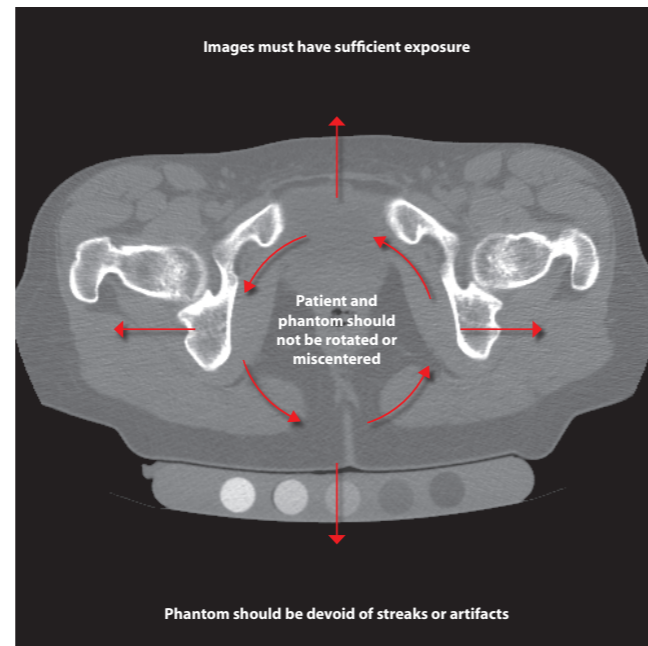| Images	Scan Type	Start Loc.	End Loc.	Scout Plane	No. of Images	Thick (mm)	Image Int'val	Pitch	Gantry Tilt	SFOV	kV	mA
1	Scout	S0.0	I300.0	0							120	100
1-40	Helical Full 1.0 sec.				38	3	3.0	1.0	S0.0	Large	120	200

4 Localizer

- Obtain an AP localizer from the iliac crest to a few cm below the base of the lesser trochanter.
- Prescribe the axial scans. Set the scan start location at the femoral head. Set the scan end location 1–2 cm below the base of the lesser trochanter.
  - Extend the lower scan range, if necessary, to so the last slice is beyond the pelvis.
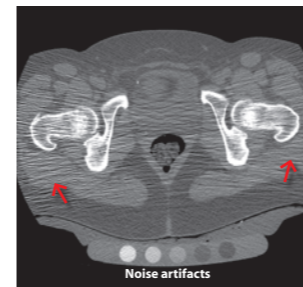
Localizer Example

Start localizer at the iliac crest

Start scan at femoral head

End scan 1 cm below the base of the lesser trochanter

End localizer 5 cm below the base of the lesser trochanter

5 Axial Scans

- Instruct the patient to breath normally during scanning.

Images must have sufficient exposure

Patient and phantom should not be rotated or miscentered

Phantom should be devoid of streaks or artifacts

Examples of scans that cause analysis failures
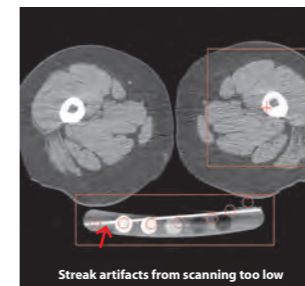

Noise artifacts

Insufficient Exposure
Insufficient exposure resulted in high noise, bad phantom data, and hip isolation difficulties. Solution: Use exposure tables to determine patient-specific exposure.

Shading artifacts from insufficient bolus
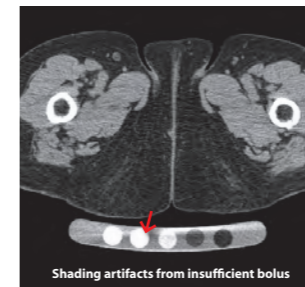
Insufficient bolus
Insufficient bolus, particularly in the area under the upper thigh can produce artifacts preventing successful analysis. Be mindful of shading or streak artifacts in the phantom.
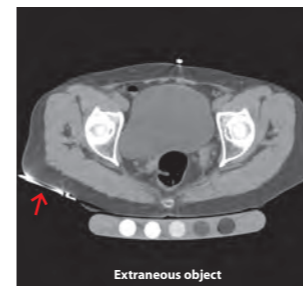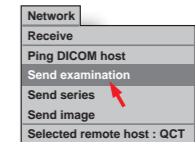

Extraneous object

Extraneous high density object in scan field
A high density object in the patient's hip pocket was interpreted as "bone" by the CTXA analysis software. Depending on circumstances this false bone may prevent analysis or bias the bone density estimates.

Streak artifacts from scanning too low

Scanning too low
Scanning below the bolus can produce artifacts preventing successful analysis. Solution: Position bolus properly under thighs and do not scan more than 2 cm below the base of the lesser trochanter.
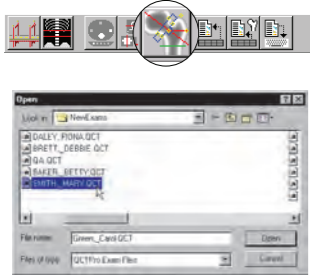
6 Image Transfer

- Send the QCT images to the QCT PC using your scanner's image transfer function.

Network
Receive
Ping DICOM host
Send examination
Send series
Send image
Selected remote host : QCT

Application	Selection	Remove	Sort	Network	Archive	PPS	Queue

Examinations :

Exam	Name	Date	Description	Mod	Fmt	PPS	A
945	CARVER, DOROTHY	Jul 09 02	Head	CT	DICO	-	N
946	BAKER, MARILYN	Jul 09 02	L-Spine	CT	DICO	-	N
947	COHEN, HERMAN	Jul 09 02	ABD/PELVIS	CT	DICO	-	N
948	CHANG, GONG WU	Jul 09 02	CHEST W/CON	CT	DICO	-	N
949	BLACK, COLLEEN	Jul 09 02	HEAD	CT	DICO	-	N
950	SMITH, SUZANNE	Jul 09 02	SINUSES	CT	DICO	-	Y
951	MARINEZ, HECTOR	Jul 09 02	PELVIS	CT	DICO	-	Y
952	DOE, JANE	Jul 09 02	BMD	CT	DICO	-	Y
953	SMITH, JANE	Jul 09 02	BMD	CT	DICO	-	Y
954	VILAROSSA, MANUE	Jul 09 02	HEAD	CT	DICO	-	Y
955	ALBERTSON, SAM	Jul 09 02	HEAD	CT	DICO	-	Y
556	CARVER, DOROTHY	Jul 09 02	BMD	CT	DICO	-	Y
957	CHOU, CHEN	Jul 09 02	BIOPSY	CT	DICO	-	Y
958	MUNOZ, ANNA	Jul 09 02	HEAD	CT	DICO	-	Y
959	LAI, KIT	Jul 09 02	HEAD	CT	DICO	-	Y
960	PARK, YOUNG	Jul 09 02	CHEST	CT	DICO	-	Y
961	MENDOZA, MIKE	Jul 09 02	ABDOMEN	CT	DICO	-	Y

60 Examinations

CE 0499

Hip Analysis Overview
## CTXA Computed Tomography X-Ray Absorptiometry

1 Open

- Open the Hip module, then open the examination.

2 Patient Info

A Review, add, or modify the patient information as required.

- Last Name, First Name, Date of Birth, Sex and Patient ID are required. Other fields are optional.

B For new patients click on "Add New Record."

- For patients already in the database from a previous analysis, click on "Confirm Match" if the displayed Patient Database Record is correct. Otherwise rescan or browse the database as necessary, click on "Update Record" if necessary, then click on "Confirm Match."

*Click on the "**Extraction**" tab to go to the next step.*
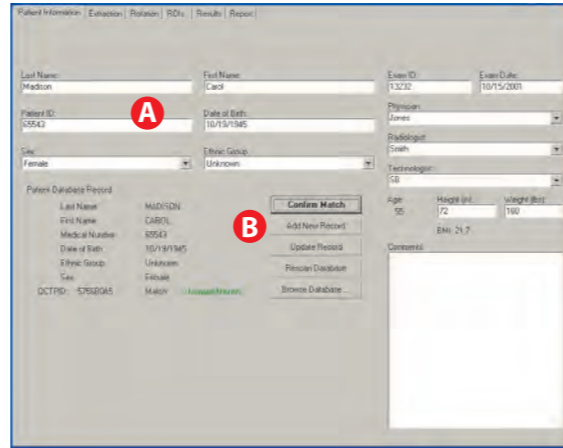
3 Extraction

- Extraction is automatic. Inspect the box locations. If a box is unsatisfactory, make the necessary adjustments.

To reposition a box Move the cursor inside the box, depress the left mouse button and drag.

To resize the phantom box Move the cursor inside the box, press the right mouse button and drag.

*Click on the "**Rotation**" tab to go to the next step.*
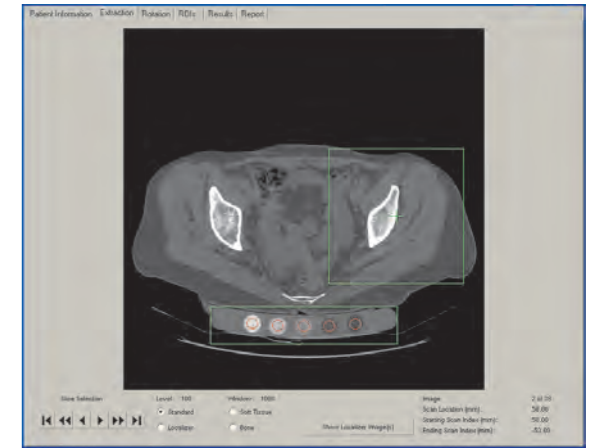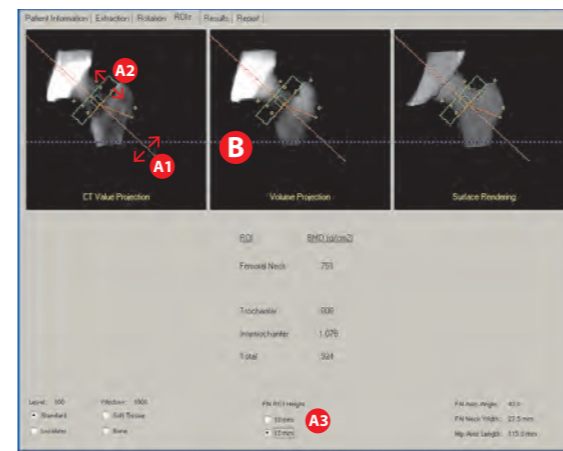

4 Rotation

- Hip isolation and rotation are automated.

A Inspect the images for soft tissue pixels and/or holes by scrolling forward and backward.

B If any are found, eliminate them with the Hip Segmentation Controls.

C Inspect the rotation of the femur and adjust if necessary.

- To rotate, click on an image with the left mouse button and drag clockwise or counterclockwise.
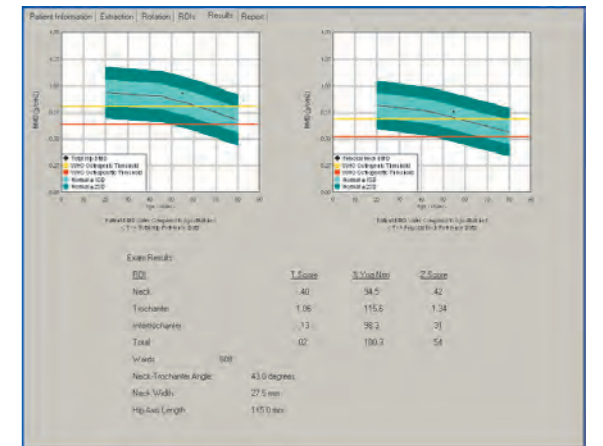
*Click on the "**ROIs**" tab to move to the next step.*

Check for soft tissue pixels and/or bone holes
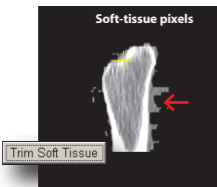
Isolation

If soft tissue pixels remain or bone holes are visible, use the isolation controls to eliminate them.

Eliminate soft-tissue pixels
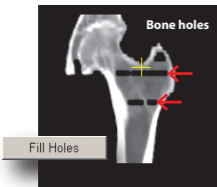
- Click on "Trim Soft Tissue".
- Repeat as needed.

Soft-tissue pixels / Trim Soft Tissue

Eliminate bone holes

- Click on "Fill Holes" to fill bone holes.
- Holes in the femoral head are acceptable.
- Repeat as needed.

Bone holes / Fill Holes

Eliminate soft-tissue pixels and bone holes simultaneously

- Click on "Trim and Fill."
- Bone holes will typically fill first, leaving soft tissue pixels to eliminate with the "Trim Soft Tissue" button.
- Repeat as needed.

Trim and Fill
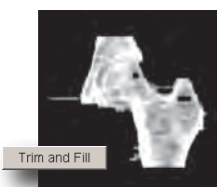
Rotation

Inspect the images to ensure an orientation is attained with characteristics as illustrated below. Make needed adjustments using the rotation controls.

**Axial**

The femoral neck should be horizontal.

Scroll to a level at the distal end of the femoral head. The neck should be horizontal. If rotation is needed, click on the image with the left mouse button and drag clockwise or counterclockwise.

Just below femoral head / Greater trochanter
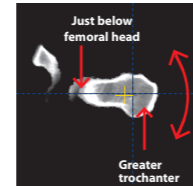
Sagittal
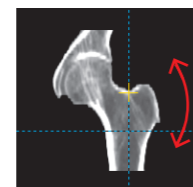
The femoral shaft should be vertical.

A reference line should align with the anterior cortical shaft.
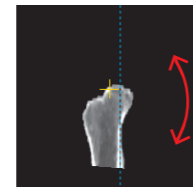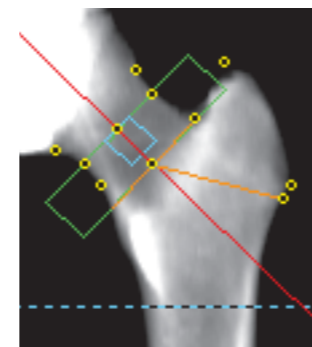
Coronal

The image should look similar to a hip x-ray or DXA scan.

A vertical reference line through the neck-trochanter junction should pass through the center of the distal shaft.
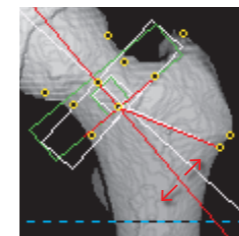
5 ROIs

- ROIs are automated. Inspect and adjust the ROIs if needed.

A1 Rotate the femoral neck axis.

A2 Reposition the femoral neck box.

A3 Decrease the height of the femoral neck box. Readjust the box position.

B Adjust the intertrochanteric distal extent line if needed.

*Click on the "**Results**" tab to go to the next step.*

ROIs

- ▬▬ Intertrochanter distal extent line
- ◆◆◆ Femoral neck axis
- ◆◆◆ Femoral neck ROI
- ◆◆◆ Ward's triangle ROI
- ◆◆◆ ROI boundary lines
- ■ Landmarks

ROI Adjustment Tools

A1 Femoral neck axis
Should bisect the femoral head and neck. Rotate it by clicking on it with the left mouse button and dragging.
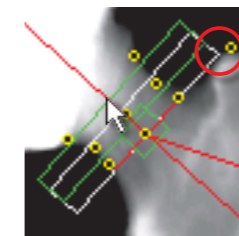
A2 User-defined femoral neck ROI box
The femoral neck ROI box can be dragged with the mouse along the femoral neck axis. It should be positioned low on the femoral neck near the wing of the trochanter with the upper-right corner of the femoral neck ROI box just touching the upper extent of the trochanter.
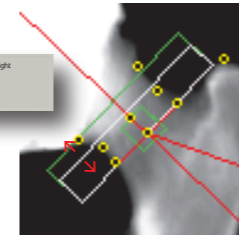
A3 Femoral neck ROI height
Use the FN ROI Height options to decrease, as needed, the height of the femoral neck ROI box. Exclude any overlying acetabulum and/or ischial spine from the box. Adjust the femoral neck ROI position after resizing.
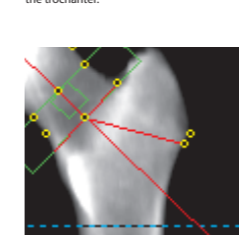
B Intertrochanter distal extent line
Should be at the base of the lesser trochanter. Drag it with the mouse.

6 Results

- The results screen is a view-only screen.

*Click on the "**Report**" tab to go to the last screen.*

7 Report

If desired, information can be included in the report by typing information in the Interpretation field, selecting a pre-defined report from the Template list, or selecting a name from the Interpretation By list.

If desired, information in the drop down Condition and Therapy lists can be included in the exam record.

A Click on "Save Exam Record."

B Click on "Print Report."

The exam must be saved before it can be printed