

Frequently Asked Question/

Hip 6.0

Frequently Asked Question is a document with the most upcoming questions regarding Hip 6.0.

SETUP

QUESTION

Where is the optimal place for the camera?

ANSWER

Try what is best

CLARIFICATION

We recommend placing it on the head side of the OR table, opposite to the operating surgeon near to the anesthetist .

PATIENT PREPARATION WITH PATIENT POSITIONER (important for lateral patient position)

QUESTION

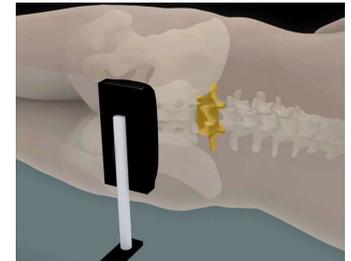
Do I have to change positions for new registration method?

ANSWER

The position of the anterior and/or posterior supports might need to be changed slightly.

CLARIFICATION

Place the posterior support at the sacrum and the anterior support a bit more distally.



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PIN PLACEMENT

QUESTION

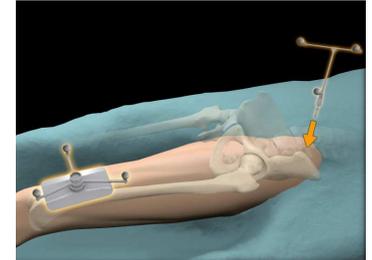
How should I place the pins on the Pelvis for the array?

ANSWER

On the Iliac Crest.

CLARIFICATION

Pin placement should be in the middle of the crest. The Surgeon has to come from posterior.
We recommend to place the pins without an incision, the sharp tip can be easily placed, with a hammer, without incision.
Location: approximately 2,5cm posterior to the ASIS to prevent disturbance of nerves (e.g. the lateral femoral cutaneous nerve)



Is there a way to avoid having to place pins for the acetabular/cup navigation?

NO

We need a fixed reference array at the pelvis.

PINLESS ARRAY - FEMUR

QUESTION

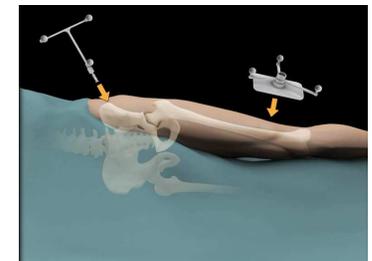
Where should I place the pinless array?

ANSWER

On the femur as far distally as possible

CLARIFICATION

Lateral position: Array is attached laterally on the femur
Supine position: Array is attached on the anterior femur



How should I fix the pinless array?

With a sterile adhesive drape

When can I use the pinless plate instead of a fixed reference array at the femur?

For THR cup only and Express leg situation Workflow

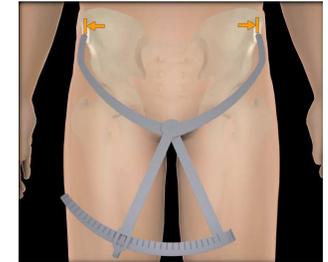
If stem navigation is required you need a fixed reference at the femur.

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SPINA SPINA DISTANCE MEASUREMENT WITH CALIPER (for lateral patient position)

Construction of the Pelvic Planes is based on gender specific, fixed relations between anatomical landmarks in the human pelvis. If only the treated side ASIS is registered, we need to calculate the contra-lateral side. In order to do so, we need to know, how “wide” the pelvis is --> ASIS-to-ASIS distance from the pre-op measurement.



QUESTION	ANSWER	CLARIFICATION
Can I use an X-Ray image to measure the spina spina distance?	NO	Magnification error! Reproducibility of points (soft tissue is taking into account) → You have to acquire the same point later in the surgery on the skin not on bone.
Can I measure the distance the day before?	Should not!	Our recommendation is that the surgeon who acquires the spina point intra-operatively shall do the measurement with the caliper! Because it is important to register the same point pre- and intraoperatively.
Can I measure the distance in standing position?	NO	Because of soft tissue it is better to measure the Patient in lying position on the bed than in standing position! The registration of the point intraoperatively is also in a lying position.
Can I mark the Spina-Spina points while measuring?	YES	It can be taken as an orientation for palpating only. Due to the movement of the patient and soft tissue movement the marked point can move.
Is it important to find the exact point intraoperatively?	YES	If the measured Spina point distance before and during the procedure do not match, the accuracy of anteversion and inclination calculation is compromised.
How can I find the right point?		It has to be at the spina. You have to remember the exact location of the landmark to reproduce the location of the registered point.

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SPINA POINT (LATERAL)

The landmark in lateral patient position, is used to calculate the landmarks on the contralateral side together with the Spina Spina distance measured with the Caliper to get the pelvic planes (anterior and mid-sagittal).



QUESTION

Where should I acquire this landmark?

ANSWER

Lateral position:
It has to be the same spot as measured before the surgery

CLARIFICATION

Differences in the measured and acquired landmark will result in a bad registration. We recommend that this point has to be acquired from the same person who measured the point preoperatively.

Why should I do it before the incision?

Due to soft tissue tension

Soft tissue tension after the incision can make it more difficult to acquire the ASIS point.

SPINA POINT (SUPINE)

The landmarks in supine patient position, are used to calculate the pelvic planes (anterior and mid-sagittal).



QUESTION

Where should I acquire this landmark?

ANSWER

Supine position:
It should be in the same region on both sides.

CLARIFICATION

To get the right tilt of the pelvic plane.

Why should I do it before the incision?

Due to soft tissue tension.

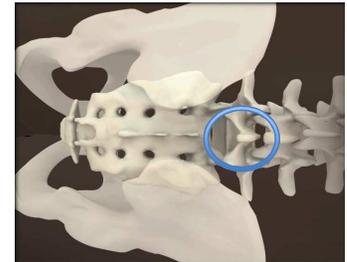
Soft tissue tension after the incision can make it more difficult to acquire the ASIS point.

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POINT ON MIDSAGITTAL PLANE (for lateral patient position)

The landmark is used to calculate the landmarks on the contralateral side to get the pelvic planes (anterior and mid-sagittal).



QUESTION	ANSWER	CLARIFICATION
Can I acquire this point in an unsterile environment?	YES	For this case a second pointer is needed for the acquisition of the other landmarks. Our recommendation is to register through the patient draping.
Can I mark L5 before the OR?	YES	Please take it as an orientation only. Due to the movement of the patient and soft tissue the marked point can move. We recommend an ECG electrode, for better palpation under the drape.
How to find L5 best?	Palpate the posterior iliac spine and move cranially to palpate the spinous process of L5	Hip 6.0 shows a “How-to” video when you have to register this point.
Can I register L4 instead of L5?	Should not!	The spine is curved when patient in lateral position. There is always a risk when you register L4 instead of L5. Due to possible movement of the lumbar spine relative to the pelvis, it can result inaccurate registration. If e.g. the patient has undergone L5 laminectomy, L4 can be registered. However, the accuracy might be compromised and Inclination/Anteverision values should be used with caution.

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ACETABULAR FOSSA

Also used for calculating the pelvic planes and depth information for reaming!

QUESTION

ANSWER

CLARIFICATION

Where should I acquire this landmark?

On the true acetabular floor.

Make sure to have access to the fossa. Remove osteophytes if needed. We recommend to use a curette. If using a reamer be careful not to remove too much bone from the acetabular floor.
If the acquired points are too inferior then redo it.

What about protrusio?

This is a contraindication for navigation right now.

Mild protrusio with caution! At least a bit of floor needs to be present.



ACETABULAR CAVITY

Used to determine the pelvic planes and default position for cup placement. Furthermore used for calculating the cup size.

QUESTION

ANSWER

CLARIFICATION

How much of the acetabular cavity needs to be covered?

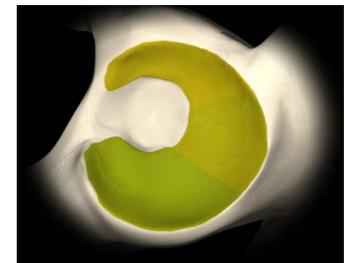
The whole part of the acetabular cavity which is not deformed!

When the pointer slips off the acetabular cavity's surface while registering redo it!

What about dysplasia?

Dislocated:
Neo acetabulum:
Mild dysplasia:

No navigation possible
No navigation possible
Caution as effect on Leg Length and Offset



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INFERIOR PEAK OF PSOAS VALLEY

This point defines one of the statistical relationships in landmarks in the pelvis – also used to calculate the non-treated side and the pelvic planes.



QUESTION

ANSWER

CLARIFICATION

Where should I acquire this landmark?

Look at the midpoint of the TAL (notch), take it as a 6 o'clock position and acquire the psoas point at 9 o'clock position for left hips or 3 o'clock position for right hips

If there is an osteophyte on this point, do I have to remove it?

YES

We recommend to remove the osteophyte although it is not very critical if the point is registered more lateral on top of the osteophyte.

What if I do not want to remove osteophytes?

OK

As long as you take the point on rim as this is in the same plane as the true point this will not have a big effect on the pelvic plane calculation

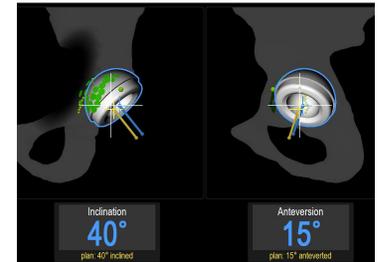


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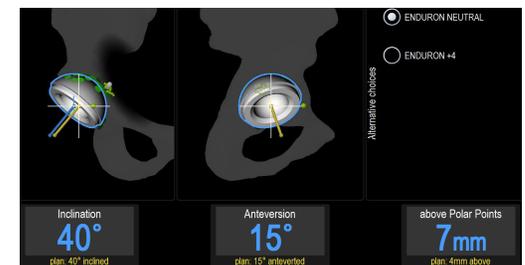
CUP PLACEMENTS

QUESTION	ANSWER	CLARIFICATION
Can the software tell the surgeon what the best cup orientation is?	YES	The Lewinnek Safe Zone. 40° (±10°) inclination and 15° (±10°) anteversion are the default values which can be changed to the surgeons plan.
What does the main page show me?	The values for your cup position	The 40° and 15° are the middle of the Lewinnek Safe zone. Either change the plan to your goal or directly proceed to navigation and go for your target
Can the software show planning and navigation information regarding e.g. medialization?	YES	Enable additional controls from the menu to plan e.g. medialization of the acetabular cup. If you want to navigate the reaming steps, you need to enable „navigated steps: reaming“ in your procedure.



CUP DEPTH INFORMATION

QUESTION	ANSWER	CLARIFICATION
Does the software show cup depth information?	YES	With data base Version 3.6.2 Rev 103. Please see implant integration list. There is no depth information for reaming.
How do I get depth information?		Register 3 points on the acetabular rim. This step appears after reaming.



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PELVIC TILT

QUESTION

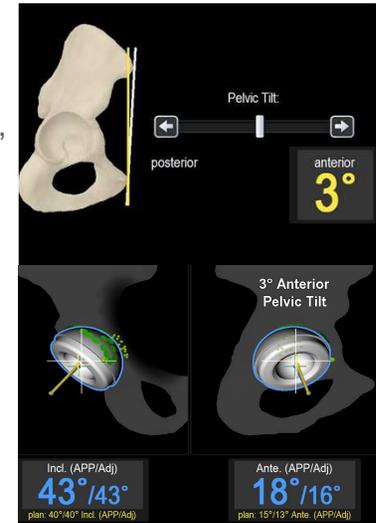
Do we consider pelvic tilt?

ANSWER

YES optionally

CLARIFICATION

A preoperative, standing, lateral X-ray is needed. You have to tell the software what pelvic tilt the patient has, this will change the values for inclination/anteversion on the cup navigation page



LEG LENGTH AND OFFSET

QUESTION

Do I need to place a little screw in the greater trochanter for leg length measuring?

ANSWER

YES

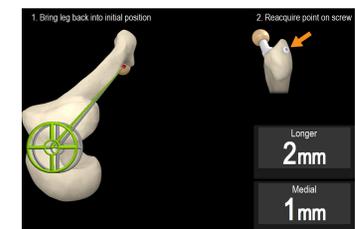
CLARIFICATION

We recommend to place a screw to be able to reproduce this specific point again.

Can navigation (without pre-op templating) provide target information for leg length changes?

NO

We do not know the non-treated side and what the surgeon wants to achieve! The desired lengthening and offset change needs to be assessed during pre-op templating



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GENERAL QUESTIONS

QUESTION	ANSWER	CLARIFICATION
Will the software work for dysplastic hips?	NO	We are using statistics of more than 600 CT datasets for the algorithm, that do not include dysplastic hips This applies for: - a dislocated joint - neo acetabulum - a flat acetabulum
Does the registration work for patients with scoliosis?	YES	That is why you have to acquire L5! We did a lot of work and research to define L5! If previous spinal surgery and L5 not present use the line of spinous processes that are present → line from midpoint of sacrum and midpoint between Posterior Inferior Spine.
What about osteophytes?	Removing	It is recommended to remove them if the landmark isn't fully accessible
Are there limitations for gender and population?	NO	Indicated for adult patients with ASIS distance 140-350mm
What is the difference between active and passive array detection in navigation and why is BrainLAB's detection better?	We don't need any cables or batteries, which makes it cheaper.	Active array: This is a both way communication system of infrared waves between the trackers and the sensors. The tracker sends active a signal to the camera this is why they need a battery. Passive array: An infrared-emitting camera and reflector balls on instrument and patient side detect the 3-D position of the objects.

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ACCURACY

QUESTION

Why did you choose the Radiographic Acetabular Orientation as default definition?

Do you feel that the new Anterior Pelvic Plane (APP) reconstructed from the new registration landmarks on hip 6.0 will take more consideration of change in pelvic tilt during surgery? If so, why?

With Brainlab hip software, you have to place an array on the operative iliac crest of the pelvis, why can you not place the array on the contralateral side?

How does the algorithm work in general in lateral position?

ANSWER

The values correspond with the values on the X-Rays.

We are using multiple anatomical constants (distances and angles) to calculate a mirror image of the pelvis and re-create the anterior pelvic plane.

CLARIFICATION

Different acetabular orientation will cause incorrect results when comparing X-rays with Navigation values!
Lewinnek described his safe zones in radiographic definition.

Pelvic tilt can be addressed with a feature called: "Pelvic Tilt", which can be enabled.
The new APP reconstruction removes the "tilt"-bias (~4°) by the registration of subcutaneous fat tissue with the "old" registration method (ASIS-ASIS-Pubis-Pubis)

Sacroiliac joints potentially might move and influence accuracy. Does apply to supine position only.

Proven in 600 CT datasets

Literature references:

M. Haimerl, M. Schubert, M. Wegner, S. Gneiting. Anatomical Relationships of Human Pelvises and their Application to Registration Techniques. 2012
E. Davis. A new method of registration in navigated hip arthroplasty without the need to register the anterior pelvic plane . 2012

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ACCURACY

QUESTION

How accurate are the registered values?

ANSWER

As accurate as the registration was performed.

CLARIFICATION

If you don't trust them, refer to your conventional reference points, such as TAL, labral rim, native acetabular rim, corner of room, templated position. A clinical study with 50 patients has proven the accuracy; the main deviation was $\pm 5^\circ$ (tbd. by RnD study)

How much error is there in the anterior pelvic plane navigation based on the point collection being done on the skin, especially on obese patients?

Less than in former hip software versions, because we don't need to register pubic points

An exact value depends on different factors of the registration. Target is to acquire them on the bony surface!