

**Pepłoński A., Pawlik J., Wojtkowski M., Kwiatkowski K.**

## **Leg length and lateral offset after hip arthroplasty.**



Clinic of traumatology and orthopedics  
Military Institute of Medicine

Head of the Clinic: prof. dr hab. Krzysztof KWIATKOWSKI, MD

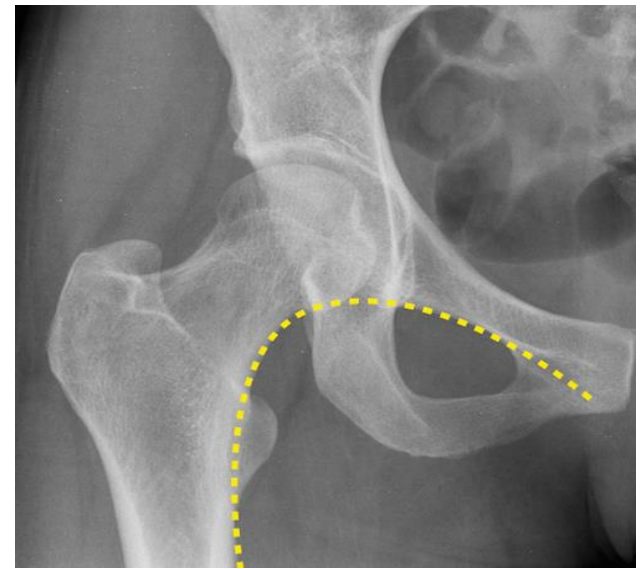


**WOJSKOWY INSTYTUT MEDYCZYNY**



# Preliminary

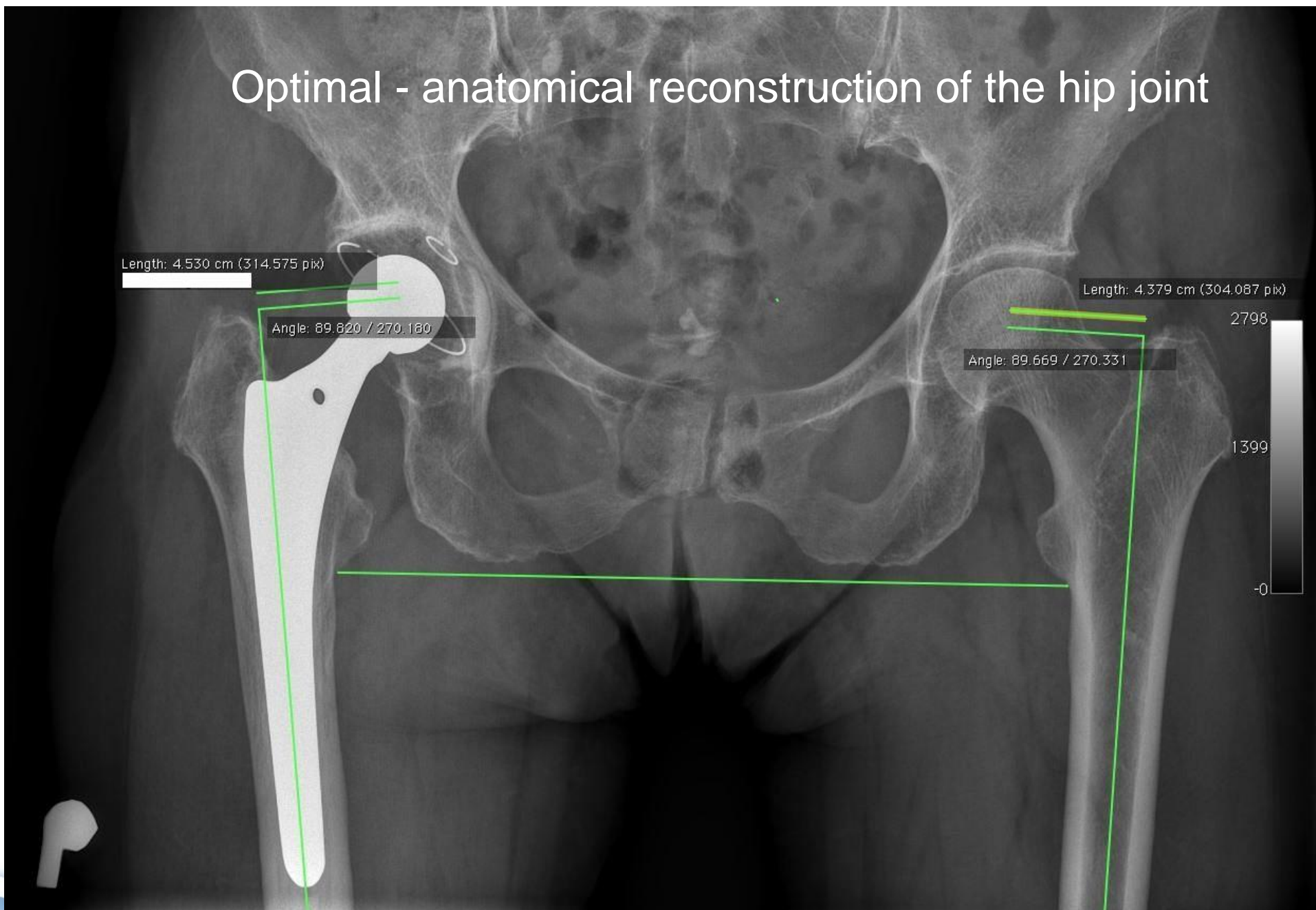
- one of the main objectives of the hip arthroplasty is correct biomechanics of the joint
- the ideal situation after arthroplasty is reconstruction the center of rotation of the acetabulum, length and offset and obtaining a total anteversion of 30-40 degrees.\*
- the deviation of each individual reconstruction component from the standard can be up to 1 cm\*
- if the mistake is smaller than 1 cm, but in more than one of components, it will disrupt the function of the prosthesis and create discomfort for the patient\*

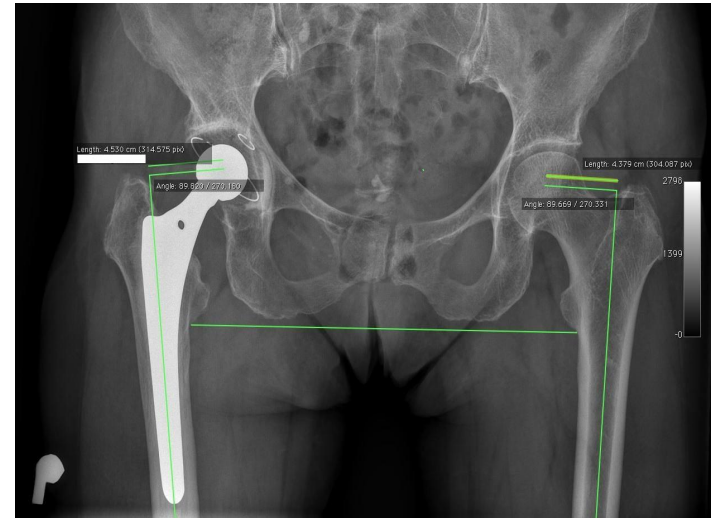


\*quot. : „Hip Arthroplasty Minimally Invasive Techniques and Computer Navigation” Lawrence D. Dorr,



# Optimal - anatomical reconstruction of the hip joint

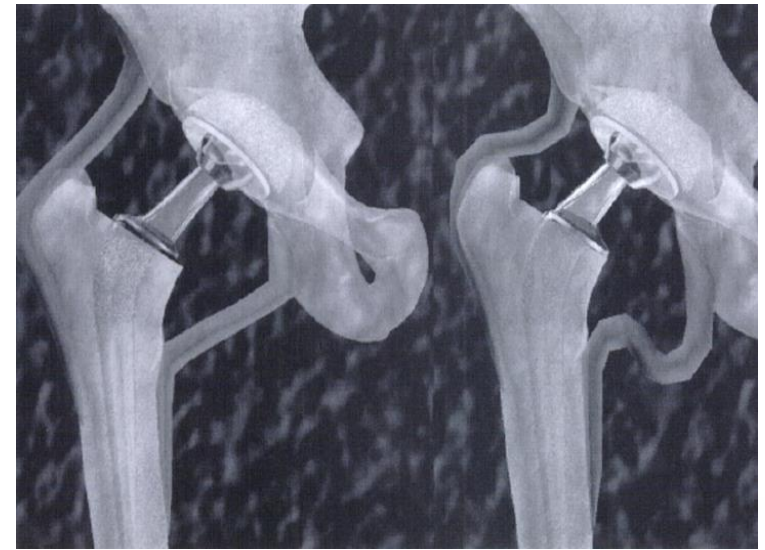
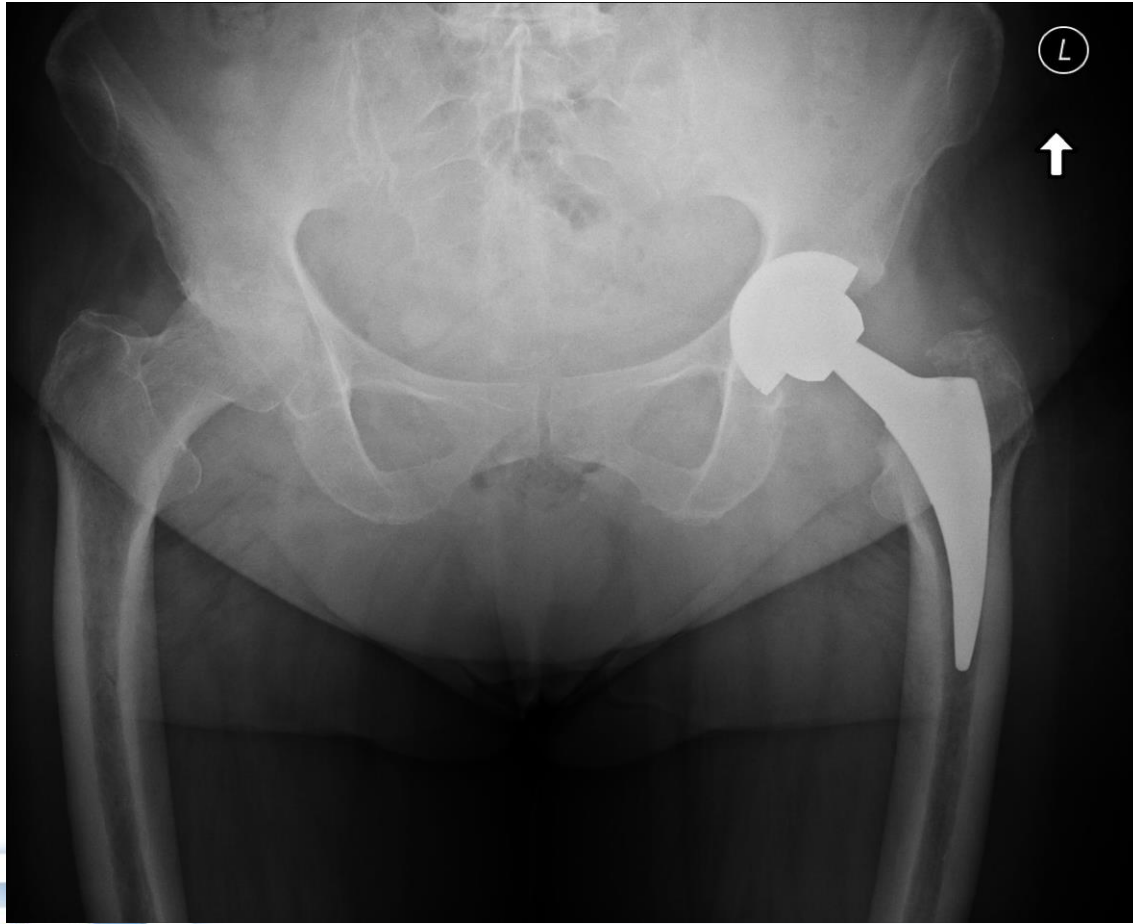




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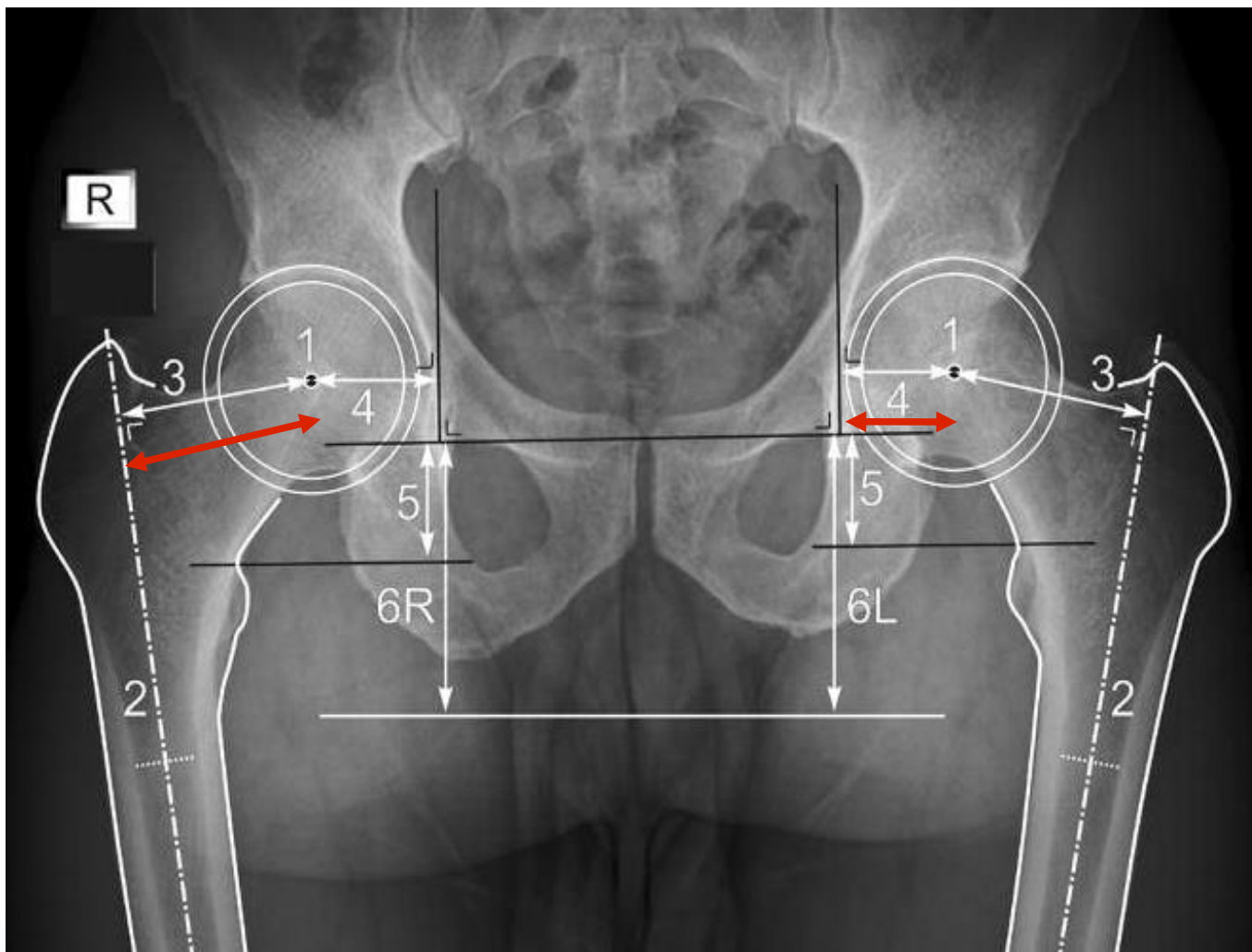


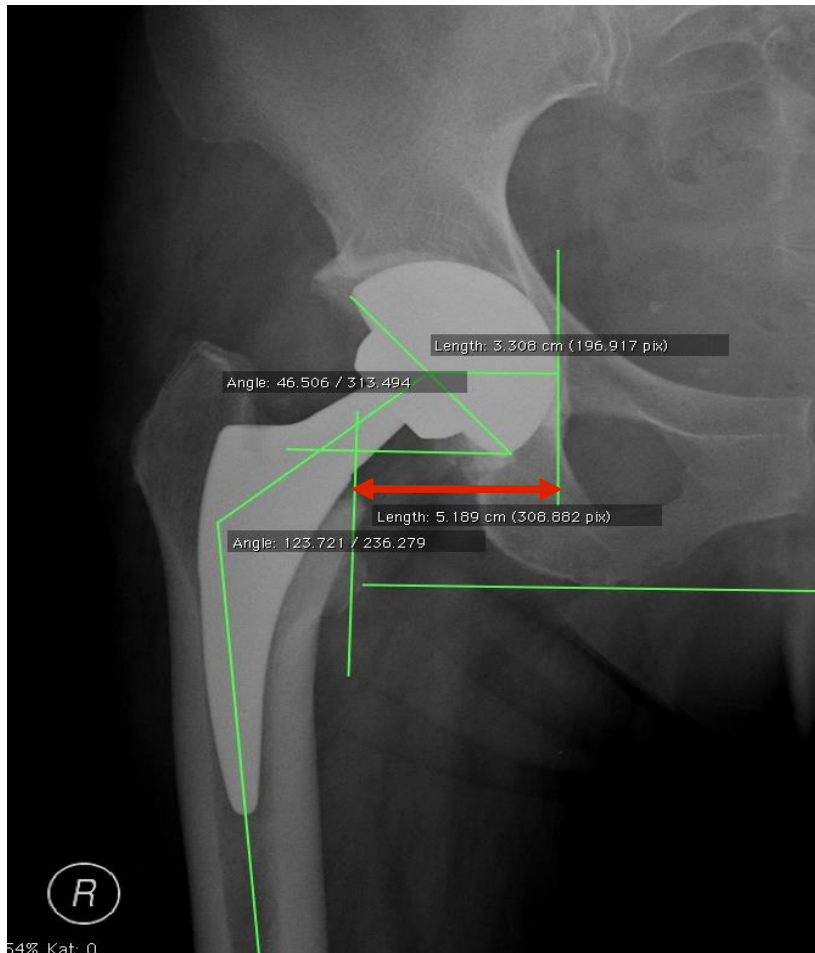
- purpose of hip replacement - reconstruction of natural biomechanics (limb length, offset and avoiding the phenomenon of conflict) which determines the correct tension of soft tissues
- **we do not reproduce normal anatomy**



Hip joint offset - this is the position of the femur in relation to the pelvis

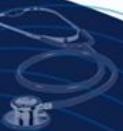
femoral offset (3) + acetabular offset (4)



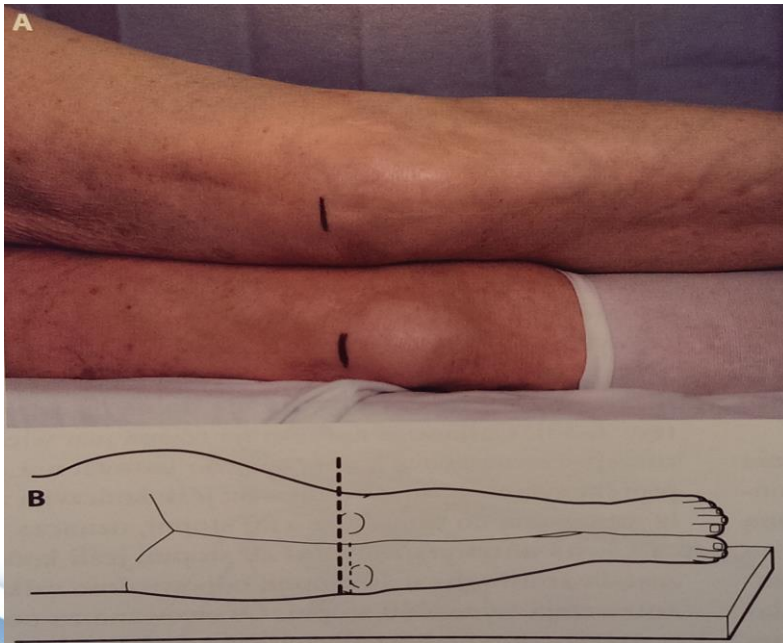


## Hip joint offset - measurement methods

\* do not measure the offset from the center of the stem in the femoral canal, because this value corresponds to the implant offset and not to the correct hip joint offset

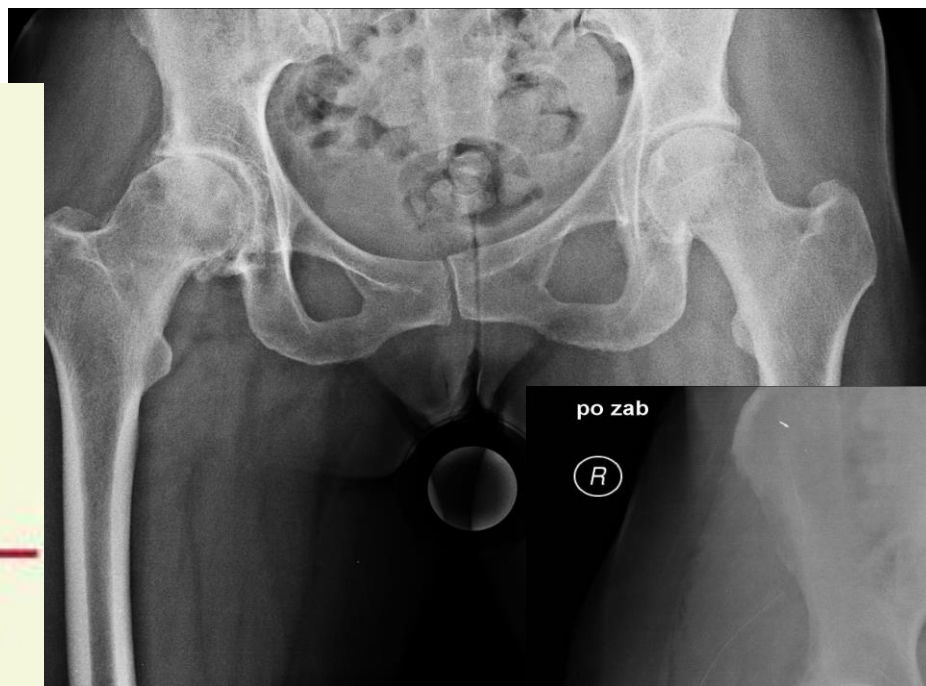
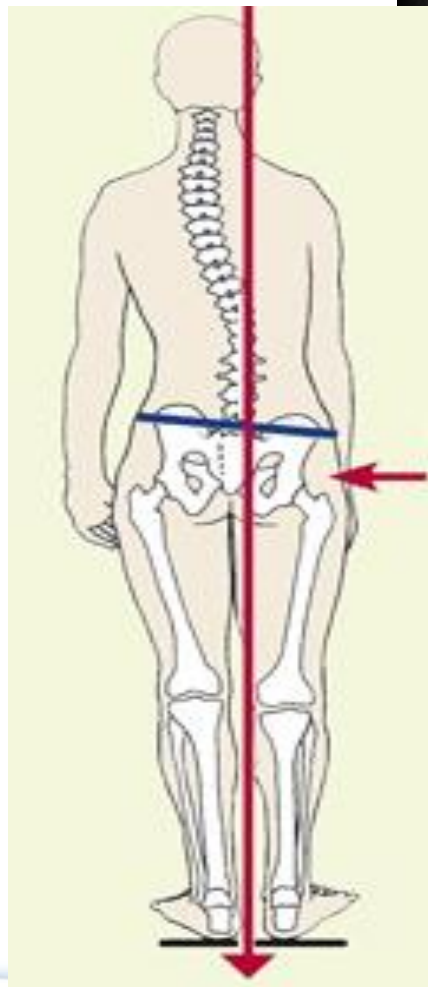


# Leg length :

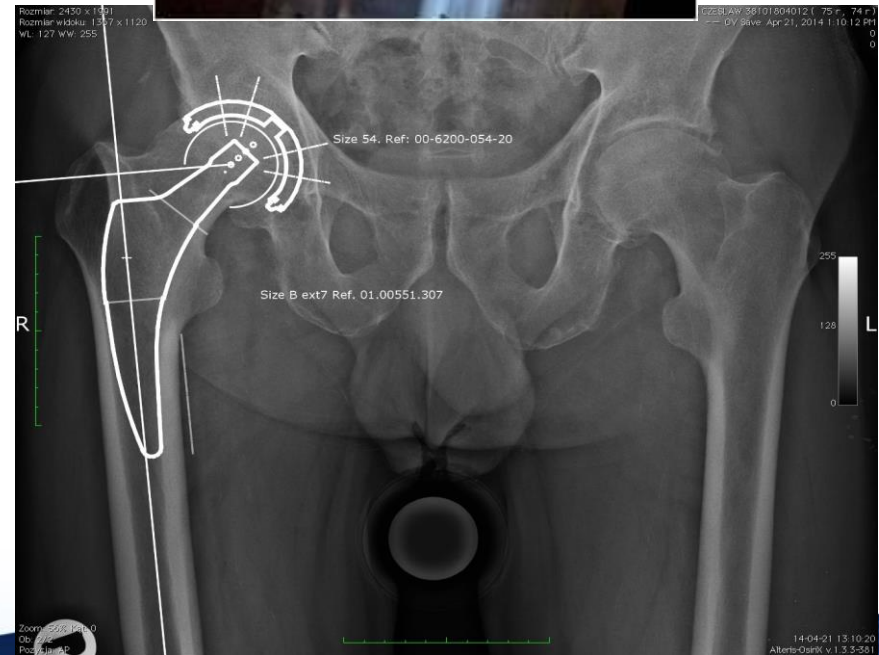




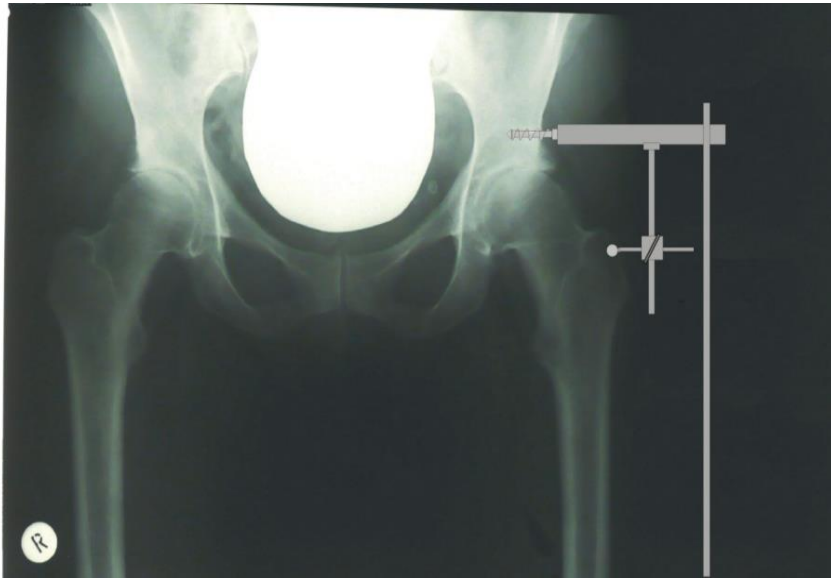
**Attention** to the functional asymmetry of the lower limbs with skewed pelvis position in the case of scoliosis and / or fixed contractures of the hip abductors (most commonly medium gluteal muscle)



# Preoperative planning methods

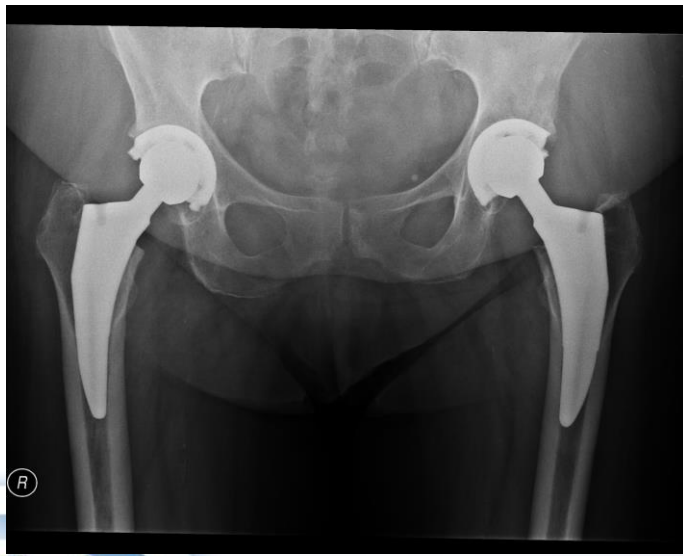


# Methods of intraoperative assessment of the position of components



# Material

- at the WIM Orthopedic Clinic in 2013-2016y. there were 643 total hip replacements
- 82 patients underwent bilateral hip arthroplasty
- short-stem prostheses accounted for 93% of all implants
- metal-polyethylene articulation predominated in 78% of cases



# Method

- we used measurements made on digital x-rays and measurements of the computer system for pre-operative planning to analyze the difference of the limb and offset.

## OrthoView™ Report

Report Date: Tuesday, November 5, 2013

## Patient Details

ID: 51041603680

Life stage: Adult

## User Details

Report Generated: lekarz  
Wojskowy Instytut Medyczny

Saved: Tuesday, November 5, 2013

## Total Hip Replacement

Procedure planned: Total Hip Replacement

Body area: Hip

Procedure Side: Right

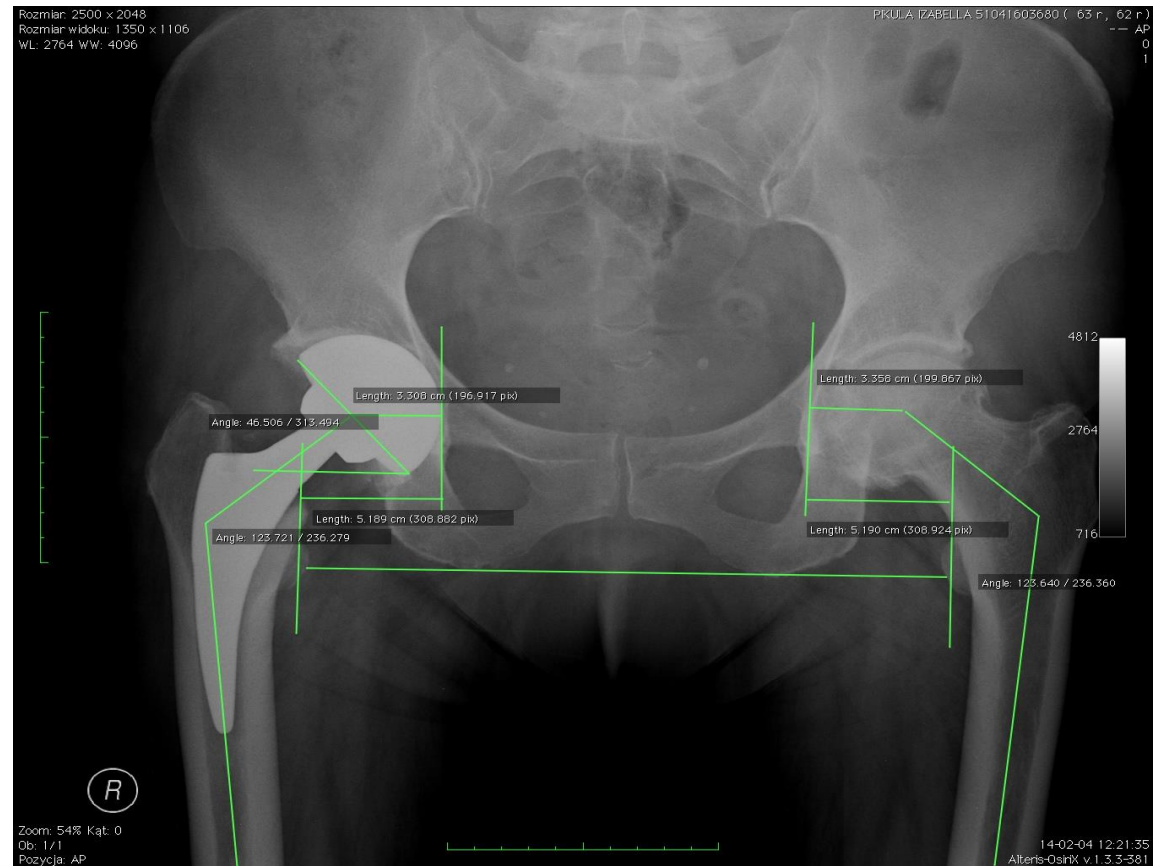
Pre-operative Right leg longer by: 4 mm

Planned Right leg lengthening: 4.5 mm

Predicted Right leg discrepancy: 8.5 mm

Pre-operative Right offset: 50.5 mm

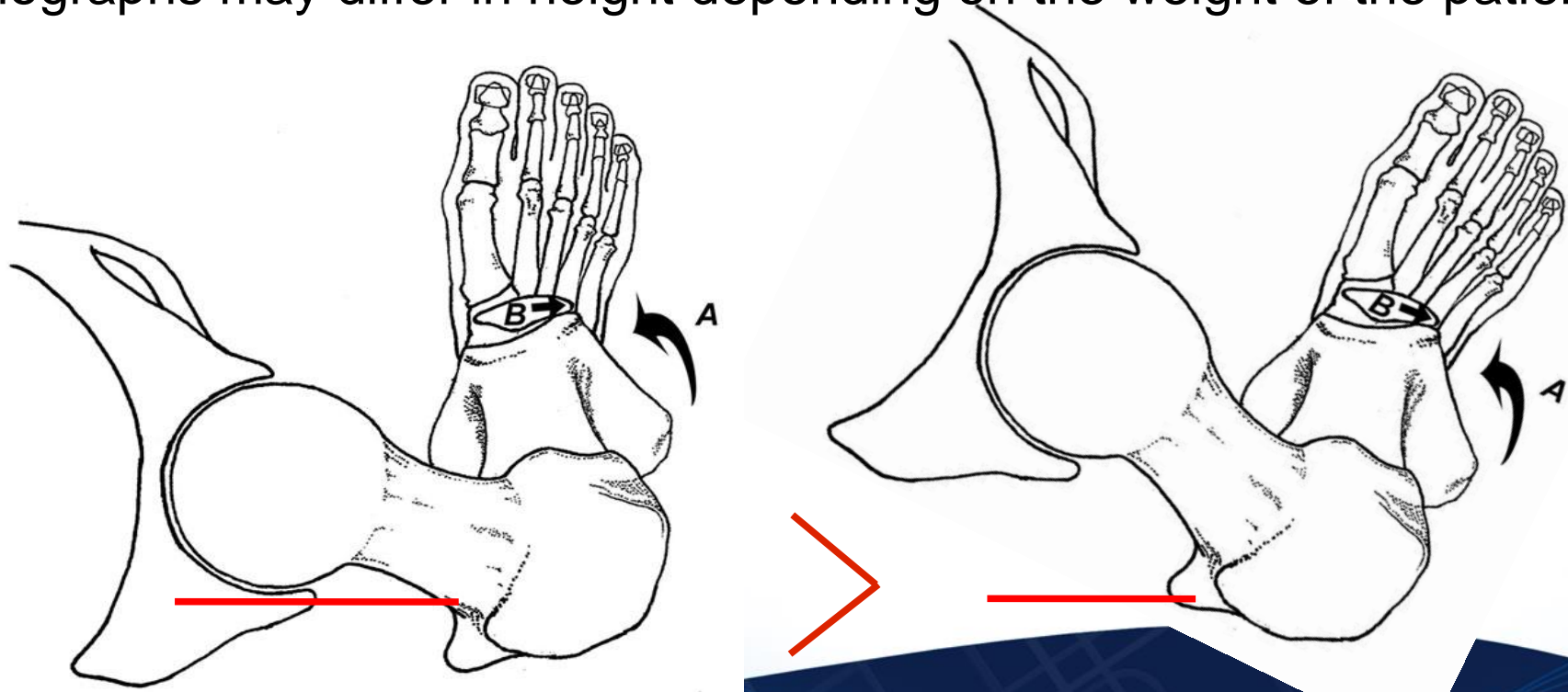
Planned Right offset medial by: 6.5 mm



# Method

Contrary to the quoted rules, in our opinion it is difficult to accept a specific numerical value as a significant difference in the length of the limb or offset for several reasons:

- always take into account the height and "proportions" of the patient
- the offset measured on the radiograph changes depending on the rotation of the limb
- radiographs may differ in height depending on the weight of the patient



# Results

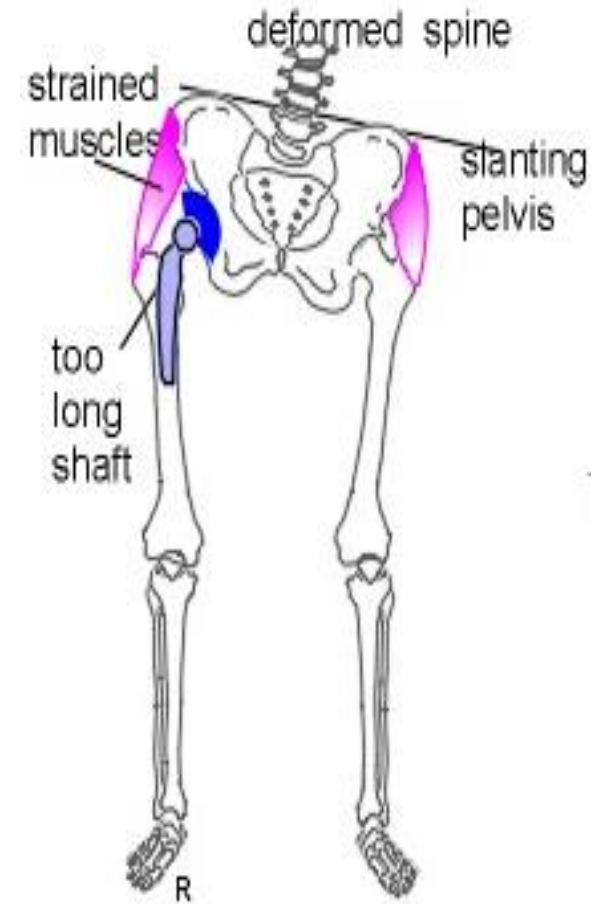
- as the "failure" of the procedure, we took cases of patients reporting pain discomfort after having passed prosthesis or complications with coexisting significant radiological disparity in the hip joint offset or leg length
- of the 643 operated hip, 39 cases were assessed as "failure"
- the vast majority were patients with lengthening of the limb – 23 people (usually more than 1.5 cm - that is, requiring the use of alignment under the foot of the opposite leg)
- the other 16 patients had "clearly" changed offset (usually increased - 13 cases)
- observation period is from 1 to 3 years



# Results

Among people with significant leg elongation, side effects were noted:

- discomfort while walking - 20 patients
- pain in the operated hip, most often located in the buttock area- 15 patients
- L-S spine pain -9 patients
- pain of the medial compartment of the knee as a result of varus distortion of the operated leg - 5 patients
- transient peroneal nerve paresis - 2 patient



23 patients



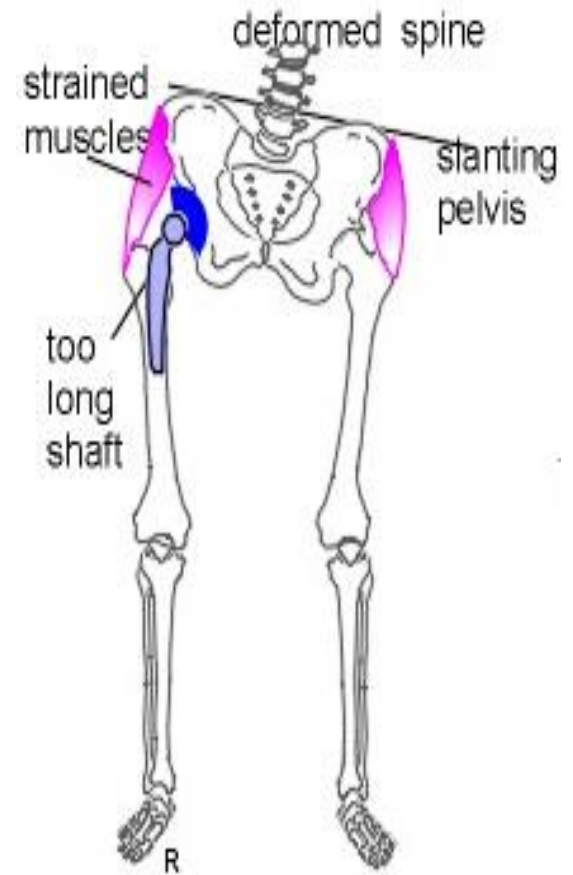


# Results

## Causes of limb elongation

- too long femoral neck - 15 patients
- incorrect stem selection (e.g. too large cervical-shaft angle) - 4 patients
- too low position of prosthesis cup - 2 patients
- incorrect choice of the size (length) of the prosthesis head - 2 patients

\* Please note that the offset increase also causes elongation of the limb



23 patients



# Results

There were side effects among people with significant difference in offset:

- pain symptoms of the operated hip, most often located in the groin and trochanteric region  
- 11 patients
- exudative periarticular inflammation  
- 5 patients
- anterior instability of the prosthesis (> 2 dislocations) as a result of reduced offset  
- 2 patients reoperated in the early period
- extended rehabilitation process conditioned by contracture of the abductors - 4 patients



16 patients



# Results

## Causes of incorrect offset:

- incorrect stem selection \* (with too large offset) - 10 patients
- incorrect placement of the cup - too lateral - 3 patients
- incorrect selection of the stem (with reduced offset) and too much medial placement of the cup - 3 patients

\* keep in mind that with increasing the size of the stem increases its offset so that curvature of the arch be preserved



16 patients

### Fitmore Hip Stem B, 137°



#### Details

Protasul -64 Alloy

Taper 12/14

uncemented

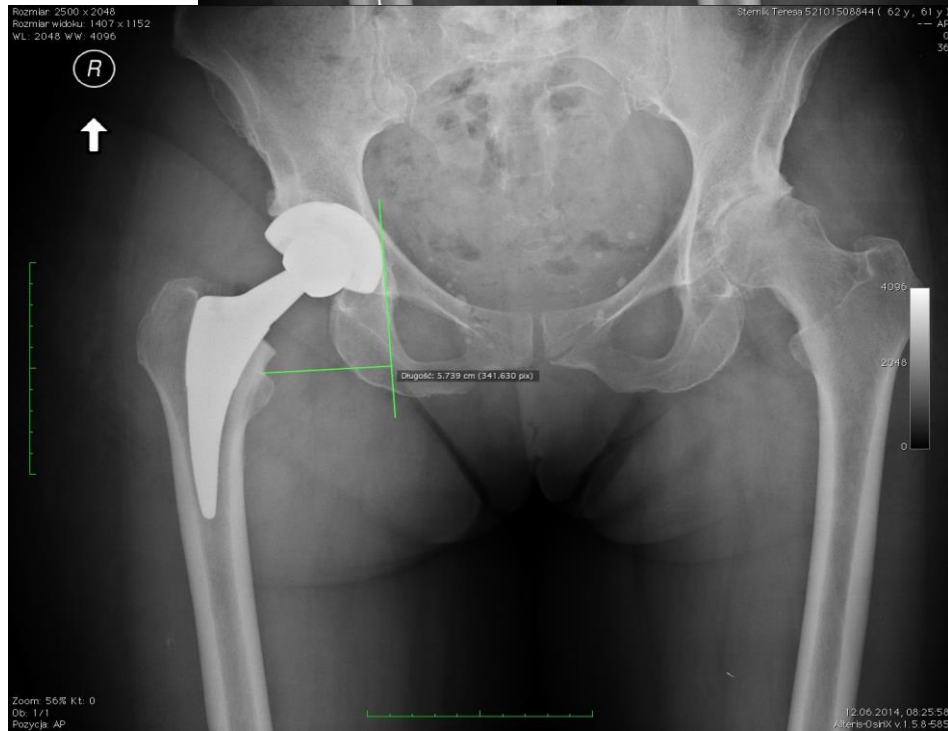
STERILE R

#### Dimensions

Size 1	37.00
Size 2	37.50
Size 3	38.00
Size 4	38.50
Size 5	39.00
Size 6	39.62
Size 7	40.25

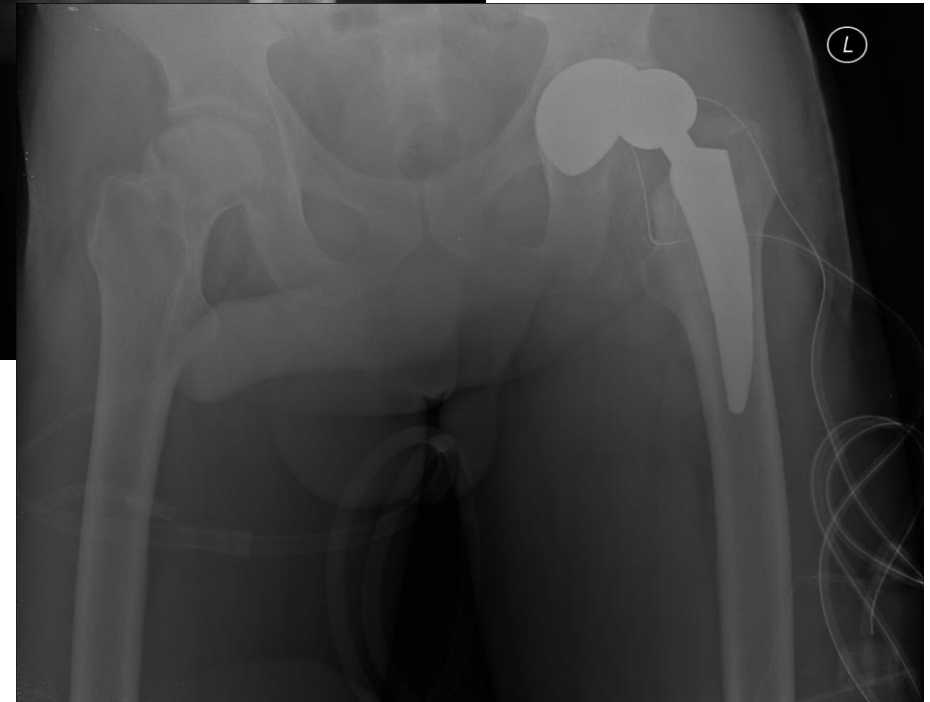
#### Offset





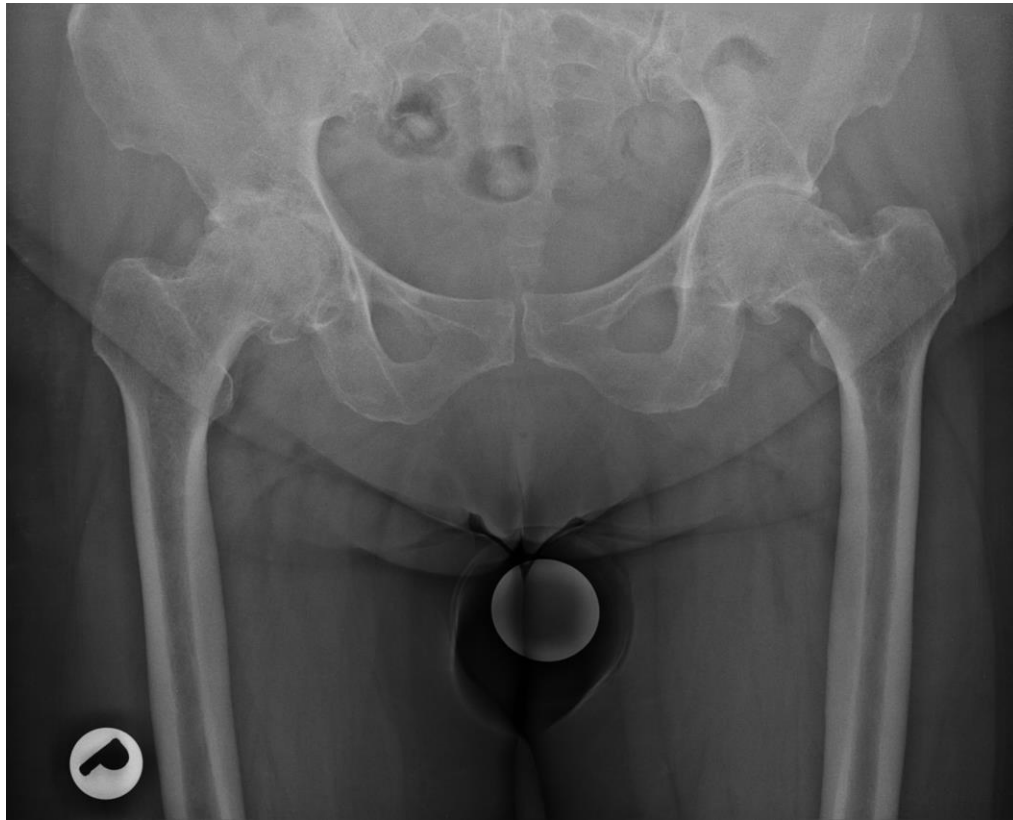
Example 1, S.T, ♀, I. 64, height 151 cm, increased offset about 1 cm, pain of trochanteric region





Example 2, D.P, ♂ years 37, height 175 cm, reduced offset about 1.5 cm, dislocation of hip joint prosthesis.





Example 3, R.M., ♀, I. 59, height 168 cm, elongated leg about 2 cm,  
without hip pain or other symptoms



# Literature :

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3. Eggli, S., Pisan, M., & Muller, M. E. (1998). **The value of preoperative planning for total hip arthroplasty.** Journal of Bone and Joint Surgery, 80(3), 382-90.
4. Goldstein, W. M., M.D., Gordon, A., M.D., & Branson, Jill J, R.N., B.S.N. (2005). **Leg length inequality in total hip arthroplasty.** Orthopedics, 28(9), S1037-S1040.
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# Conclusions

- It is believed that leg length inequality is the main cause of dissatisfaction of the patient after hip prosthesis
- increasingly it emphasizes that the incorrect offset can be a bigger problem, because in the event of a significant increase it runs the risk of suffering from chronic ailments associated with an increased tension of hip stabilizers
- extended offset can hinder rehabilitation and lead to chronic periarticular inflammation





# Conclusions

- both the increased offset and significant elongation of the leg can lead to faster implant wear in the future
- a reduced offset can cause the prosthesis to become unstable due to the reduced tension of the anterior capsule and adductor muscles
- often "radiologically significant" extension / shortening of the limb or incorrect offset does not correlate with the function, comfort and satisfaction of the patient after hip prosthesis





Thank you for your attention

