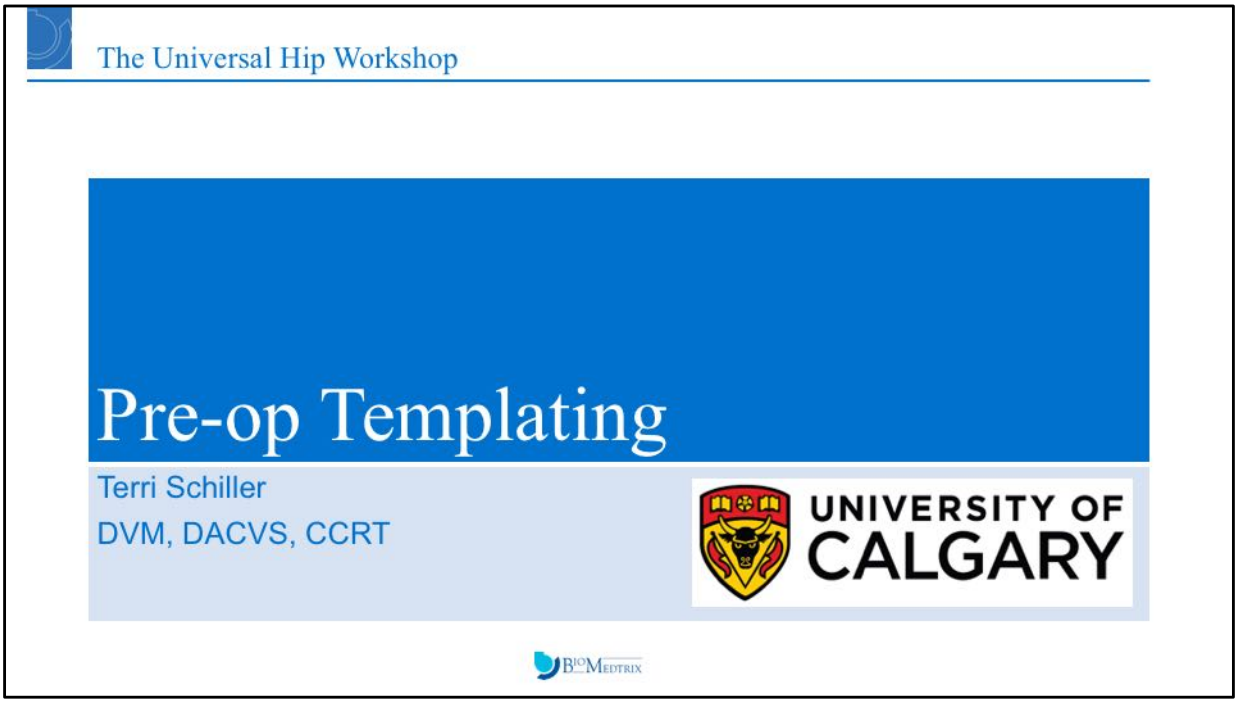

The Universal Hip Workshop
Pre-op Templating
Terri Schiller
DVM, DACVS, CCRT
UNIVERSITY OF CALGARY
BioMedtrix

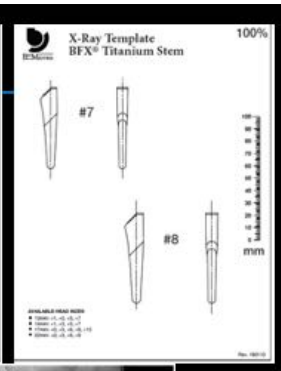
Notes

Notes There is a 1 mm of tolerance with press fit implants. Usually the femoral template does correlate well with the size that is actually used.

Pre-op Radiographic Templating

Options in Templating

- Acetate
  - Limited magnification options
- Digital Radiography
  - Improved accuracy
  - Infinite scalability with pinpoint magnification correction
  - Rapid
  - Permanent archive



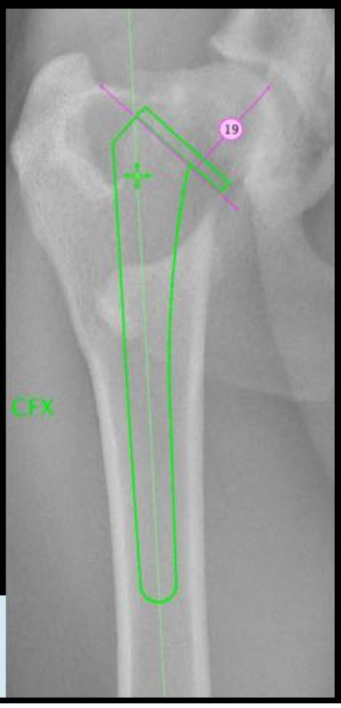
Notes Take note that the templates are now 100% magnification, not 115%.

Pre-op Radiographic Templating

Requirements for Templating

- Quality radiographs
- Magnification marker

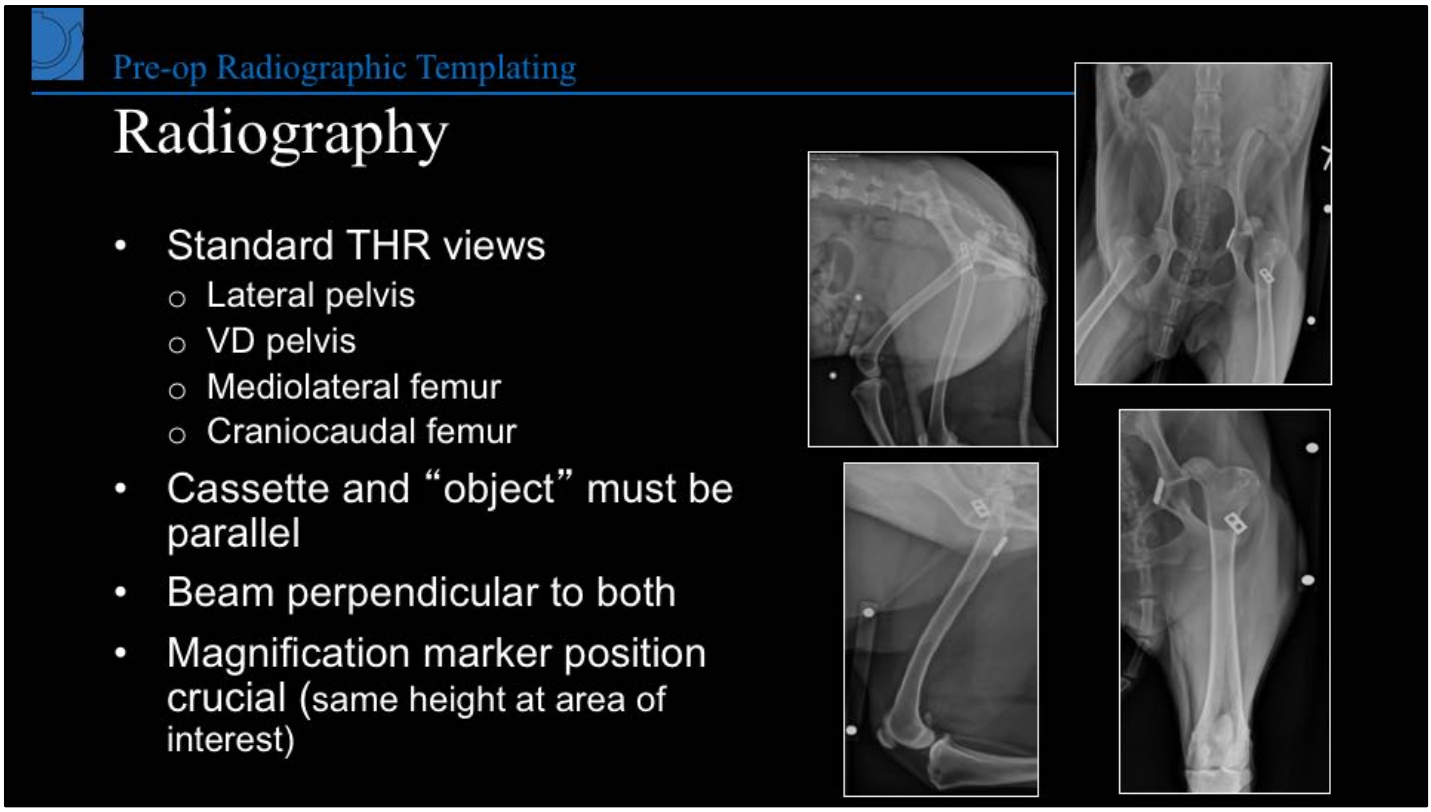
- For DR:
- Template software
- Validated template image files
  - Provided by implant manufacturer and/or DR supplier



OrthoView VET
Veterinary Orthopaedic Digital Planning

Notes Make sure that you use validated software if you are going to use software for templating.

Biomedtrix now has their own templating software that is in the Beta testing phase.



Notes The walking lateral, make sure that hte ilia are superimposed.

the VD pelvis must be perfectly straight.

The open leg lateral view is the truest view.

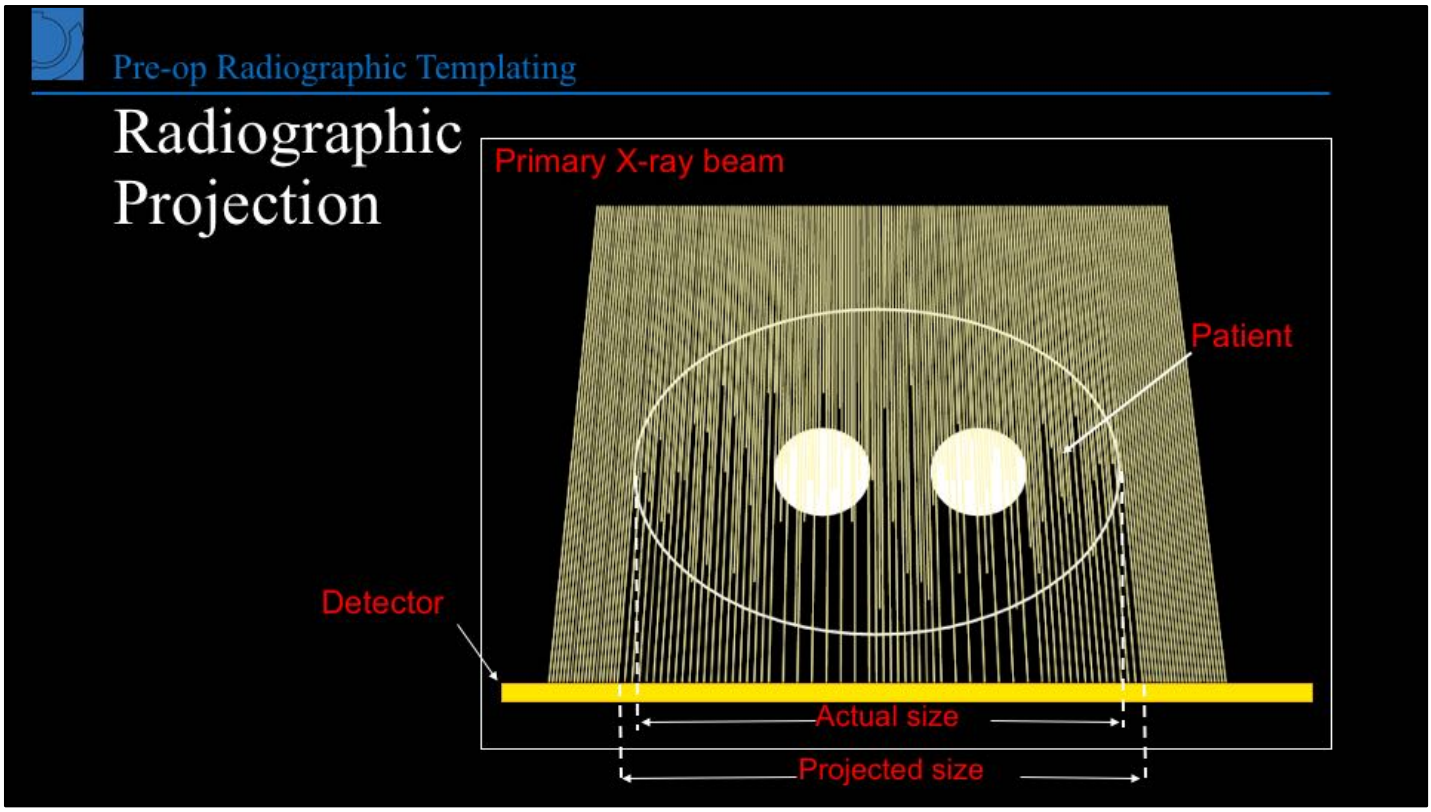
Craniocaudal femoral view is essential for femoral templating. The cassette and the bone of interest must be parallel to each other.

Pre-op Radiographic Templating

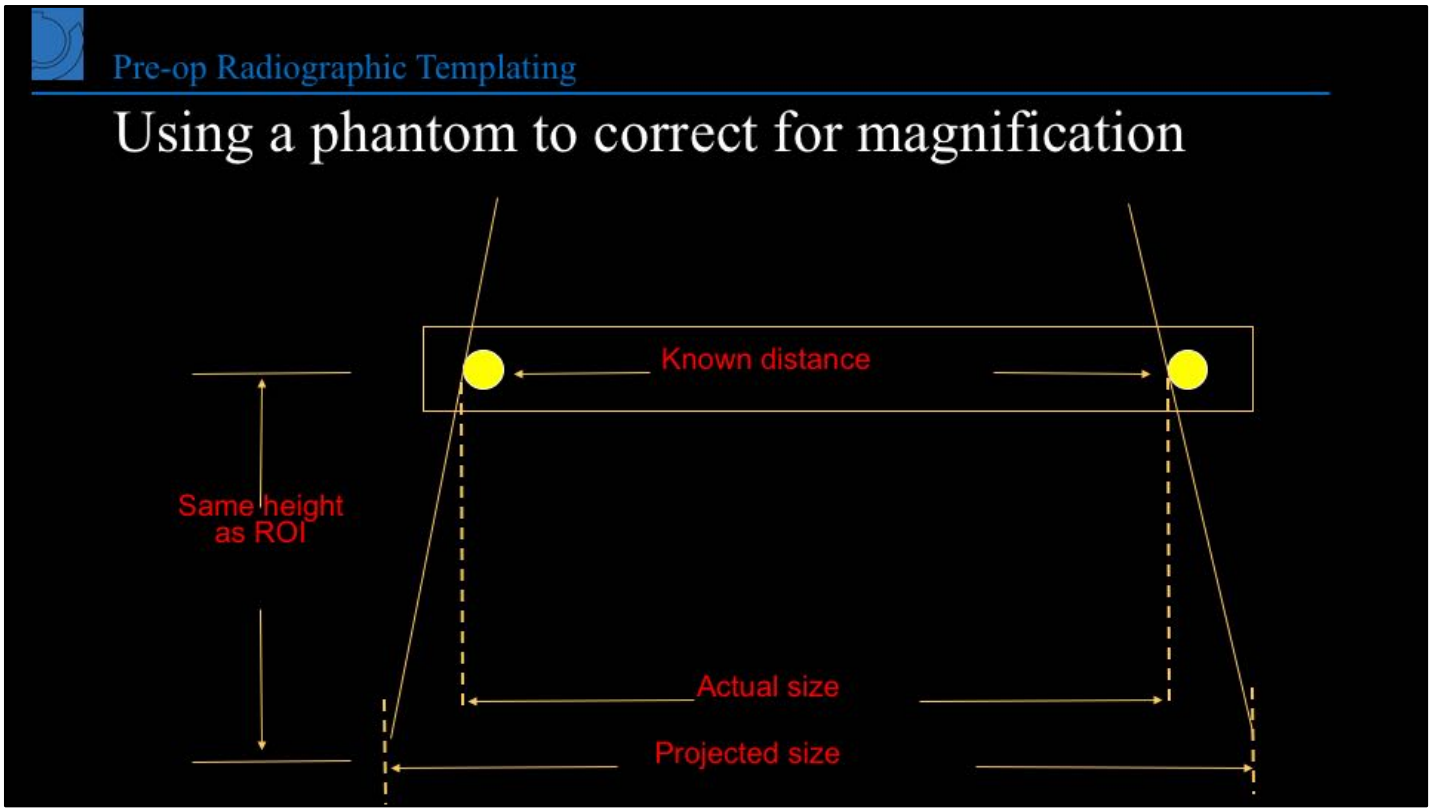
Radiography

- Magnification marker (phantom)
  - Parallel to object
  - Parallel to cassette
  - Equidistant from object to cassette
  - Foam blocks and tape

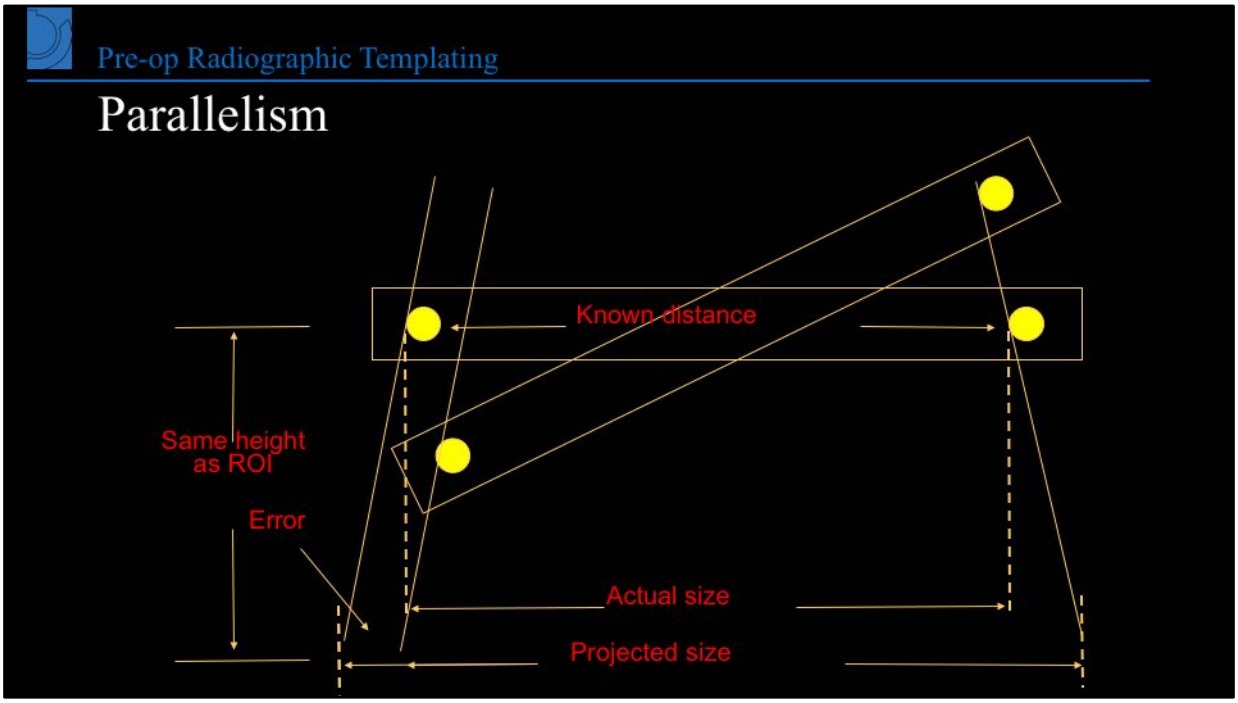
Notes VD pelvis - marker at the level of the great trochanter.


Pre-op Radiographic Templating
Radiographic Projection
Primary X-ray beam
Patient
Detector
Actual size
Projected size

Notes


Pre-op Radiographic Templating
Using a phantom to correct for magnification
Known distance
Same height as ROI
Actual size
Projected size

Notes


Pre-op Radiographic Templating
Parallelism
Known distance
Same height as ROI
Error
Actual size
Projected size

Notes

Pre-op Radiographic Templating

Magnification Markers

- Non-parallelism of linear marker may affect magnification
- 30 mm spherical calibration maker
  - J2 medical
  - malleable positioning arm
  - suction or clamp base

J2medical.com

Notes

Pre-op Radiographic Templating

Radiography: 4 Views Required

- 2 pelvic views
  - Lateral pelvis
  - VD pelvis (OFA)
- Magnification marker is at level of acetabulum
  - Greater trochanter is a good landmark
  - Femoral positioning not critical
  - Pelvis MUST be straight

Notes

Pre-op Radiographic Templating

Radiography: 4 Views Required

- 2 femoral views
  - Mediolateral femur
  - Craniocaudal femur
- Magnification marker is at the level of the greater trochanter
  - Parallel to femoral shaft
  - Proximal femur is ROI
  - Superimposed condyles
  - Central patella, bisected sesamoids

Notes The condyles should be superimposed on the lateral open leg view.

Pre-op Radiographic Templating

Radiography: Challenges of CnCd view

- True craniocaudal femur often not possible with VD pelvis positioning
- Inability to position femur parallel to cassette due to:
  1. Pain
  2. Incomplete sedation
  3. Mechanical impingement (OA, hip luxation)

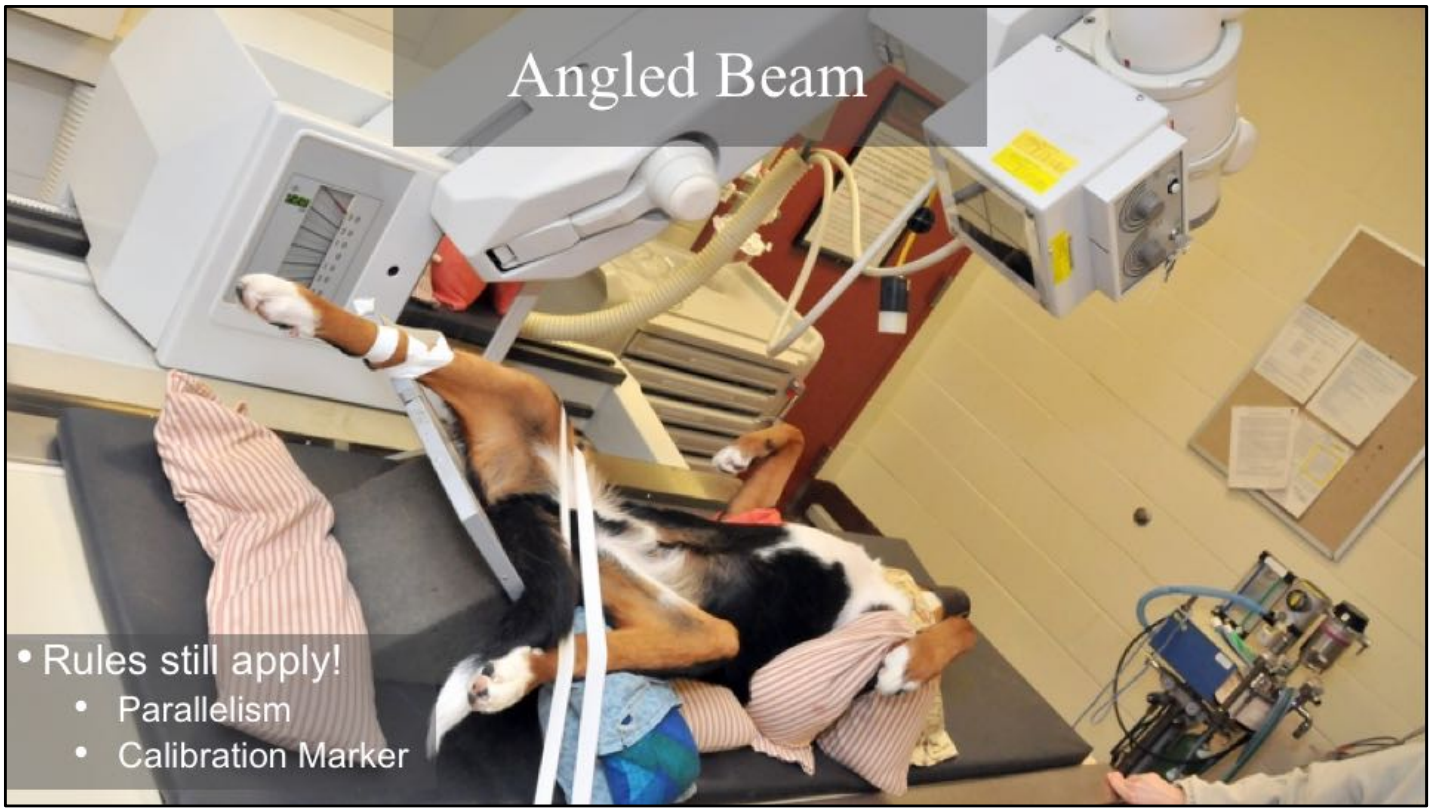
Notes With chronicity it is not possible to get the femur bone parallel. Creative methods of positioning is important.


Horizontal Beam CnCd
• Cassette holder
• Mag marker parallel to femur and cassette
• Beam perpendicular to cassette, object, & mag marker

Notes


Alternate Strategies if unable to take horizontal beam:
1.“Dog sitting”
2.Angled beam
3.Caudocranial femur

Notes

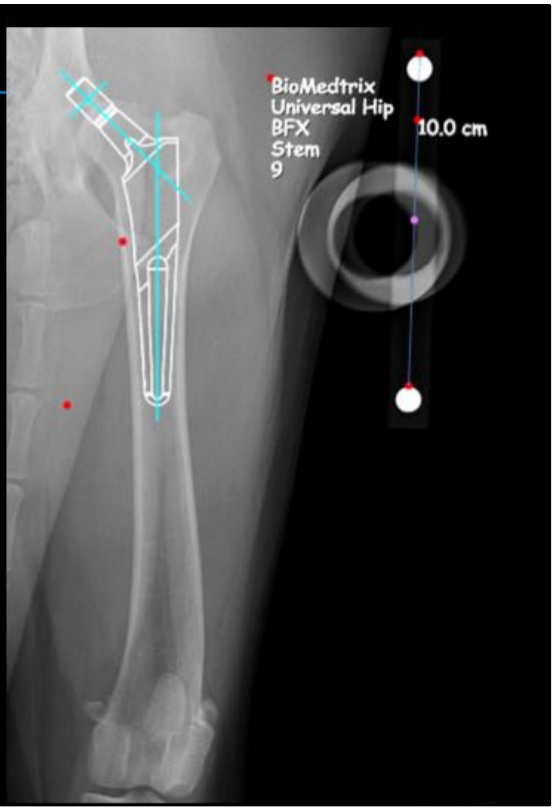


Notes Can also use a caudal to cranial view. Especially use this postop. Make sure that the mangification marker at the greater trochanter.

Pre-op Radiographic Templating

Quantifying Magnification

- Measure the bead separation distance
  - Center-center is difficult to determine
  - Edge-edge is typically measured
- Using template software, correct this measurement to actual size of magnification marker (10 cm)



Notes

Pre-op Radiographic Templating

Acetabular Templating

- Determine cup size on VD view
- Identify the:
  - Cranial acetabular margin
  - Caudal acetabular margin
  - Dorsal rim
  - Medial cortex

Notes

Pre-op Radiographic Templating

Acetabular Templating

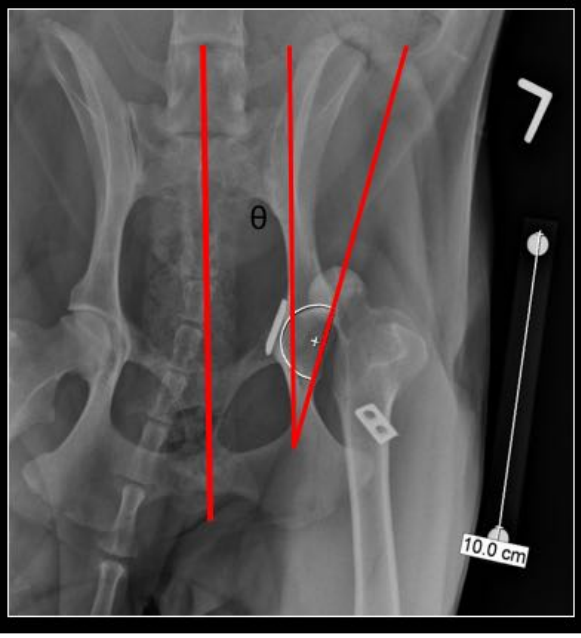
- Identify variations in individual anatomy and pathology
  - Cranial osteophytosis
  - Acetabular infilling
  - Subchondral sclerosis
  - “Useful” vs apparent dorsal acetabular rim (DAR)

Notes

Pre-op Radiographic Templating

BFX Acetabular Templating

- Size on VD view
- Choose implant that fills cranial to caudal bone stock
  - Preservation of caudal bone stock important
- Retrovert and medialize
  - Medial wall concern
- Assess appropriate cranial to caudal position pre-op and intra-op



Notes

Pre-op Radiographic Templating

BFX Acetabular Templating

- Assess cranial and caudal bone stock
  - should remove majority of subchondral bone
- Select the largest cup that allows preservation of cranial and caudal bone stock
- DAR coverage is secondary

Notes

After the ream you should see trabecular bone. The most important points of contact are the cranial and caudal pillars, not the dorsal acetabular rim. For that reason the BFX is so much more versitile.

Pre-op Radiographic Templating

What affects cup coverage?

1. Cup size
2. Magnitude of cup version (craniocaudal)
3. Medialization of the cup
4. Cup ALO (closed<neutral<open)

Notes Bigger cup gives you a bigger head which reduces impingement of the neck on the edge of the cup and less chance for luxation.

Pre-op Radiographic Templating

BFX Acetabular Templating

- Largest appropriate femoral head is preferred for optimal stability
- Do not undersize cup
- Appropriate medialization requires medial wall penetration and cranial positioning

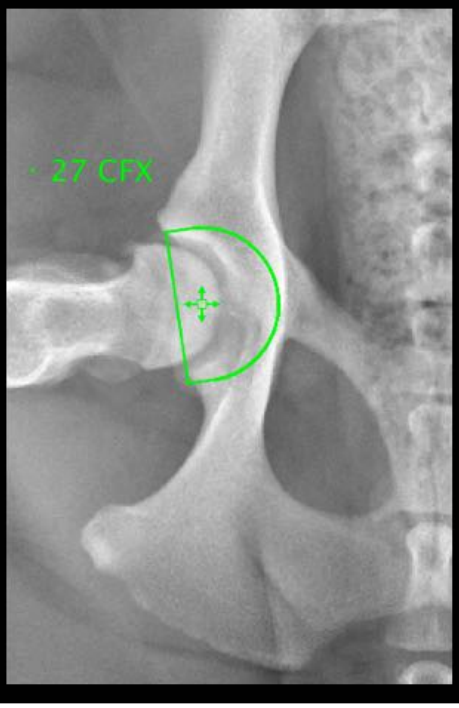
Notes

Pre-op Radiographic Templating

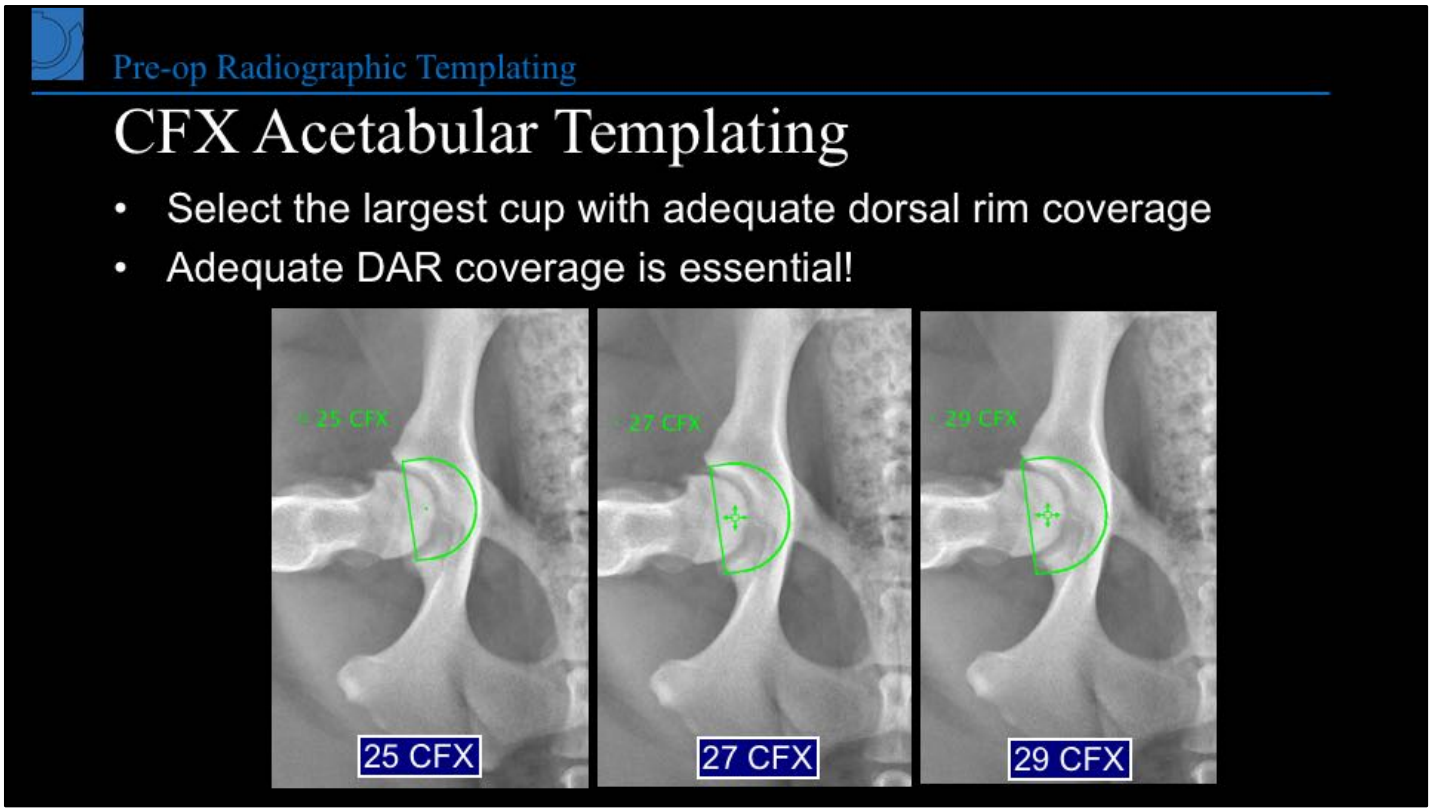
CFX Acetabular Templating

- Similar process
- DAR coverage essential
- Medial wall MUST be preserved

- Position within cr-cd width
- Retrovert
- ID osteophytes



Notes Goal is 15 to 20 mm of retroversion.


Pre-op Radiographic Templating
CFX Acetabular Templating
• Select the largest cup with adequate dorsal rim coverage
• Adequate DAR coverage is essential!
25 CFX
27 CFX
29 CFX

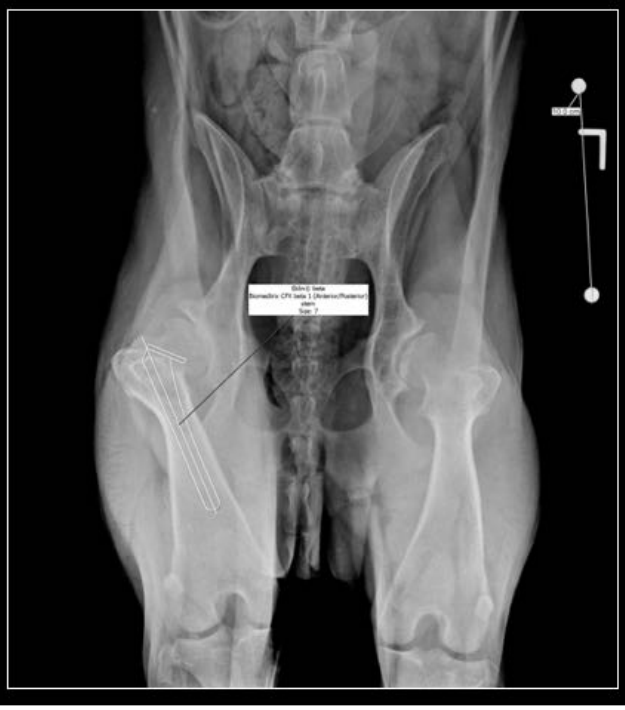
Good

Notes

Pre-op Radiographic Templating

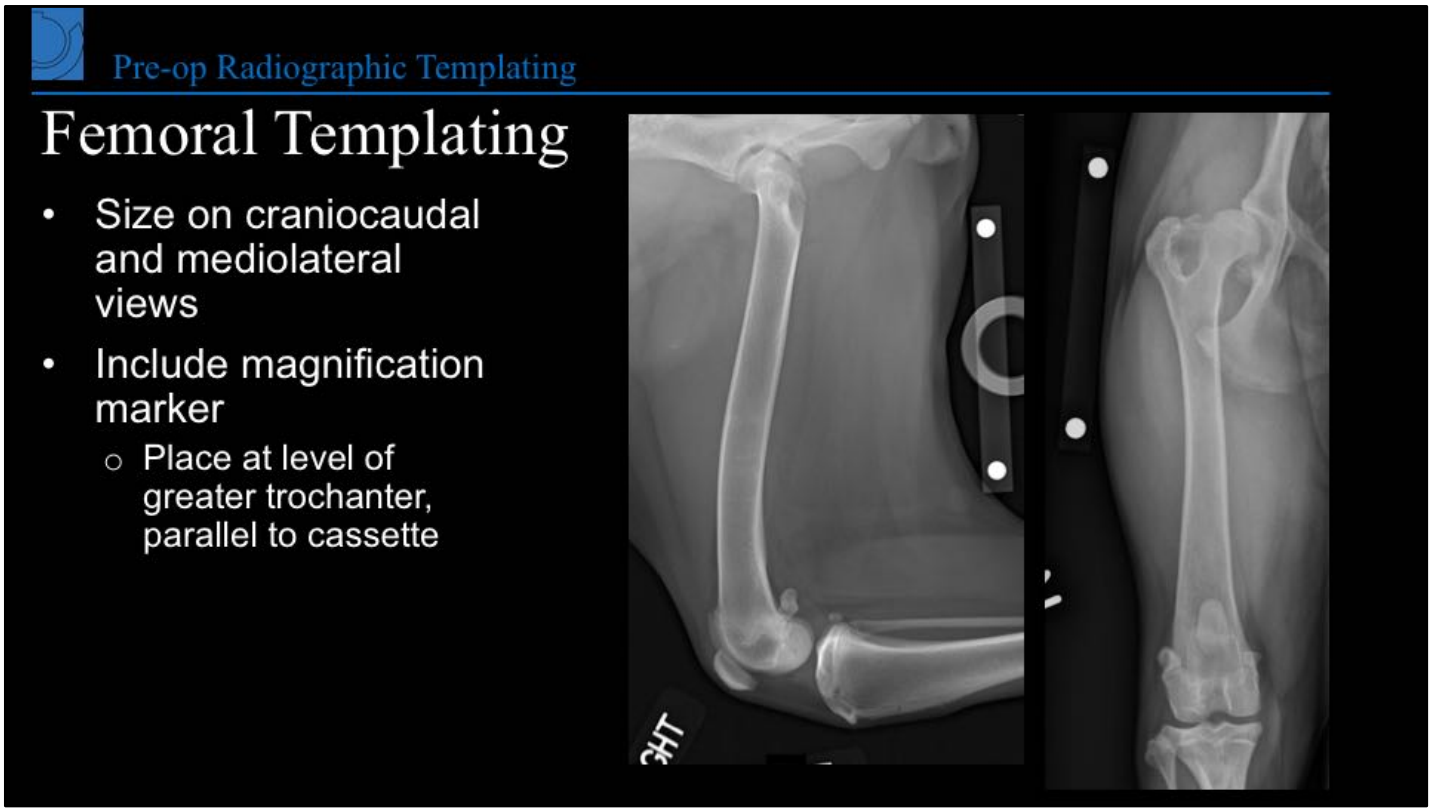
Femoral Templating

- Must use cr-cd and ML views to template
- Severe OA may diminish extension of hip
- Suggest a horizontal beam CnCd femur

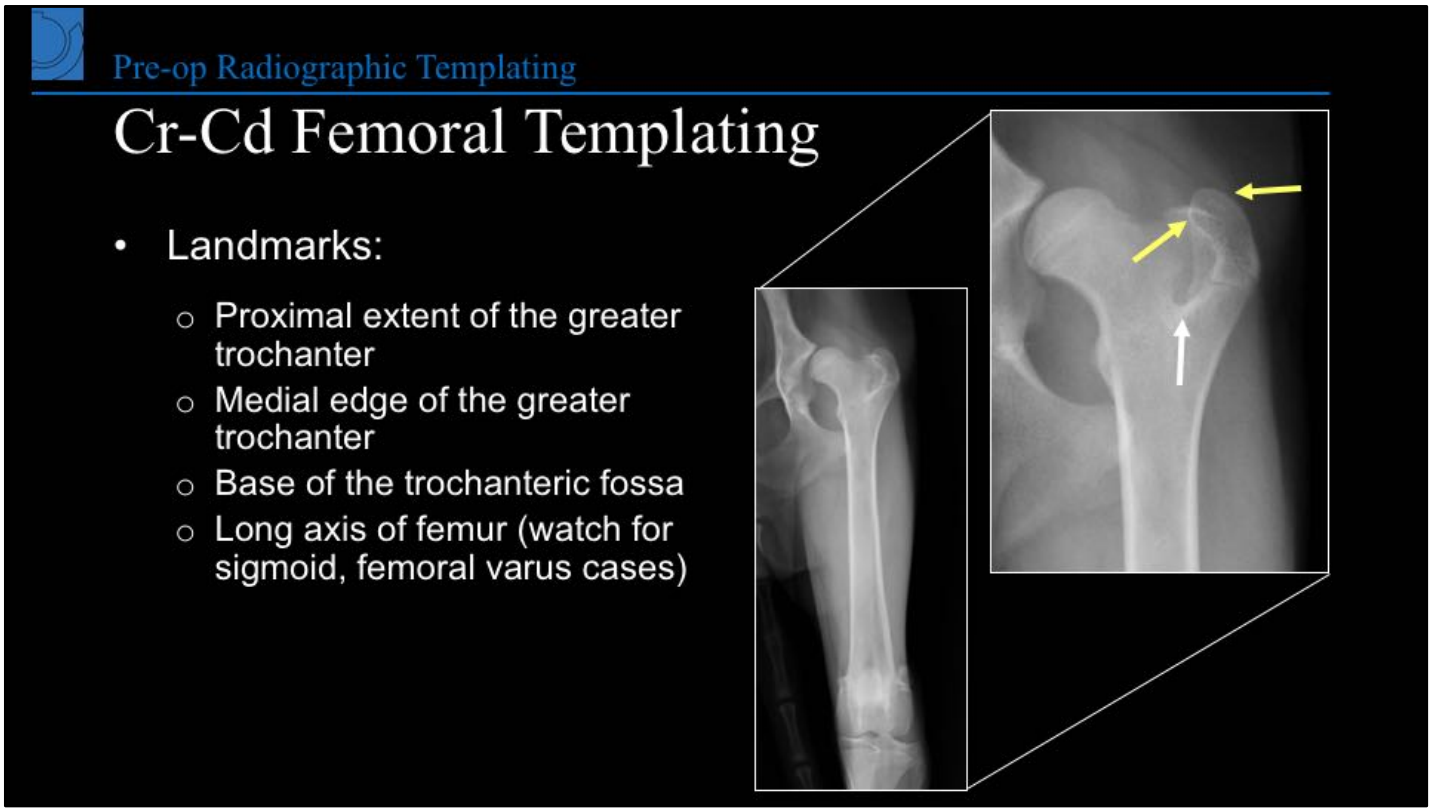


cannot use the vd pelvic view

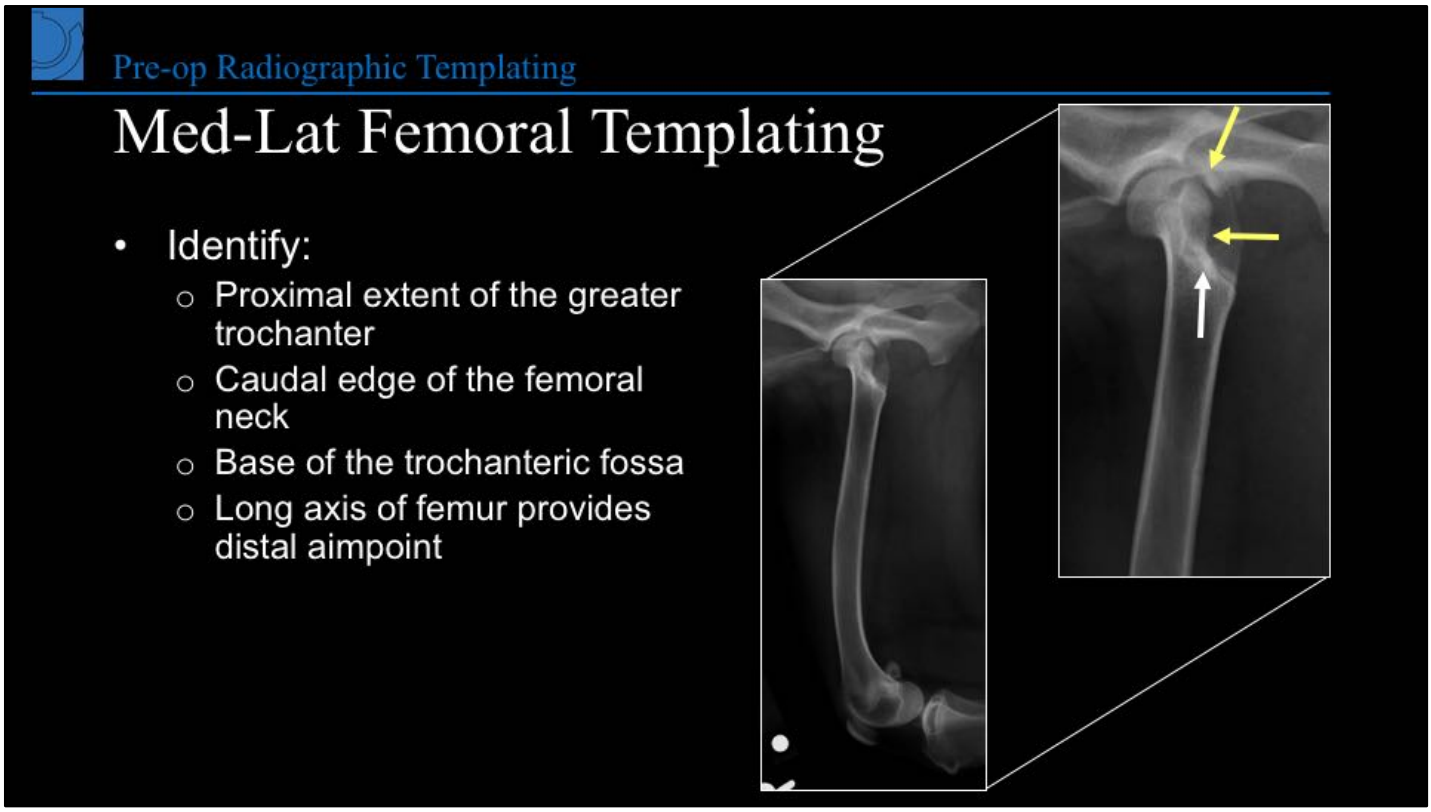
Notes



Notes be very careful between femoral implant 9 and 10 as there is a big jump in the neck length



Notes The top of the vastus attachment is the intra-op landmark. you need at least 40% of the porous stem seated below the base of the fossa.

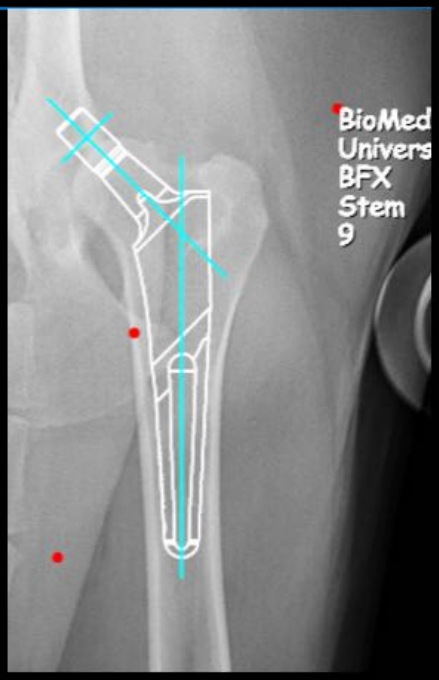


Notes The tendancy is for the femoral stem to be positioned in a cranial to caudal direction on the lateral view which is not good.

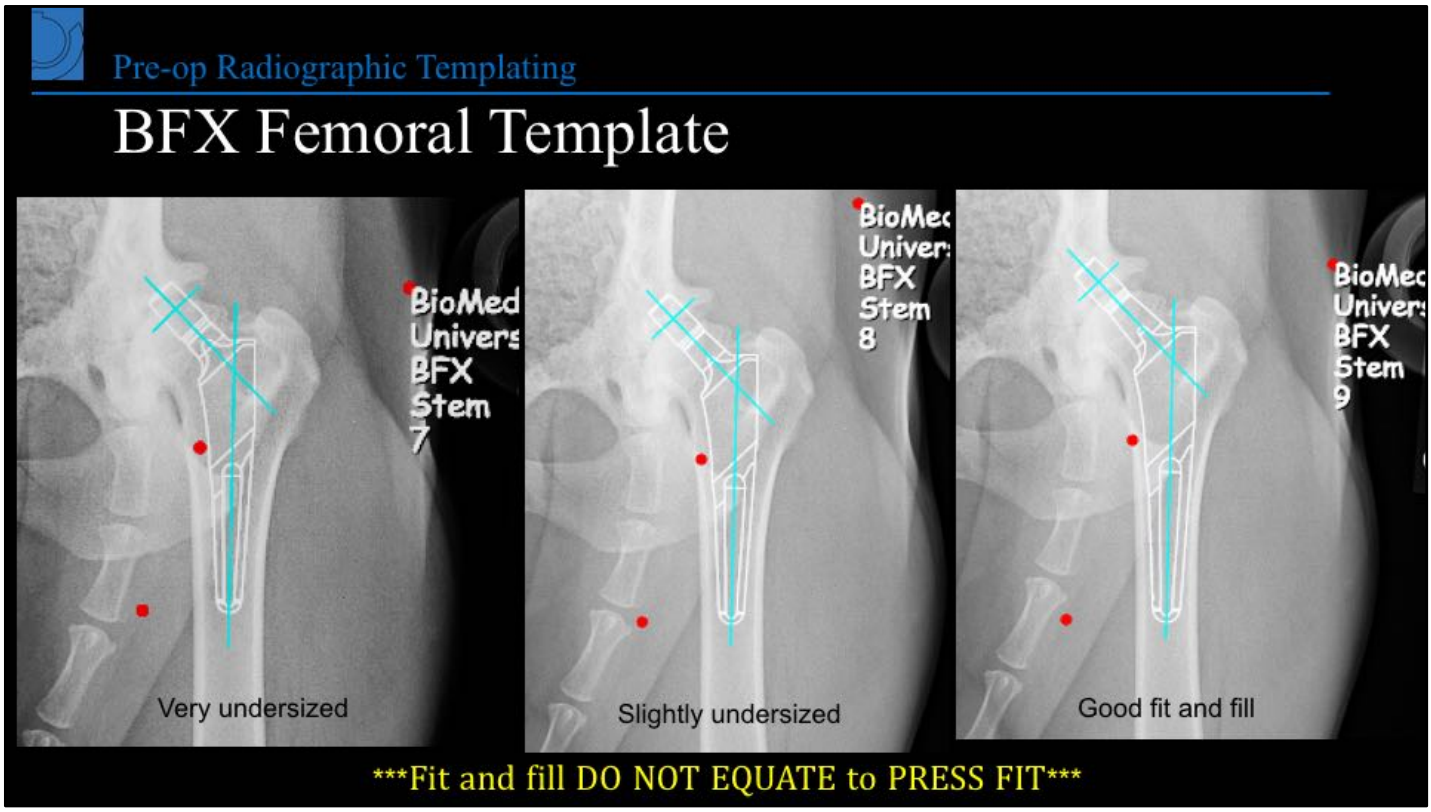
Pre-op Radiographic Templating

BFX Femoral Templating

- Start with the CnCd view
- Align stem and insert to appropriate depth
- Assess canal fill with progressively increasing sizes
  - Guideline of 80-90% fill of endosteal width through mid body of implant
  - Narrow implant tip = less fill
  - Note endosteal contact!



Notes The implant has been modified so that the implant is thinner now for easier insertion

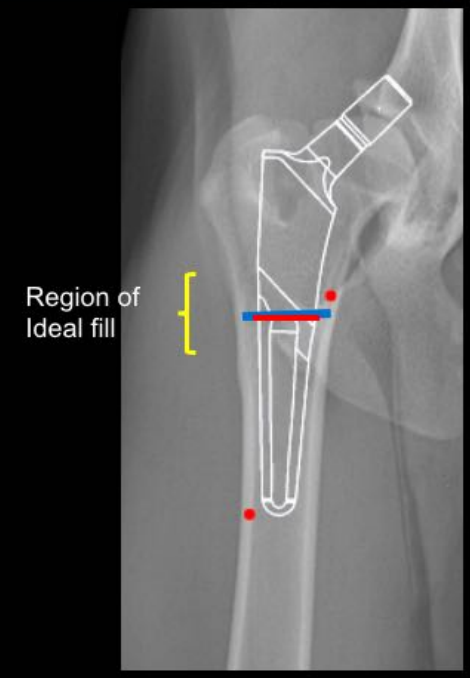

Pre-op Radiographic Templating
BFX Femoral Template
BioMed
Univers
BFX
Stem
7
Very undersized
BioMe
Univer
BFX
Stem
8
Slightly undersized
BioMe
Univer
BFX
Stem
9
Good fit and fill
Fit and fill DO NOT EQUATE to PRESS FIT

Notes

Pre-op Radiographic Templating

Estimating BFX Canal Fill

- Measure endosteal width at distal level of ingrowth surface at femoral isthmus
- Compare this to the width of implant at this location
- Should be <2-3 mm different (~80% fill)

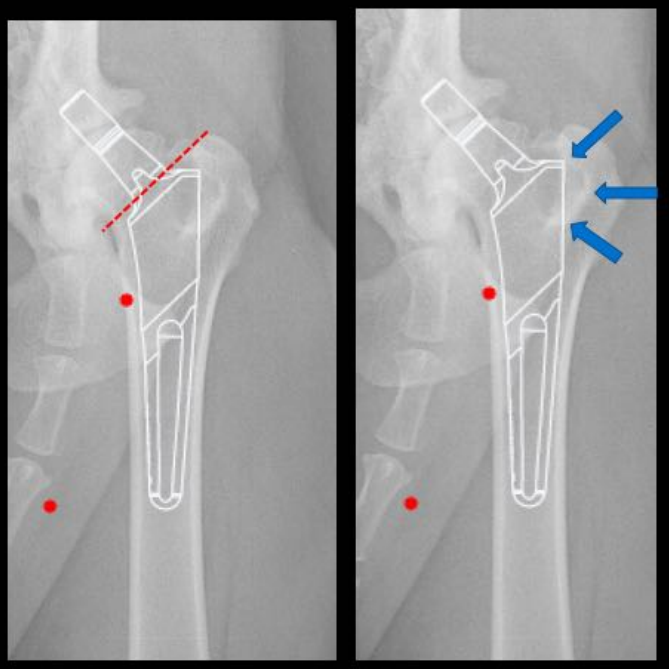


Notes

Pre-op Radiographic Templating

BFX Level of Insertion

- Assess the ideal level of implantation
  - Even with or below resection level
    - Parallel to stem collar, extending to the proximal extent of the greater trochanter
  - Distal to resection line, top 1/3 of the way along the "C" shaped medial edge of the greater trochanter

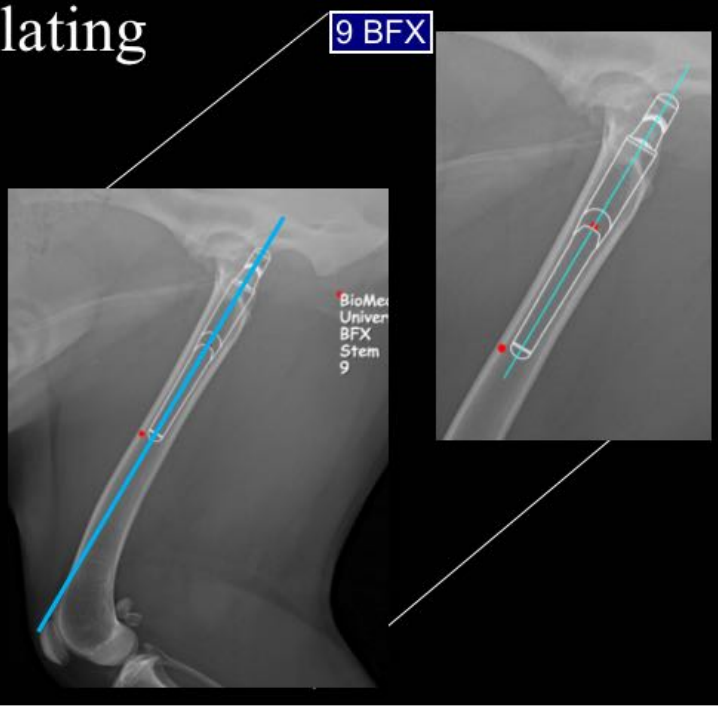


Notes

Pre-op Radiographic Templating

BFX Femoral Templating

- Use optimal size stem from CnCd, repeat for lateral
- Insert to same level based upon trochanter
- Assess canal fill.
  - less on ML view
- Assess canal preparation angle relative to distal femur



Notes

Pre-op Radiographic Templating

BFX Femoral Templating

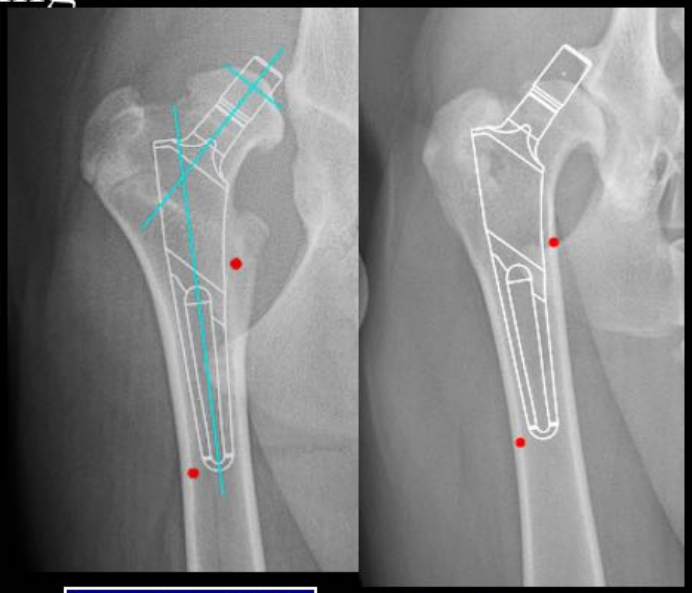
- Beware:
  - Thin cortices
  - Poor quality cancellous bone
  - Poor canal fill
  - Poor canal fit
- GSD, Newfie, St. Bernard, Mastiff, Some Labs, others
- If present, move to CFX stem or possibly collared/bolt BFX

Notes

Pre-op Radiographic Templating

BFX Femoral Templating

- Evaluate shape of greater trochanter
- If medial overhang:
  - Broach into the trochanter to maintain central alignment
- If lateralized:
  - Avoid excessive lateralization of broach against trochanter



Remove bone in this case

Notes

Pre-op Radiographic Templating

Femoral Medullary Sclerosis

- Slight increase in opacity
- Considerable increase in bone hardness
- Difficult broaching
- Fracture

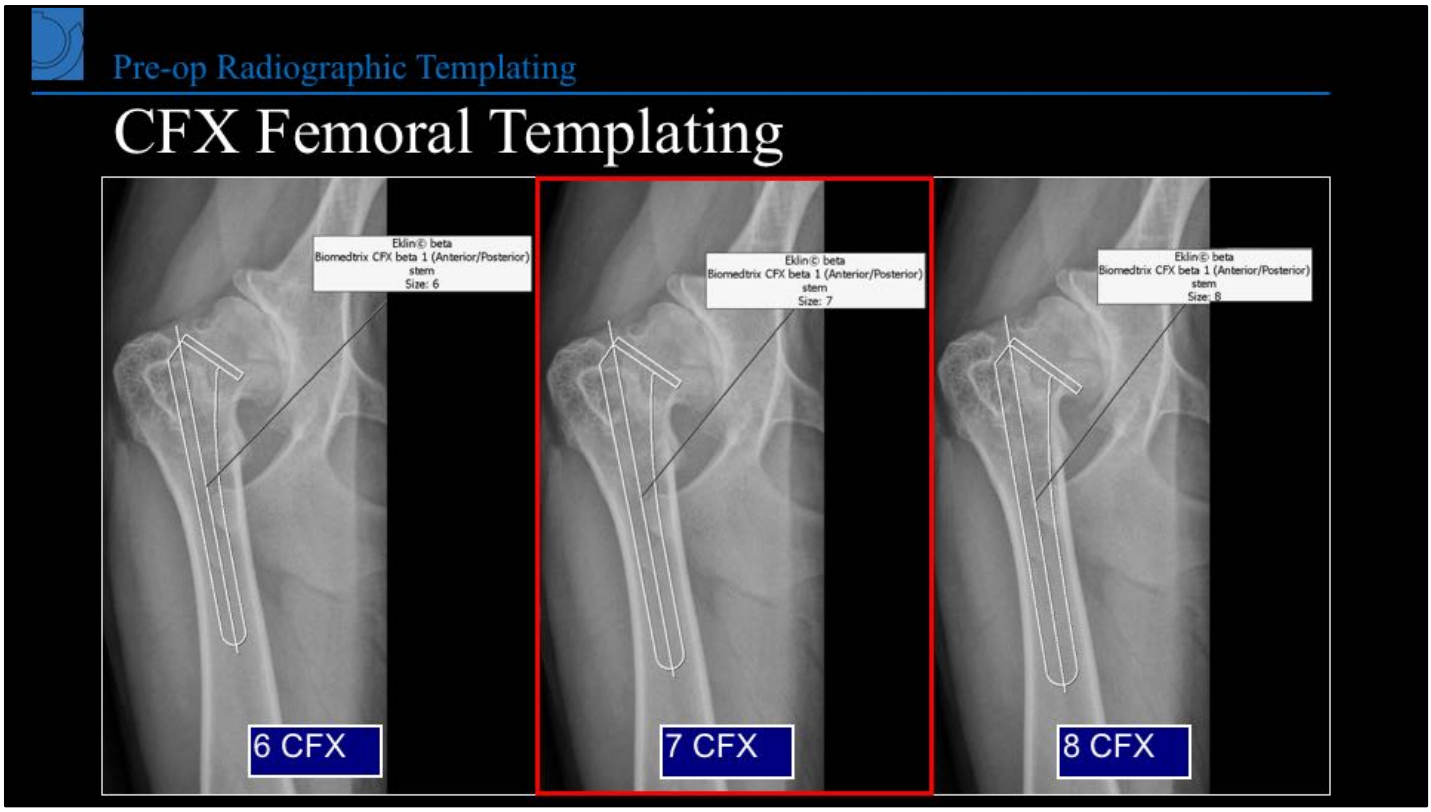
Notes

Pre-op Radiographic Templating

CFX Femoral Templating

- Align collar adjacent to greater trochanter
- Collar of stem and resection determine alignment
- Align stem with femoral centerline
- Assess endosteal diameter and cement mantle

Notes If converting to CFX down size 1 to 2 so that there will be a 2 to 4 mm bone mantle.


Pre-op Radiographic Templating
CFX Femoral Templating
Eklin© beta
Biomedtrix CFX beta 1 (Anterior/Posterior)
stem
Size: 6
Eklin© beta
Biomedtrix CFX beta 1 (Anterior/Posterior)
stem
Size: 7
Eklin© beta
Biomedtrix CFX beta 1 (Anterior/Posterior)
stem
Size: 8
6 CFX
7 CFX
8 CFX

Notes

Pre-op Radiographic Templating

CFX Femoral Templating

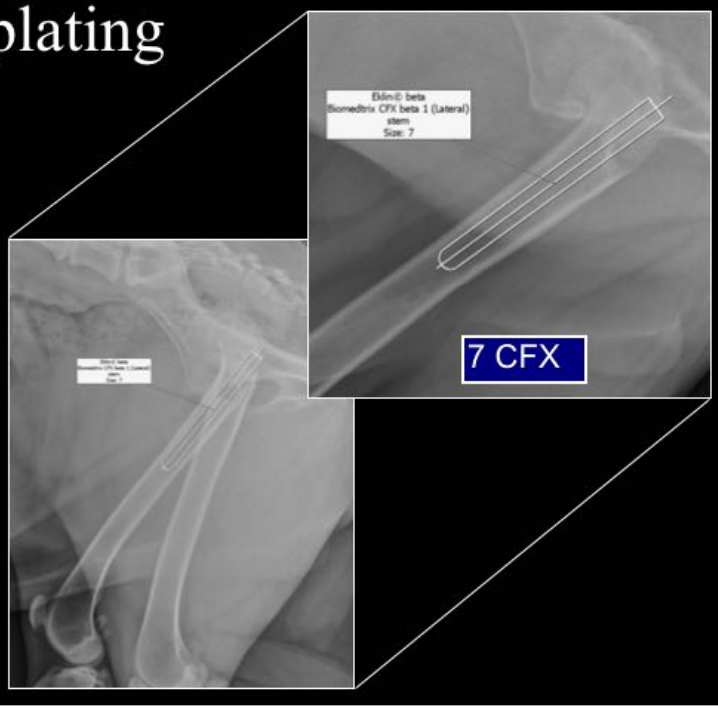
- Asssess cement mantle
- 2-4 mm is ideal

Notes

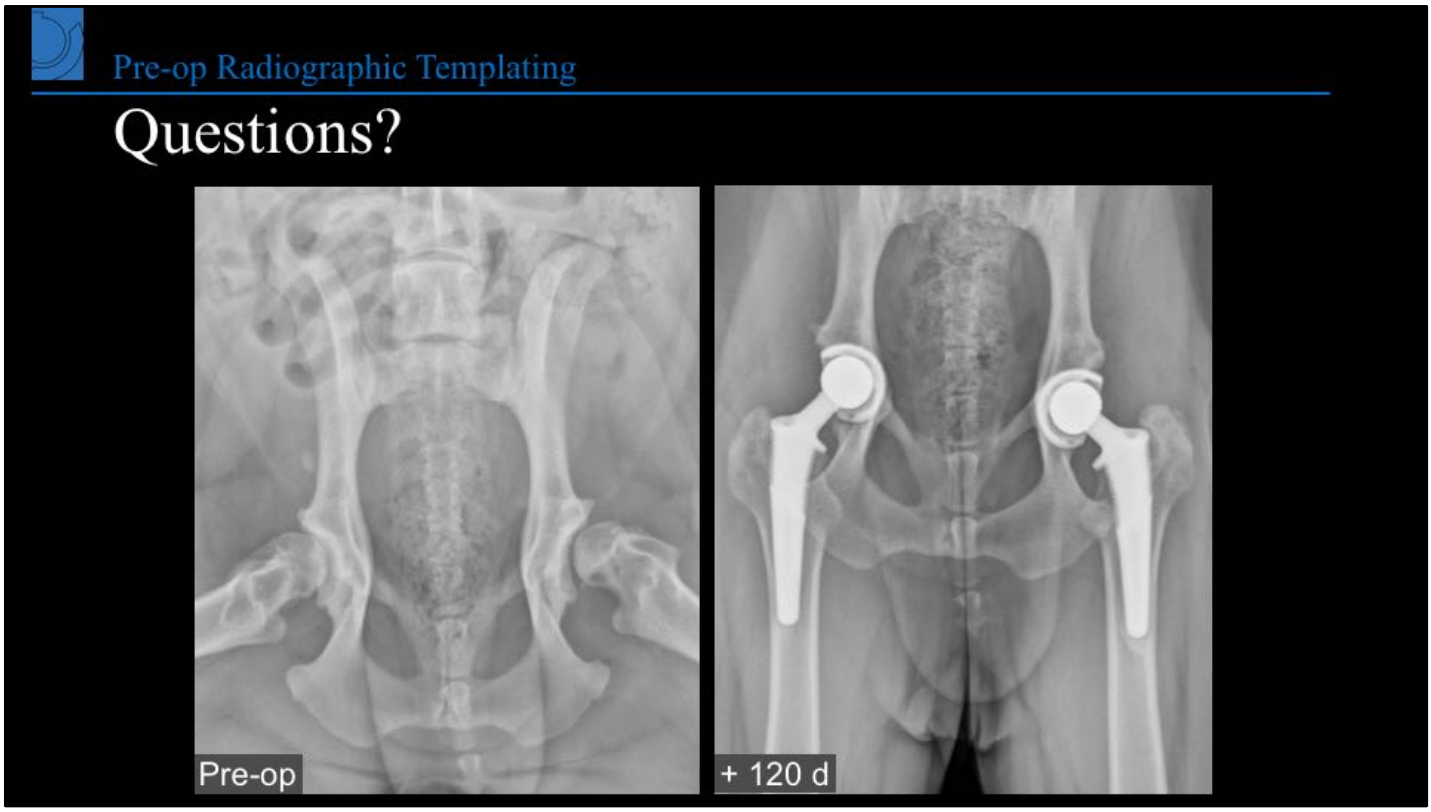
Pre-op Radiographic Templating

CFX Femoral Templating

- Once ideal stem size determined on CnCd view, repeat for lateral view
- Place template at appropriate level
- Align centerline
- Assess cement mantle
- 2-4 mm is ideal



Notes



Notes Always use the templates preop and postop which will help the surgeon become more accurate with templating.