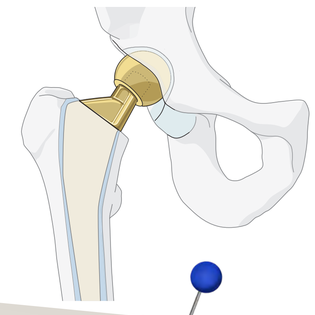
AO RECON

Skills Lab Station:
Templating a THA



Only detailed planning allows me to identify potential pitfalls through simulating the operation.

Steps

The artificial x-ray shows the pelvic model used in the stations for acetabular and femoral preparation.

1. Check the quality of the x-ray
2. Identify the reference line by combining the tips of the os ischiaticum or by drawing the inter-teardrop line
3. Assess the leg length discrepancy by measuring the distance between a femoral landmark and the reference line on both sides
4. Define the basis for cup orientation (ilioischial line, 45° inclination)
5. Draw the anatomical outline of the pelvis onto the transparent paper
6. Define the correct cup size using the template, overlay the transparent paper and draw the cup
7. Define the correct stem size and position to match the center of rotation using the template
8. Place the transparent paper over the correct stem to match the cup‘s center of rotation, draw the stem
9. Overlay the transparent paper onto the x-ray and outline the femur with stem in place
10. Define and draw the anticipated femoral neck cut

Learning objectives

- Recognize anatomical landmarks
- Explain how to reconstruct the center of rotation

Take-home messages

Reconstructing the center of rotation and leg length is crucial to achieve optimal joint kinematics

Planning helps being ready in the OR

This exercise is about:

- explaining the importance of planning
- performing all relevant steps, including identification of landmarks, and proper sizing

The center of rotation

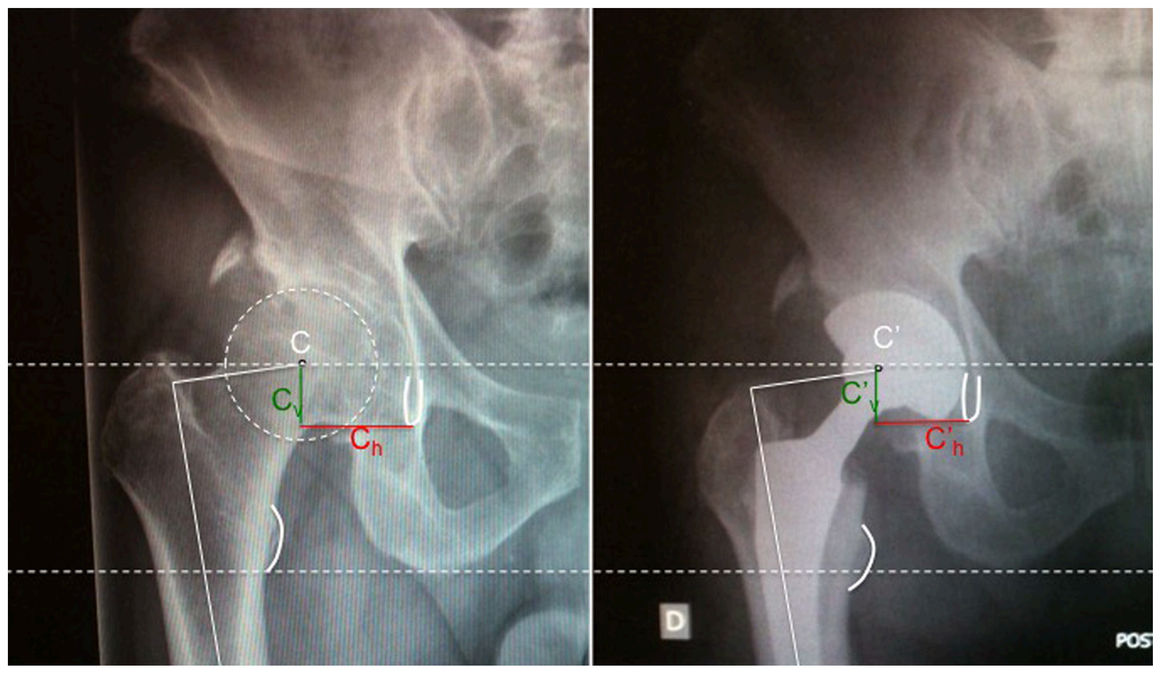


Fig 1 Example of acetabular offset modification due to excessive cup medialization. This patient had moderate hip dysplasia (a), and it was therefore reasonable to medialize the center of rotation to improve bony coverage of the cup (C’h < Ch) (b). There is little change to the height of the center of rotation. A cementless fixed-angle stem was chosen. To obtain good joint stability, the surgeon chose an extra long neck (note the skirt on the head), despite the resulting limb lengthening, which was expected to be less than 1cm and therefore without clinical significance.

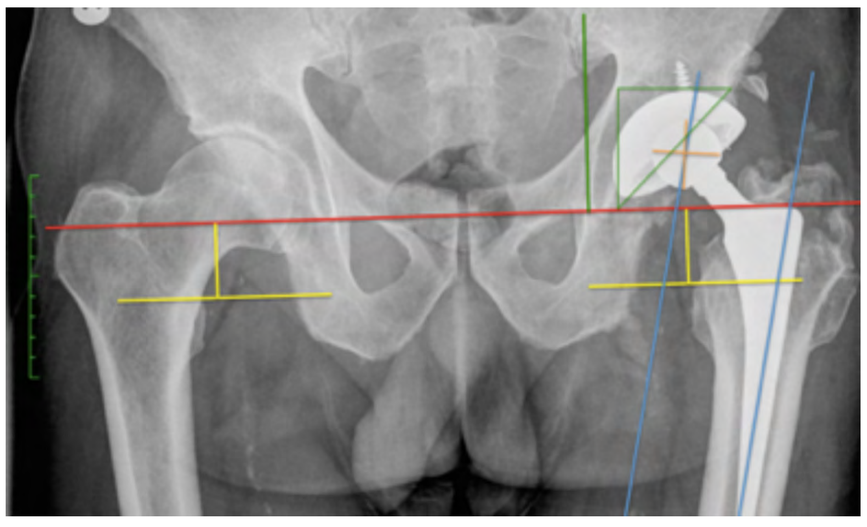


Fig 2

Red: Horizontal reference line (trans-teardrop line)

Green vertical: Ilioischial line

Blue: Determination of femoral offset

Yellow: Determination of leg length

Green triangle: Ranawat approach to reconstruct the native center of rotation

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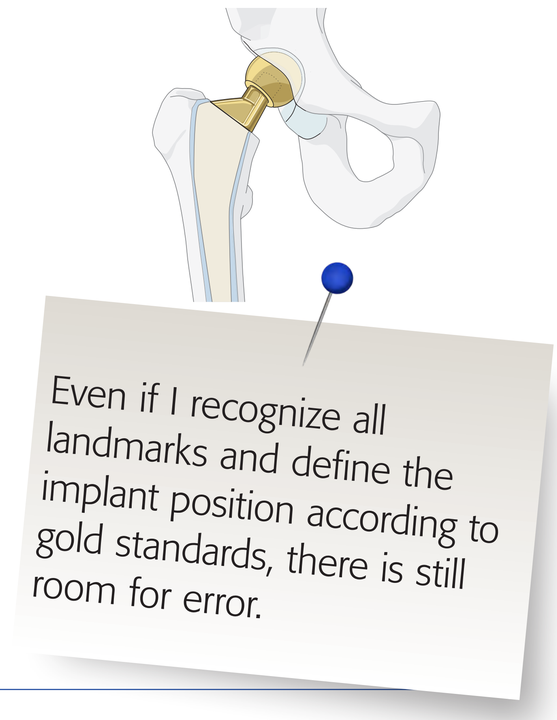
Skills Lab Station:

Reaming the acetabulum and inserting a cup



Steps

1 Identify the landmarks to define positioning and mark these on the model

2 Draw lines on the model for access/ direction of reaming (inclination, anteversion)

3 Review all preparations and equipment to be used

4 Remove the soft-tissue cover and identify the depth of the acetabular fossa

5 Use a small reamer down to the bottom of the acetabular fossa: proceed to the medium and final reamers (aim for 45° inclination and 25° anteversion)

6 Insert the cup (aim for 45° inclination and 25° anteversion)

7 Check the positioning by inserting the laser pointer into the center of the cup

8 Place the target plate to show where the cup should be placed

9 Interpret and discuss the results

Learning outcomes

- Plan the positioning of the cup based on landmarks for defining inclination and anteversion (supine or lateral positioning)
- Perform the key steps in acetabular reaming
- Identify where to place the cup

Take-home messages

Use the appropriate landmarks to plan orientation for positioning the cup (for inclination and anteversion)

Reflect on the consequences of the positioning and check for appropriate placement before implantation (and don‘t forget that the cup depth impacts the offset)

This simulation is about:

- preparing the acetabular component, starting with the positioning of the cup based on landmarks
- then moving to several key steps in the techniques of reaming and cup insertion

Recommended acetabular cup orientations

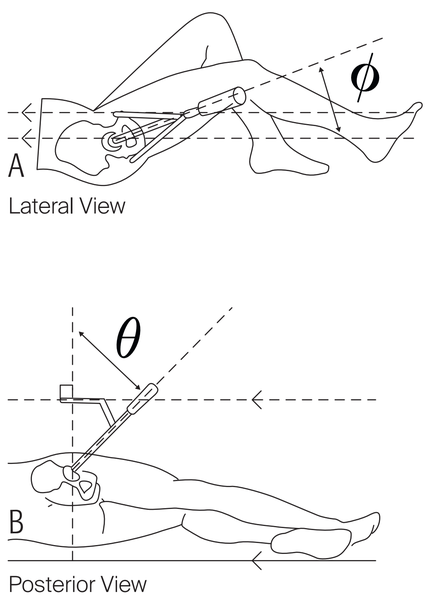


Fig 3 Surgical definition of anteversion (A) and inclination (B) angles.

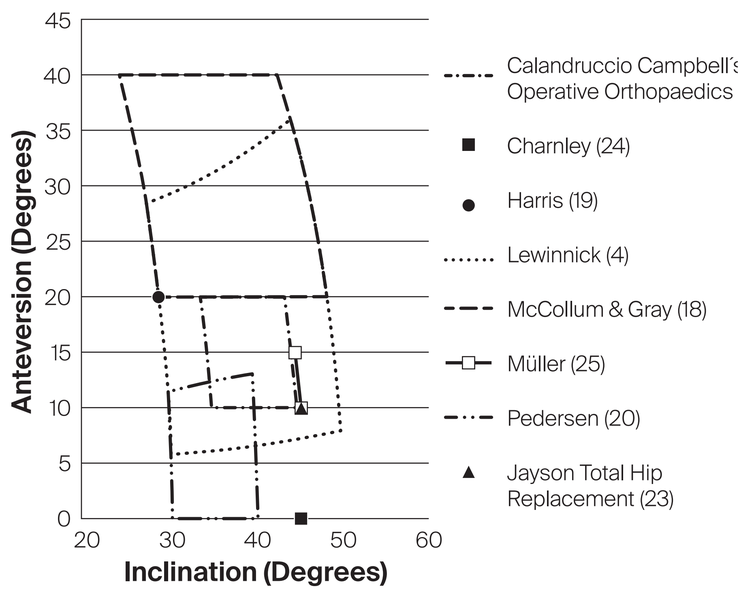


Fig 4 Recommended safe zones of the acetabular cup in the operative reference system.

“Recommended” does not necessarily mean “safe”

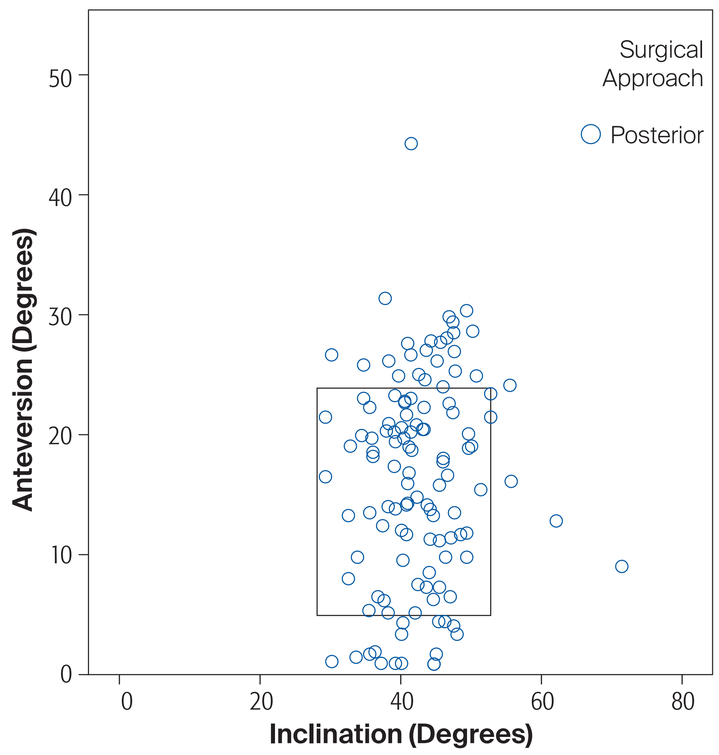


Fig 5 THA can dislocate even if the safe zones have been reached. Each circle indicates a dislocated hip. The square indicates the Lewinnek Safe Zone for inclination and anteversion.

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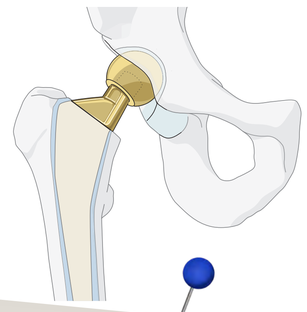
Skills Lab Station:

Preparing the femur and inserting a stem



Finding ways to notice that I have created appropriate press-fit is important in the OR. Once the press-fit is achieved, I should have reconstructed the center of rotation.

Steps

1. Define the height and mark the intended cut
2. Cut the neck
3. Open the femoral canal and define the anteversion
4. Start the broaching process
5. Define the intended depth of the stem
6. Insert the trial stem with proper press-fit
7. To assess the stem position in this educational environment:
   - Remove the trial component
   - Open the femur with the saw, and insert a press fit stem
   - Check its positioning, check for cortical contact/press-fit

Learning outcomes

- Decide the correct height of the femoral neck cut
- Prepare the femur
- Set the correct version and depth of the stem
- Achieve neutral stem insertion position (version, height, etc)

Take-home messages

Check the version via the plane of the femur and tibia with the knee flexed at 90° (figure 4 position)

The depth of the stem is crucial for the center of rotation and leg length reconstruction (and don't forget the femoral offset mentioned in the templating station)

This simulation is about:

- preparing the femoral component, starting with the appropriate positioning
- then moving to several key steps in the techniques of broaching and stem insertion

The correct version

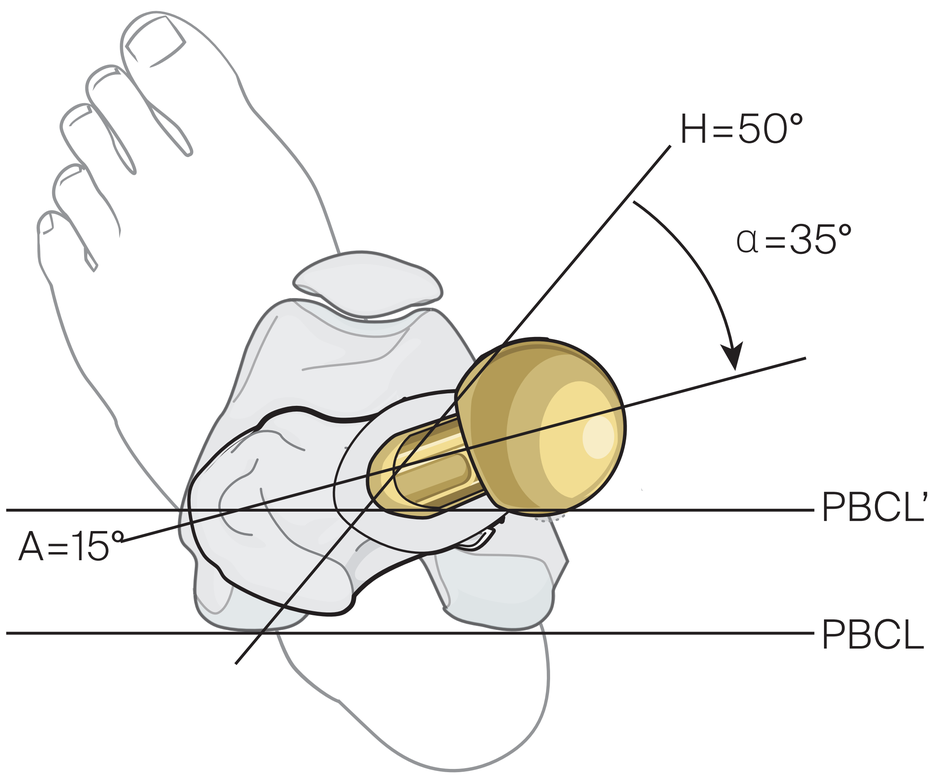


Fig 6 Measurement of femoral anteversion, and the alpha angle. The posterior bicondylar line (PBCL) is translated to the level of the neck (PBCL') to allow the measurements. The desired prosthetic anteversion angle is about 15° (A).

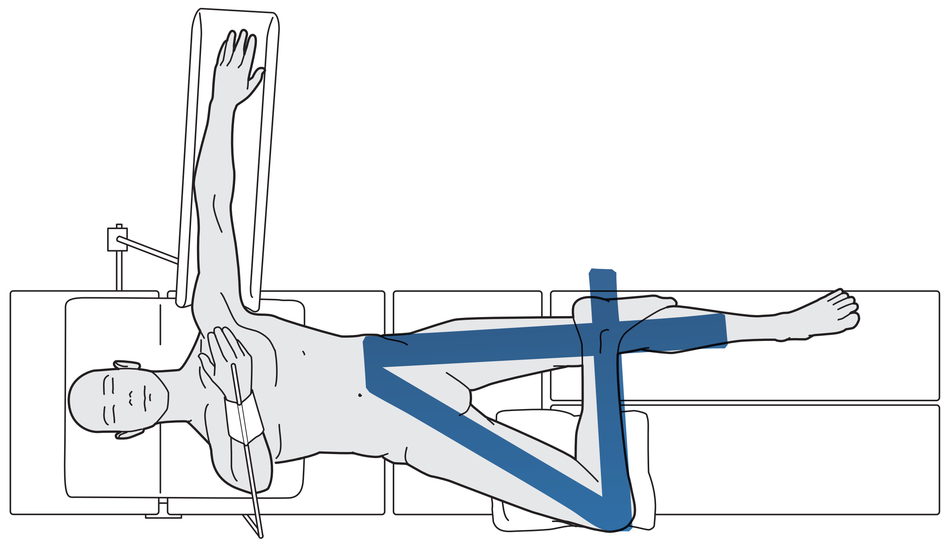


Fig 7 In case of decubitus position the figure "4" helps to determine the correct version.

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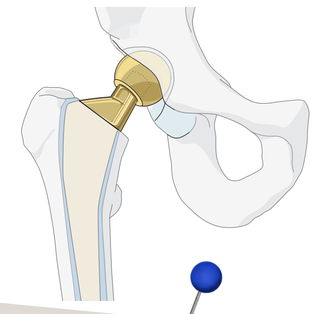
Skills Lab Station:

Safe screw insertion



Even though assessing the landmarks and safe zones helps me to avoid persistent nervous and vascular injuries, I will never be able to reduce the risk to zero.

Steps

1. Use the anatomical model to identify the interdependencies of the anatomical structures
2. Pick up the hemi-pelvis and consider the available bone stock and anatomical structures
3. With a green pen, mark the areas of the acetabulum where it is safe to insert screws
4. With a red pen, mark the areas of the acetabulum where it is NOT safe to insert screws
5. Discuss your marked areas with your group and the Faculty
6. Open the box and insert the screws into the holes of the multi-hole cup
7. Discuss which screw would have resulted in a soft-tissue injury

Learning outcomes

- Understand the anatomical structures of the pelvis
- Describe the safe and unsafe places to put the screws based on good and poor bone stock and with respect to anatomical structures

Take-home messages

When positioning screws, the location:

- Should have good bone stock
- Should avoid injuring important anatomical structures

Additionally, use common sense in the OR to further reduce the risk of persistent soft-tissue injuries

This simulation is about:

- identifying the safe and dangerous zones when inserting screws for cup fixation
- it can be conducted by individual participants and as a group exercise for comparison

Anatomy of the hip

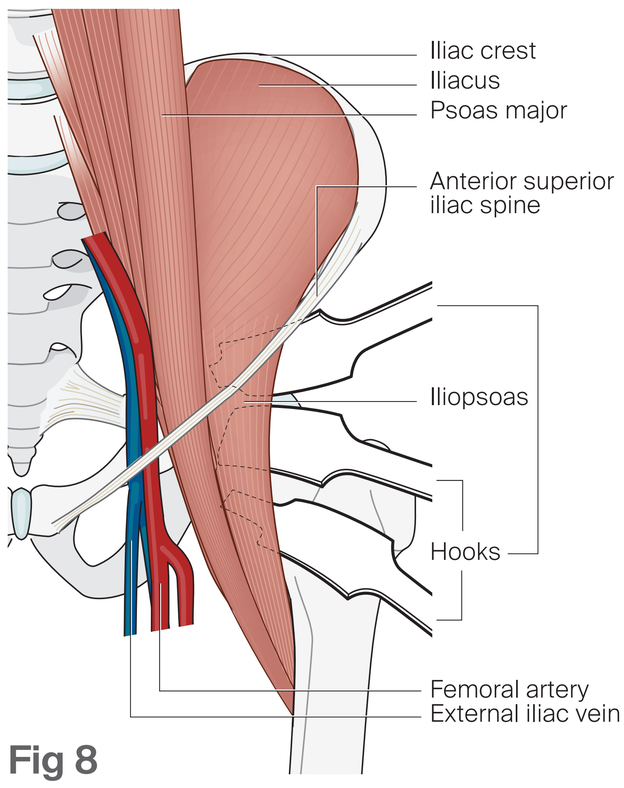


Fig 8

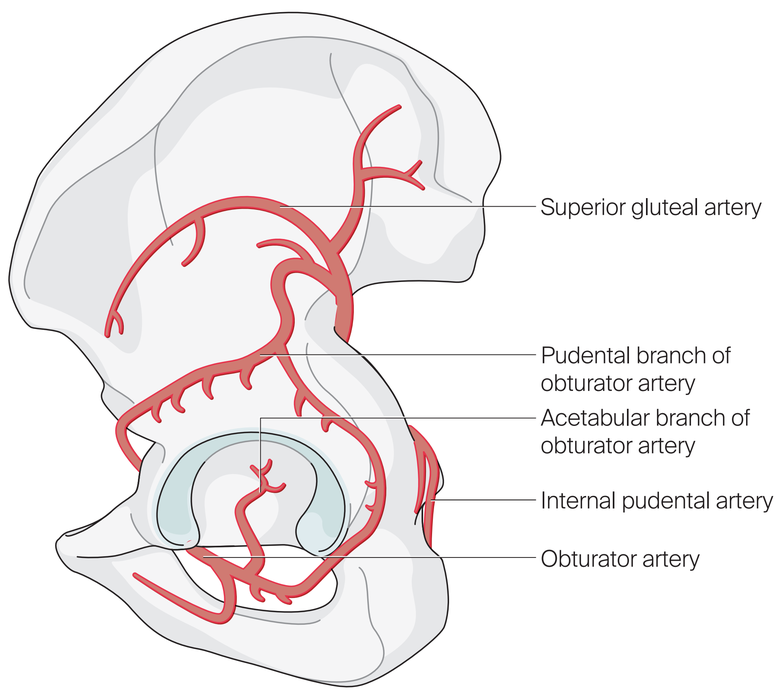


Fig 9

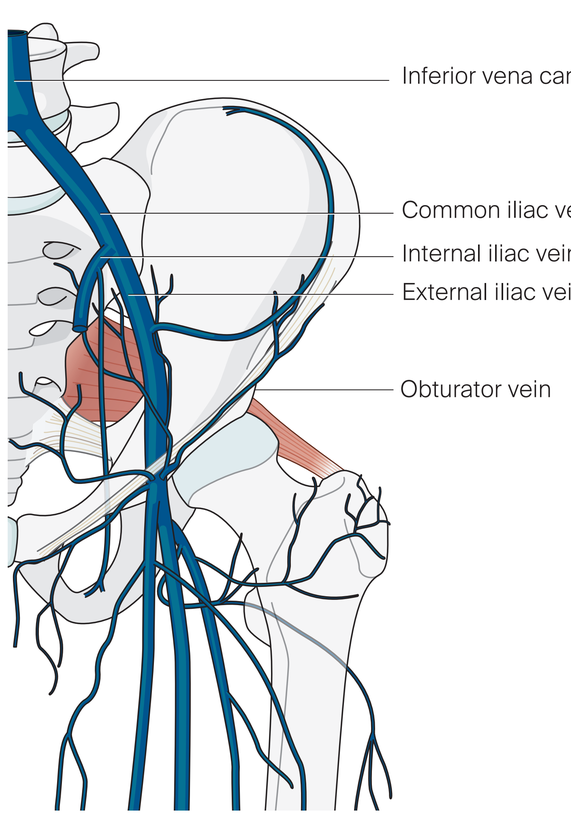


Fig 10

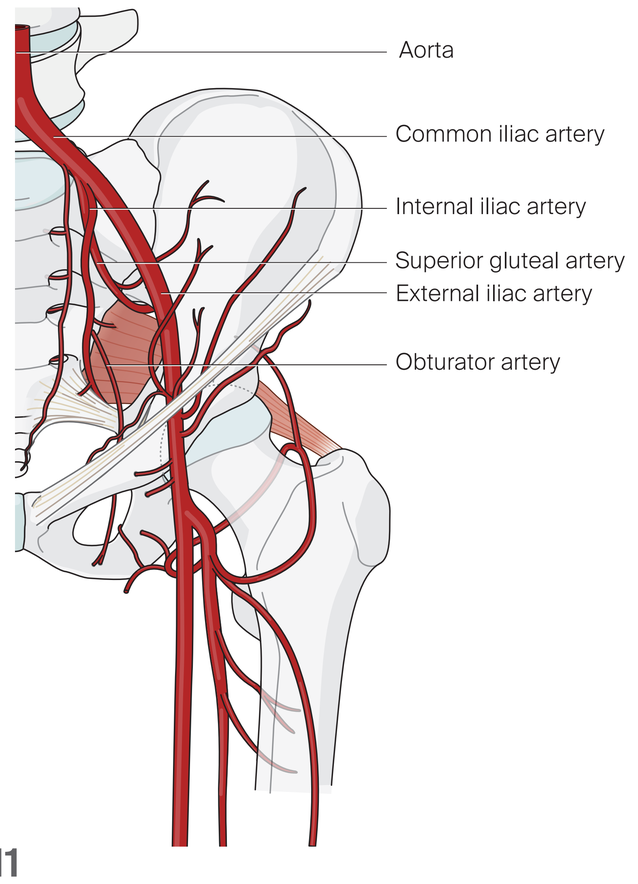


Fig 11

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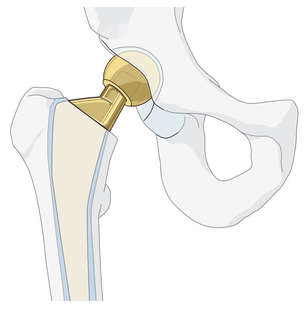


Skills Lab Station:

Meet the experts

Steps

1. Collect questions to be asked to the experts throughout the course
2. Present your questions to the Faculty
3. Discuss the options, answers, or recommendations in the group

Learning outcomes

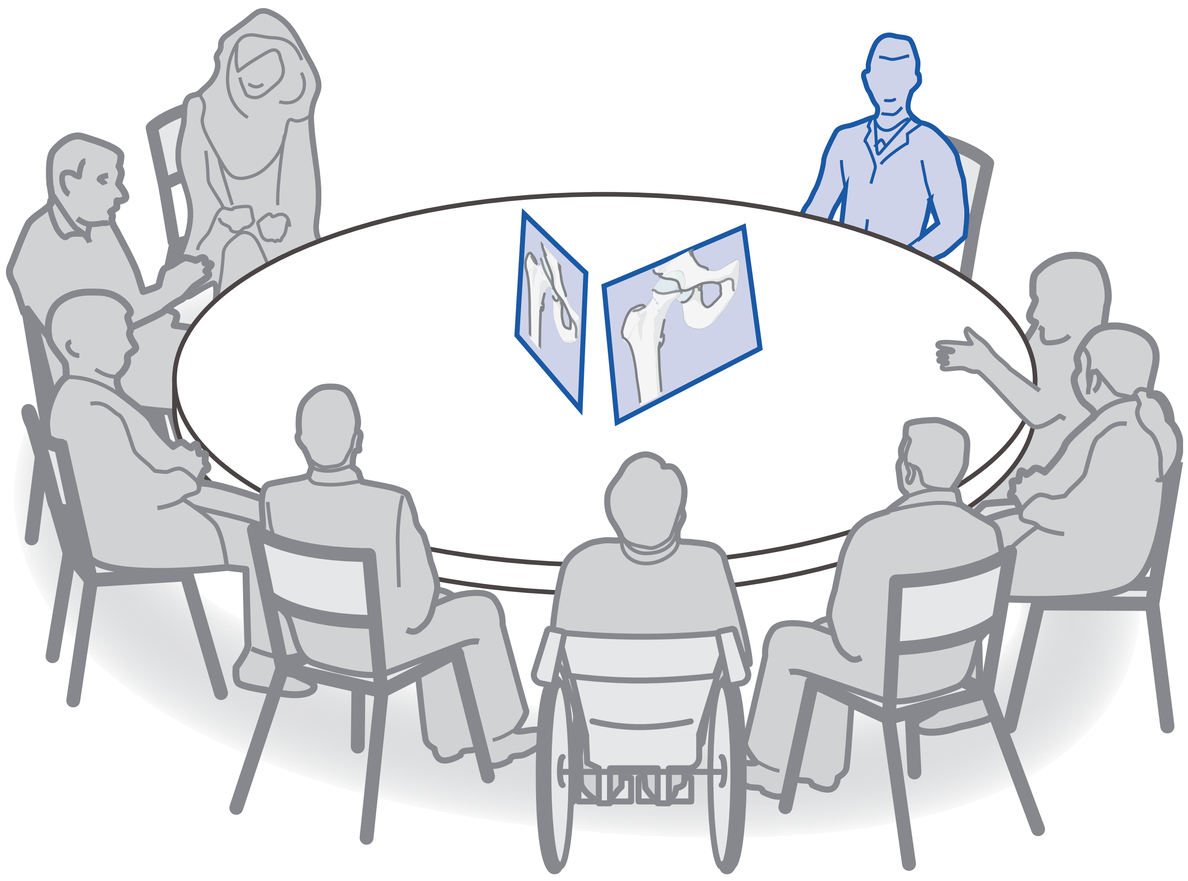
- Relate learnings from the presentations to your personal experience
- Clarify eventual questions on important concepts and models
- Collect feedback and advice from the experts in the field

Take-home messages

There is space in your booklet for you to note your personal take-home messages from this session

This session is about:

- your individual questions to faculty
- receiving direct feedback to cases, uncertainties, open points, or experiences in the OR



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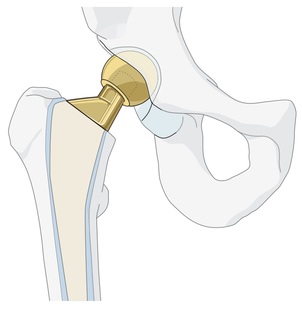


Skills Lab Station:

Case discussions

Steps

1 The faculty introduces each case and moderates the discussion

2 The participants and faculty discuss the parts of each case

3 Review the take-home messages for each case

Learning outcomes

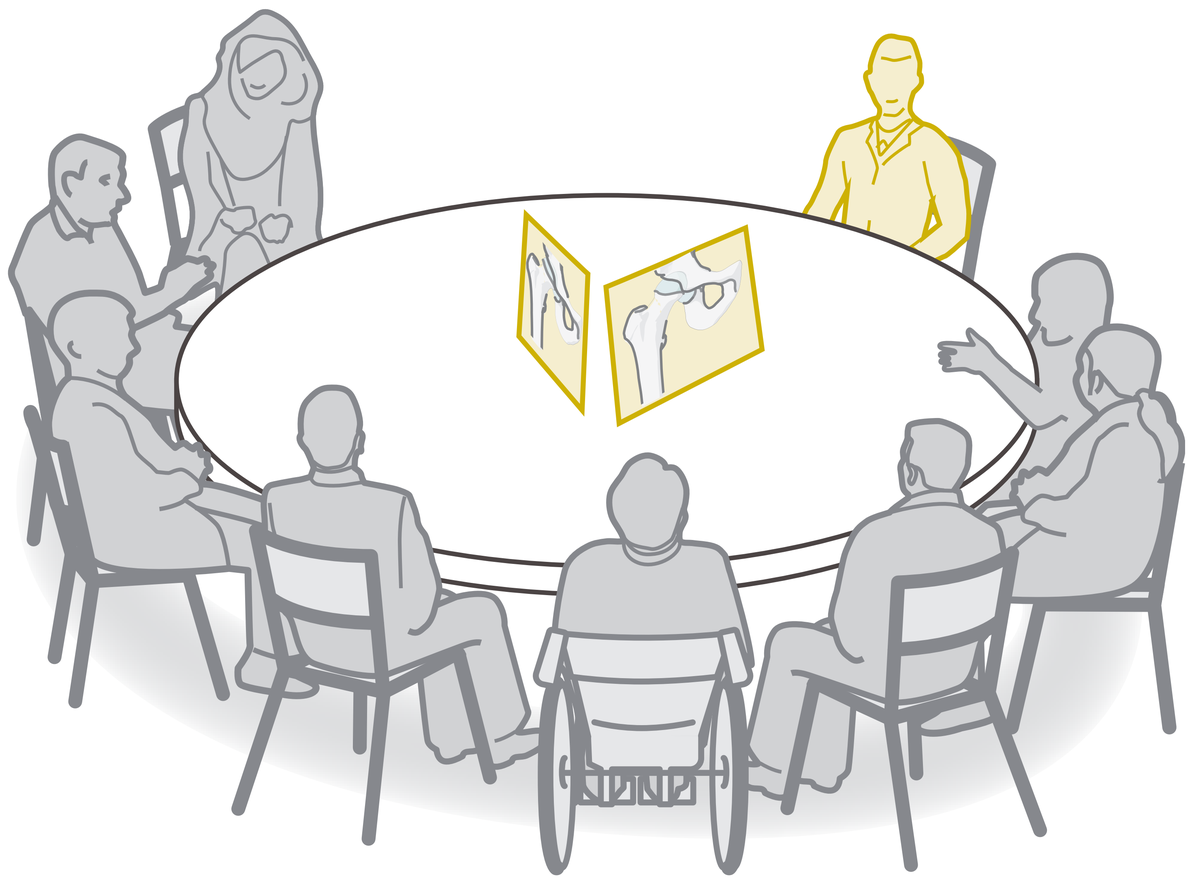
- Each case has specific learning objectives integrated

Take-home messages

There is space in your booklet for you to note your personal take-home messages from this session

This session is about:

- case-based group discussion using standard AO Recon THA cases
- topics: intraoperative challenges and complications



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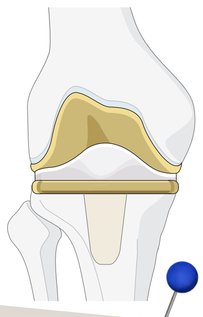
Skills Lab Station:
Planning a TKA



Only detailed planning allows me to identify potential pitfalls through simulating the operation.

Steps

AP full leg x-ray

1. Check the quality of the x-ray
2. Mark the center of the femoral head, the center of the knee joint, and the center of the upper ankle.
   Connect them with lines and measure the varus/valgus angle
3. Draw a line along the center of the femoral canal and measure the femoral valgus angle
4. Define the femoral resection plane by drawing a perpendicular line to the mechanical femoral axis
5. Define the tibial resection place by repeating step 4 on the tibia

Lateral view

6. Draw a line along the center of the femoral canal in order to identify the level of the entry of femoral intramedullary rod
7. Draw a line along the center of the tibial canal
8. Draw a tangent at the level of the joint line and follow the tibial slope
9. Measure the tibial slope (using the lines from steps 7 and 8)

Optional: Use templates in AP and lateral view to determine implant sizes and position

Learning objectives

- Recognize anatomical landmarks
- Describe how to achieve desired alignment in coronal and sagittal planes

Take-home messages

Proper alignment is crucial to achieve optimal joint kinematics

Planning the planes helps avoid surprises in the OR

This exercise is about:

- understanding the importance of planning
- performing all relevant steps including the identification of landmarks, and proper sizing

Knee alignment

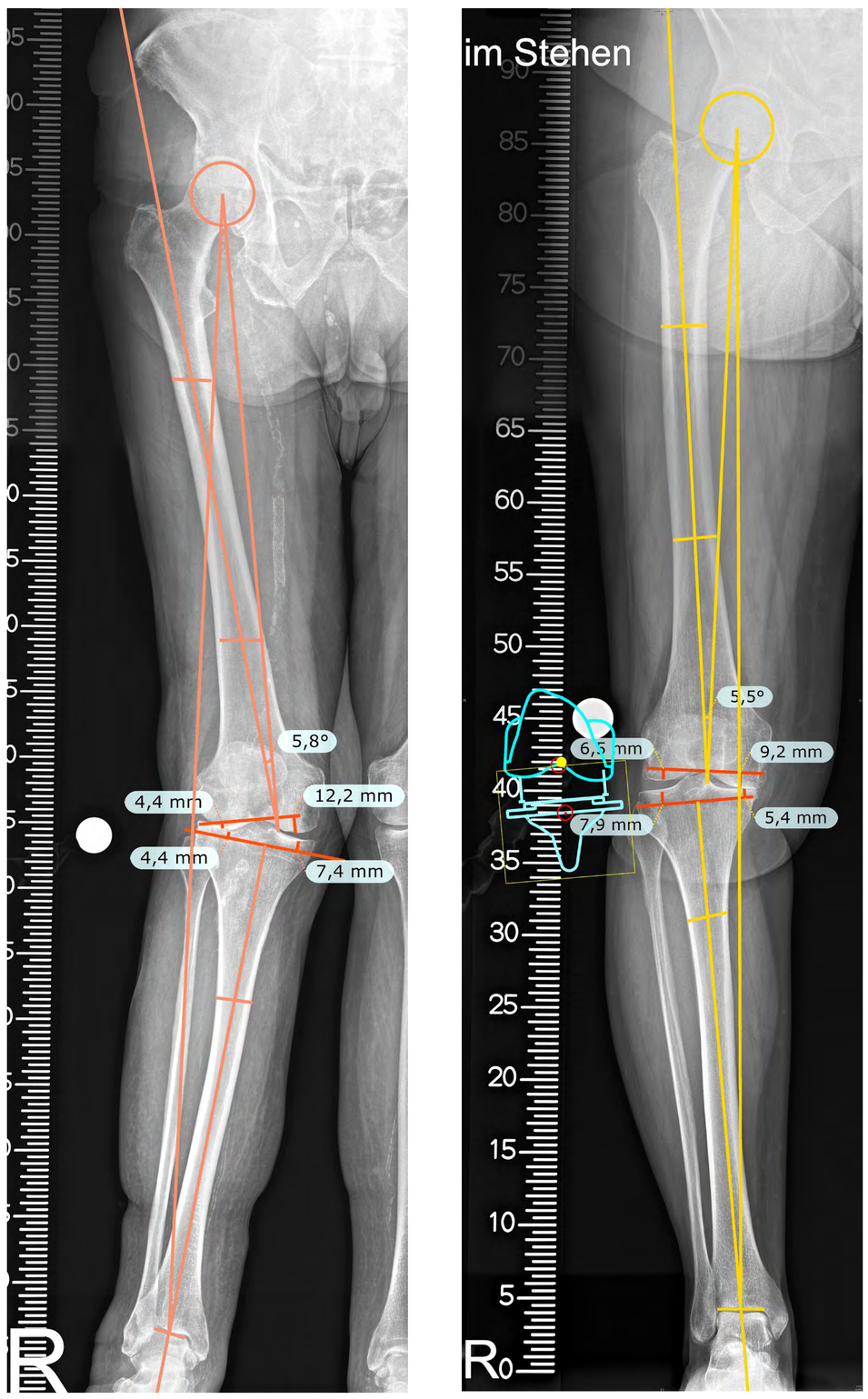


Fig 12–13 Standing LL x-rays are crucial for planning.

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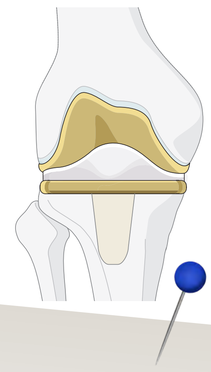
Skills Lab Station:

Alignment for a tibial cut



Even if I recognize all landmarks and define the implant position in all planes, there is still room for error.

Steps

1. Assemble the guide on the tibia using appropriate landmarks
2. Perform the desired alignment with regards to:
   - Setting the depth to 8 mm
   - Aiming for a 5° slope
   - Varus/valgus
3. Turn on the laser, remove the cover and assess result regarding the above factors
4. Describe how to correct any problems and adjust accordingly

Learning objectives

- Carry out alignment planning based on the correct landmarks
- Describe the causes for error and perform the according corrections

Take-home messages

Alignment must be planned based on the correct landmarks

All three dimensions must be considered for correct alignment and kinematics

This simulation is about:

- highlighting the importance of alignment for a tibial cut
- helping to visualize all the important components

The three dimensions of alignment

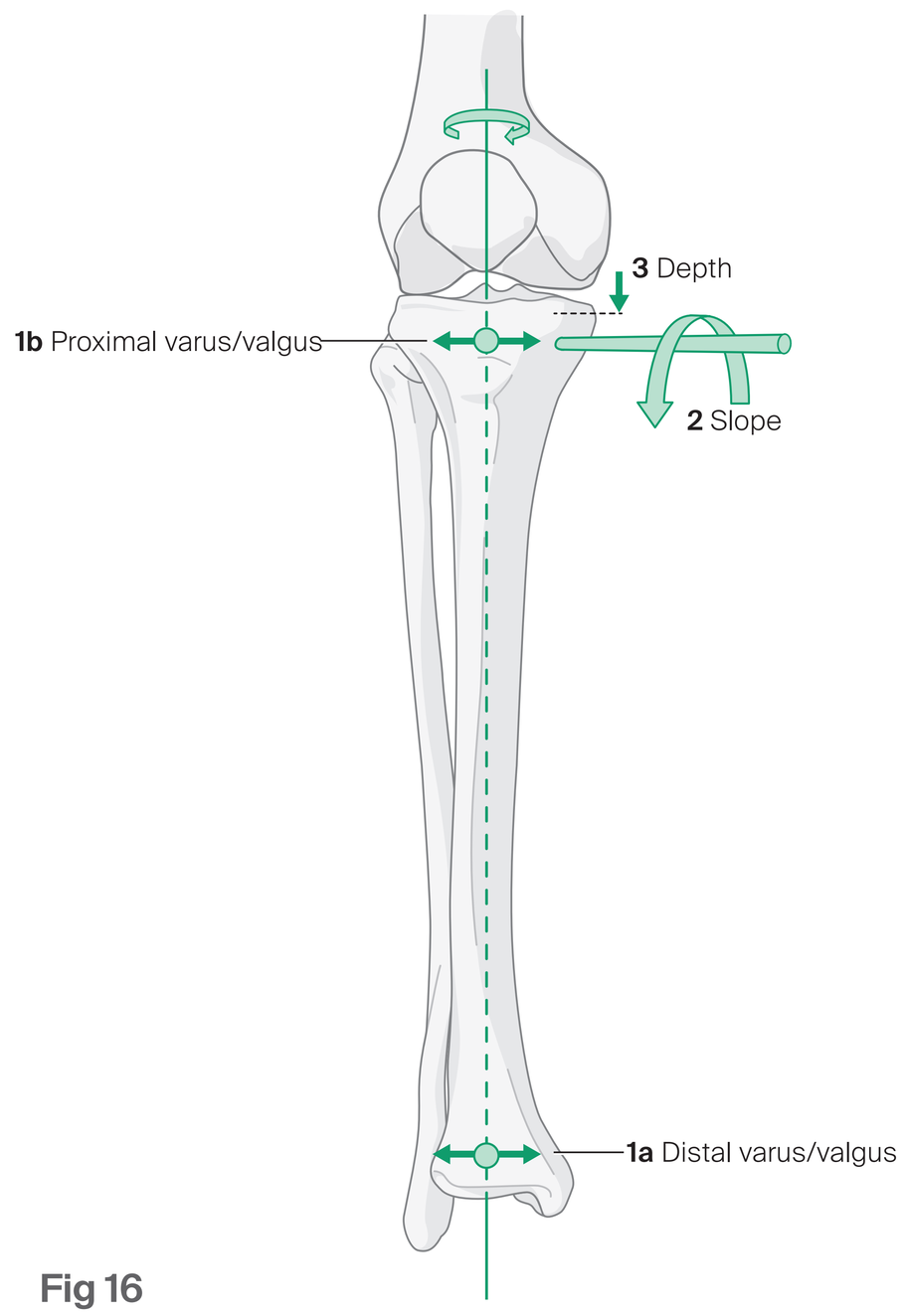


Fig 16

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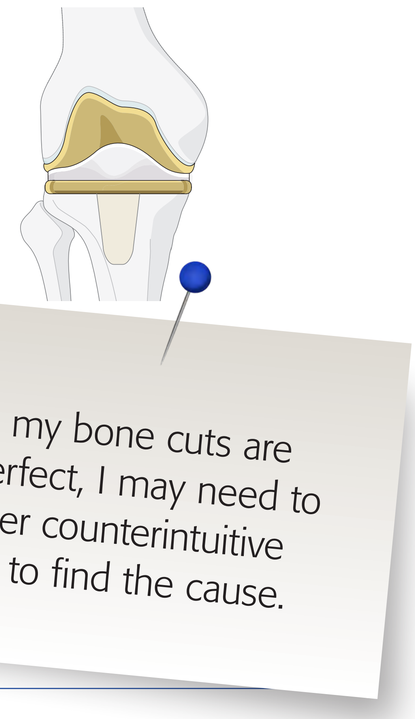
Skills Lab Station:

Performing a tibial cut



Steps

1. Insert the posterior capsule (block 1 with plasticine) behind the bone
2. Select a blade and perform the tibial cut through the cutting guide
3. Remove the block and check for soft-tissue penetration
4. Insert block 2, check the accuracy of the cut, and reflect on the result
5. Smoothen the plasticine in block 1, insert it, move the bone up, and repeat the cut with a different saw blade
6. Reflect on the differences between the two cuts

Learning objectives

- Perform an accurate plain tibial cut
- Avoid any soft-tissue damage during the performance of a tibial cut

Take-home messages

Check that you have the correct blade thickness before sawing

Avoid soft-tissue damage

Be aware of possible errors that cause poor bone cuts

This simulation is about:

- outlining how to make an accurate cut as planned
- how to avoid damaging any vessels, veins, and other soft tissues such as the collateral ligaments while sawing

Proper bone cuts

Fig 17 Correct

Fig 18 Wrong

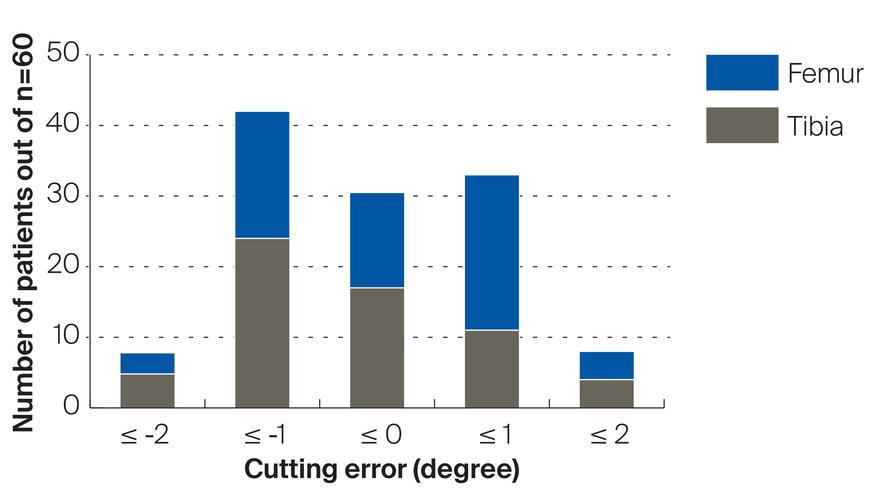


Fig 19 Cutting error on femur and tibia in the coronal plane.

Vicinity of vessels in posterior capsule

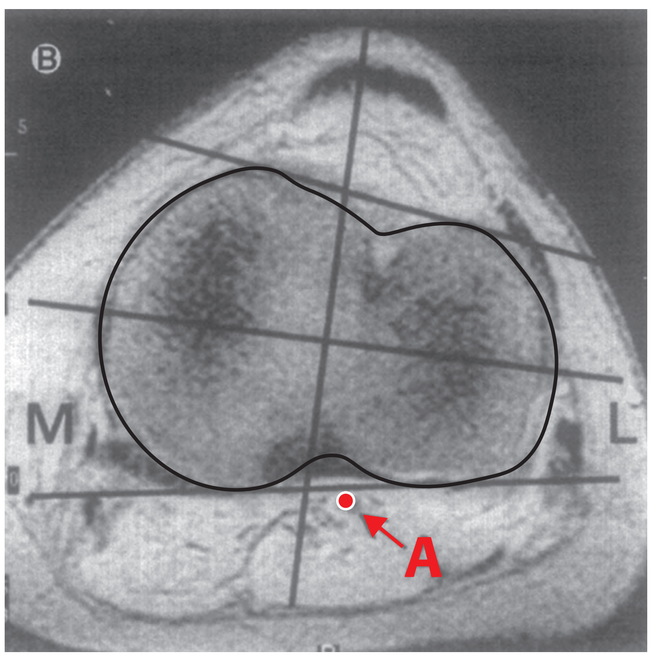


Fig 20 The popliteal artery can easily be damaged when the tibial cut is not done carefully

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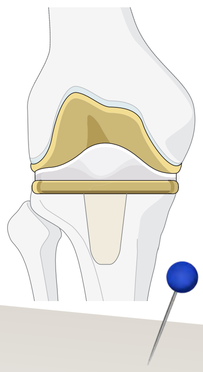
Skills Lab Station:
Cementing



I cannot use cement as if it was glue, because it is not sticky by itself.

Steps

1. Mix the cement according to instructions
2. Examine the available numbered plates: 1 is plain (represents the cortical bone), 2 has a green inlet (represents spongeous bone with debris), 3 has a dove tail (represents clean, spongeous bone). The counterparts without numbers represent the rough implant surface.
3. When the cement is no longer sticky, apply 3 equally sized chunks to the three samples
4. Use the drying phase to understand the surgical relevance by watching the featured video
5. After the hardening phase, test the strength of bonding between the samples and compare the three test sets

Learning objectives

- Describe the function of cement
- Recognize the various phases with cement (preparation phase, sticky phase, and working phase)

Take-home messages

Cement is not glue, it is grout

This simulation is about:

- demonstrating the result of using cement with various types of surfaces
- demonstrating that cement is not glue, it is grout

The form closure principle

Cement creates fixation by “hooking” into empty spaces of spongeous bone.

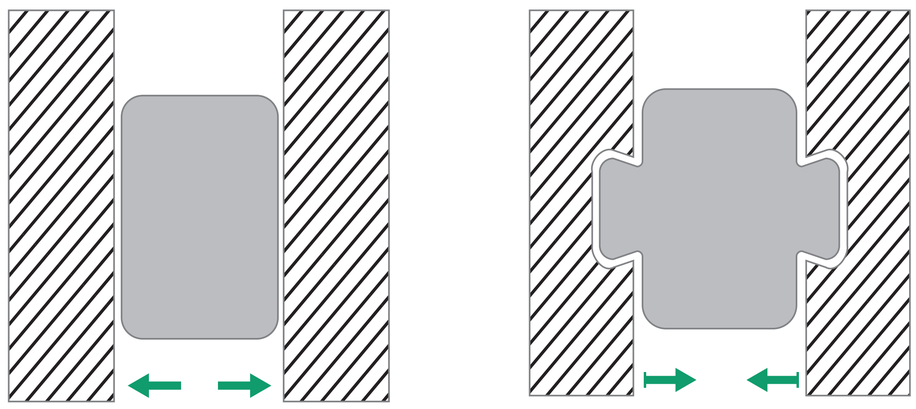


Fig 21

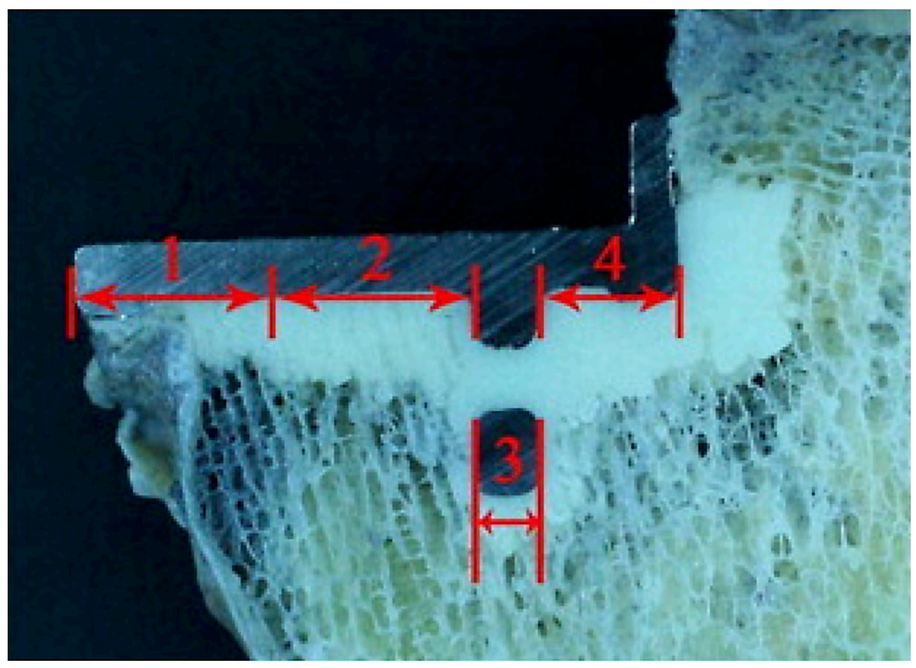


Fig 22 Cross-section of a stable bone-implant cement interface

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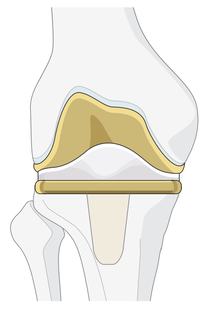

Skills Lab Station:

Meet the experts

Steps

1. Collect questions to be asked to the experts throughout the course
2. Present your questions to the Faculty
3. Discuss the options, answers, or recommendations in the group

Learning outcomes

- Relate learnings from the presentations to the personal experience
- Clarify eventual questions on important concepts and models
- Collect feedback and advice from the experts in the field

Take-home messages

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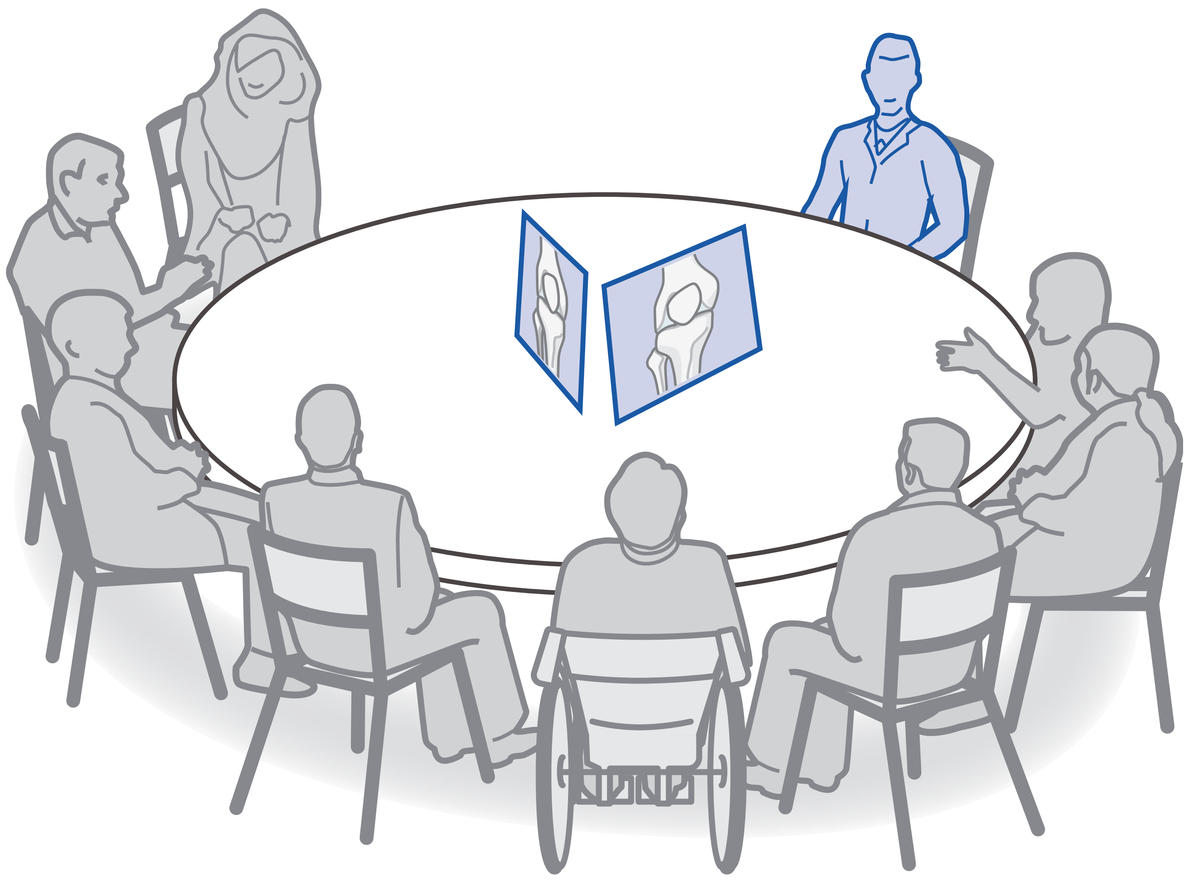
This session is about:

- your individual questions to experts
- receiving direct feedback to cases, uncertainties, open points, or experiences in the OR



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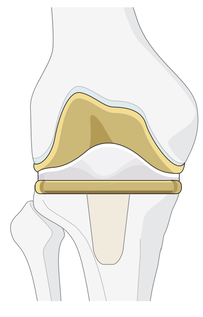

Skills Lab Station:

Case discussions

Steps

1 The faculty introduces each case and moderates the discussion

2 The participants and faculty discuss the parts of each case

3 Review the take-home messages for each case

Learning outcomes

- Each case has specific learning objectives integrated

Take-home messages

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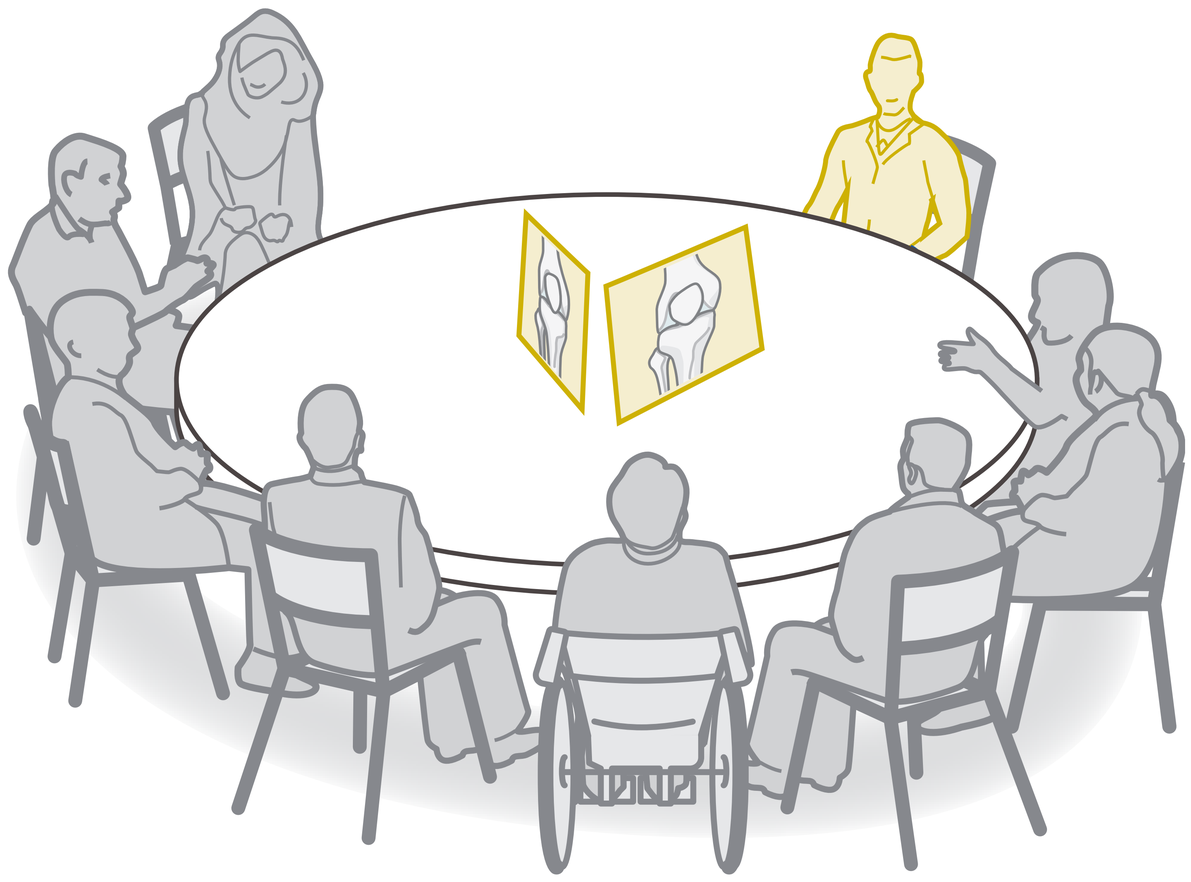
This session is about:

- case-based group discussion using standard AO Recon TKA cases
- topics: intraoperative challenges and complications



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