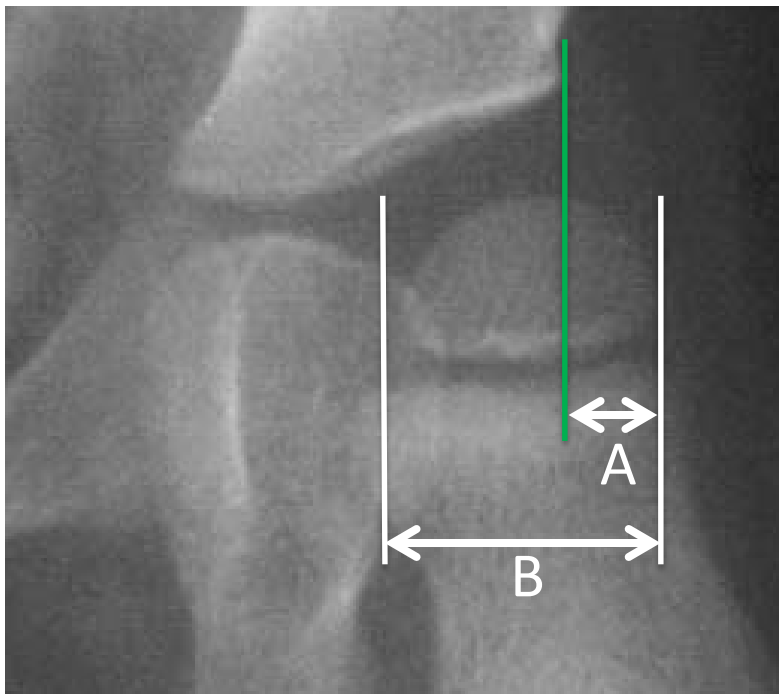




# Using the Migration Percentage Ruler

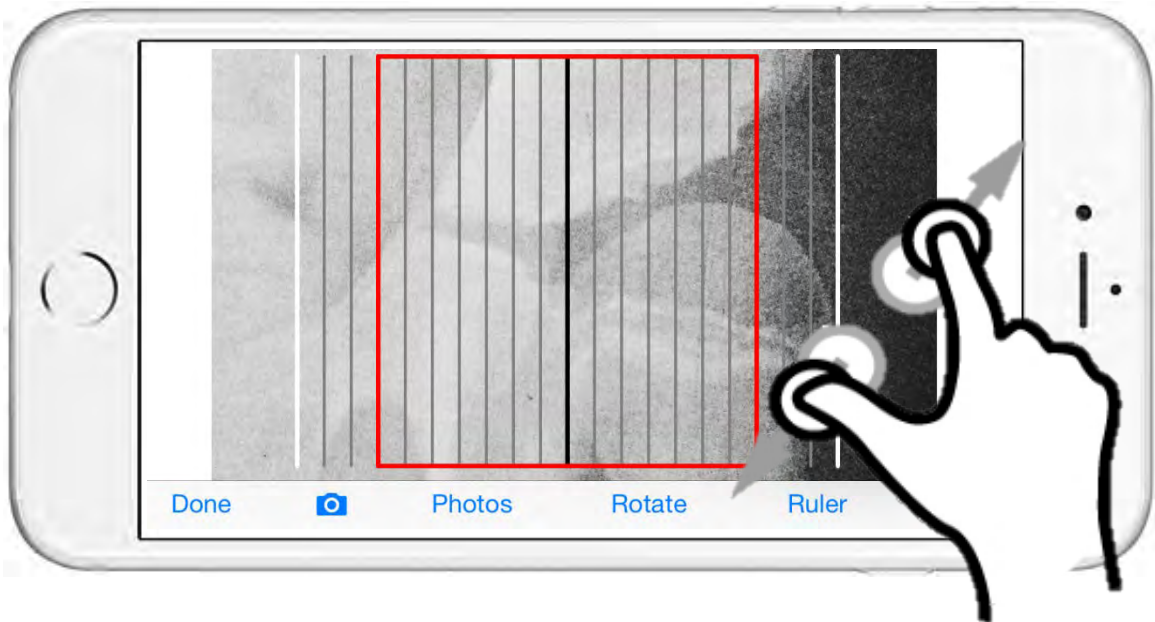
The most important measurement on an x-ray is each hip's **migration percentage**, or the percentage of the femoral head that is outside of the margin of the acetabulum.



**Migration Percentage** =

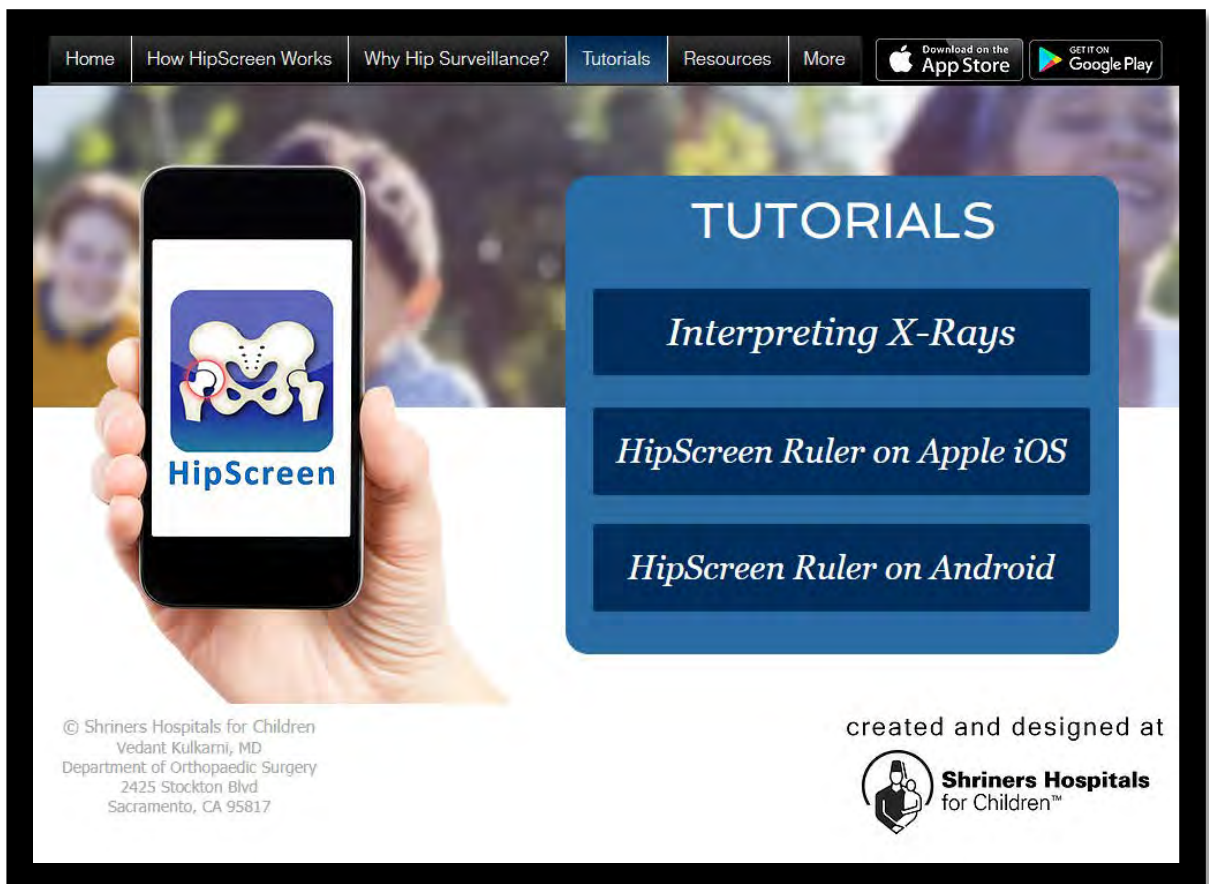
$$\frac{\text{Distance A}}{\text{Distance B}} \times 100\%$$

There is an increased risk of progressive hip displacement if the **migration percentage** is equal or greater than **30%**.



HipScreen's **Migration Percentage Ruler** allows you to take a picture of an x-ray and expand the hip to fit a ruler overlay using the device's touchscreen. This allows for a quick calculation of the Migration Percentage without measurement of distance.

Video tutorials showing how to interpret x-rays and how to use the HipScreen app are available under the **Tutorials** tab on [www.hipscreen.org](http://www.hipscreen.org).

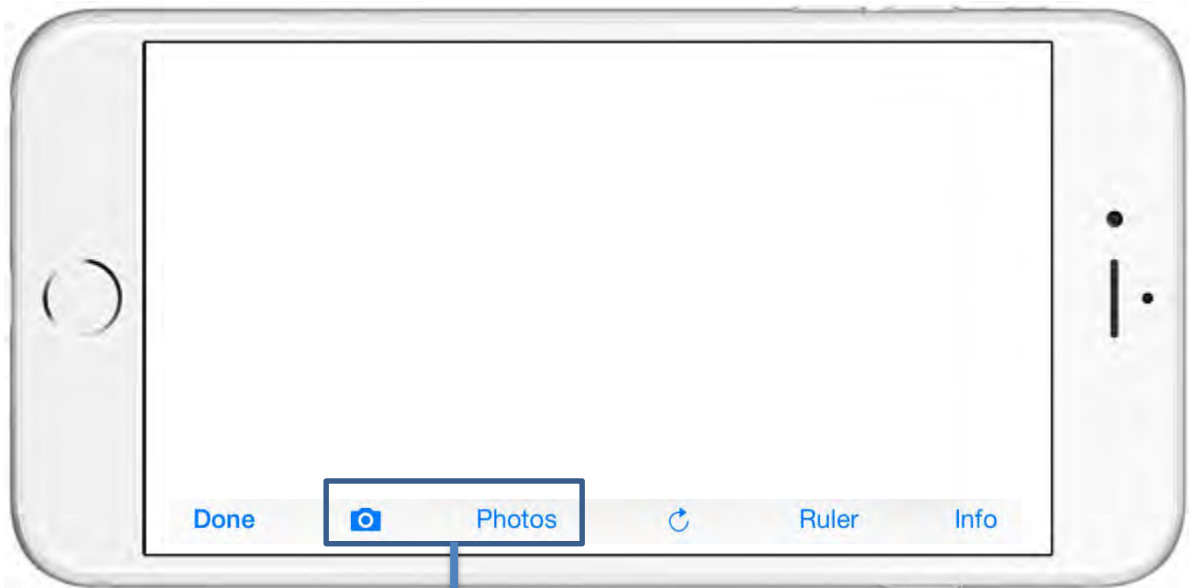


The image shows a screenshot of the HipScreen website. At the top, there is a navigation menu with the following items: Home, How HipScreen Works, Why Hip Surveillance?, Tutorials (highlighted in blue), Resources, and More. To the right of the menu are two buttons: 'Download on the App Store' and 'GET IT ON Google Play'. The main content area features a large blue box with the word 'TUTORIALS' at the top. Below this, there are three dark blue buttons with white text: 'Interpreting X-Rays', 'HipScreen Ruler on Apple iOS', and 'HipScreen Ruler on Android'. On the left side of the main content area, there is a hand holding a smartphone displaying the HipScreen app logo, which consists of a stylized white hip joint on a blue background with the word 'HipScreen' below it. At the bottom left, there is copyright information: '© Shriners Hospitals for Children, Vedant Kulkarni, MD, Department of Orthopaedic Surgery, 2425 Stockton Blvd, Sacramento, CA 95817'. At the bottom right, it says 'created and designed at' followed by the Shriners Hospitals for Children logo and name.

Let's go through the steps to use HipScreen's Migration Percentage Ruler to measure an AP Pelvis hip surveillance x-ray.

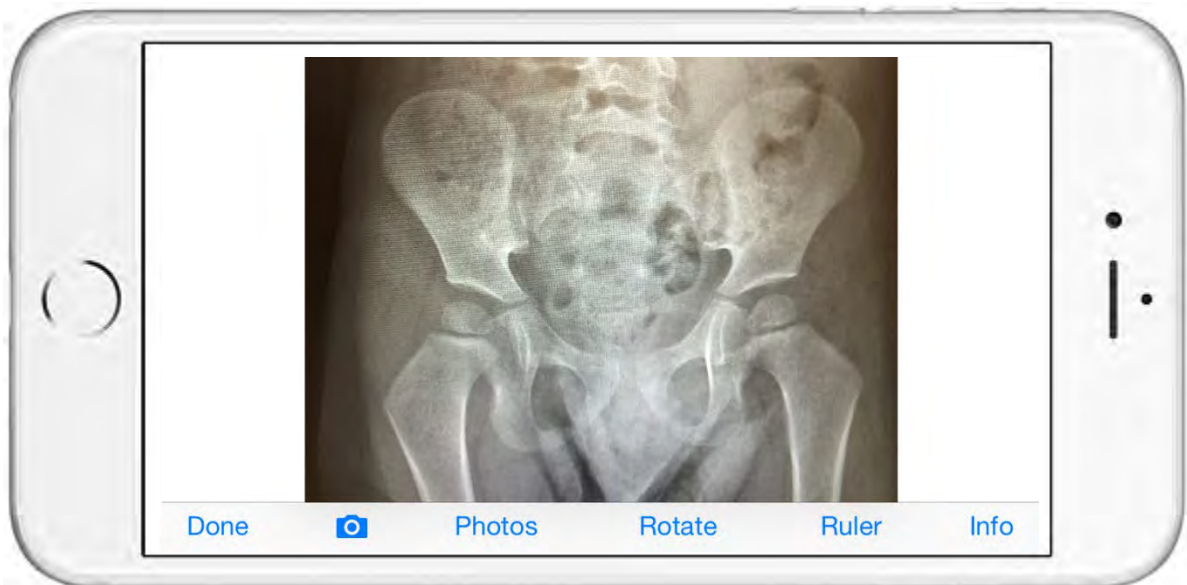
## Step 1:

Load the X-Ray image into HipScreen



Take a picture of an x-ray using the camera icon, or load an x-ray already stored in your “Photos” into HipScreen.

*Pictures taken within the HipScreen App are not stored on your phone.*



## Step 2:

Rotate image to level the pelvis.



Opens up the Rotate Tool.

“CW” rotates clockwise.

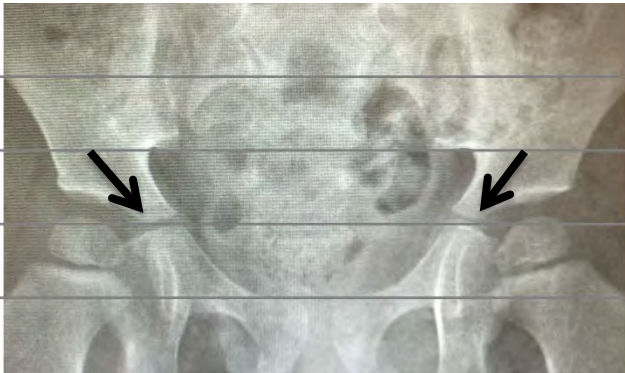
“CCW” rotates counter clockwise.

“90°” turns 90 degrees clockwise.

Press “Done” when finished rotating.



Use the CW and CCW buttons to level the pelvis using any of the common landmarks marked by the arrows below.



Tri-radiate cartilage



Ischial Tuberosity



Acetabular Teardrop



Iliac Crest

Remember, you can Pinch-Zoom and Pan to place the lines over the landmarks.



### Step 3:

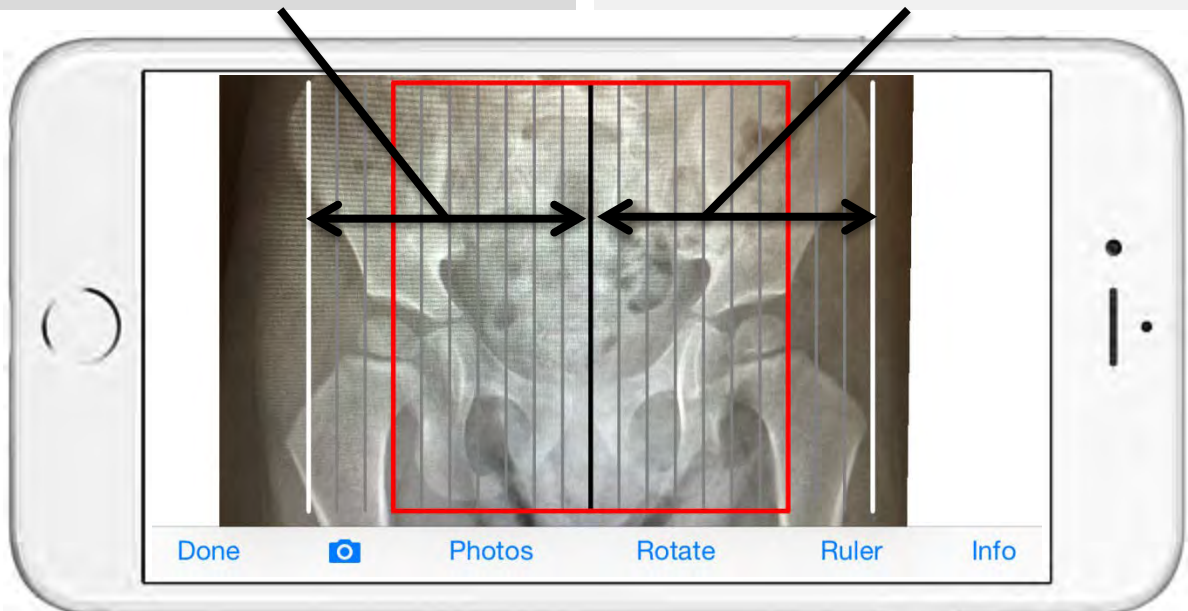
Use the Ruler to determine Migration Percentage.



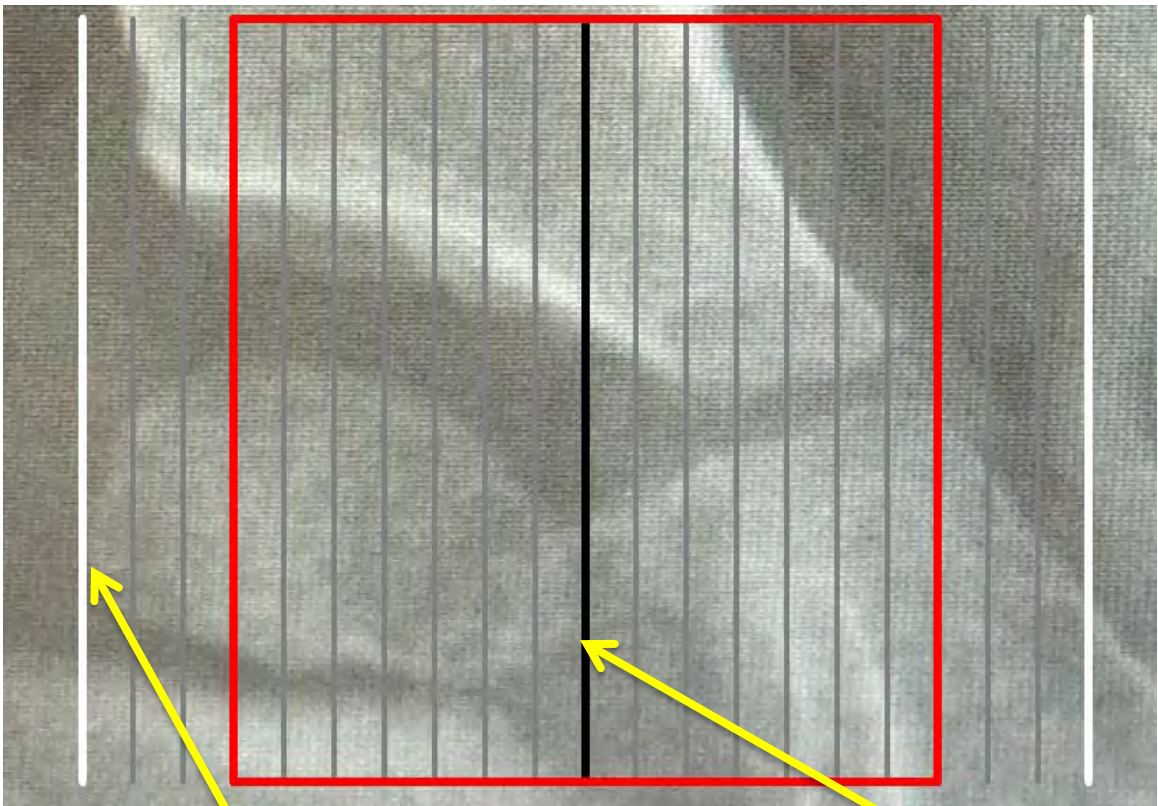
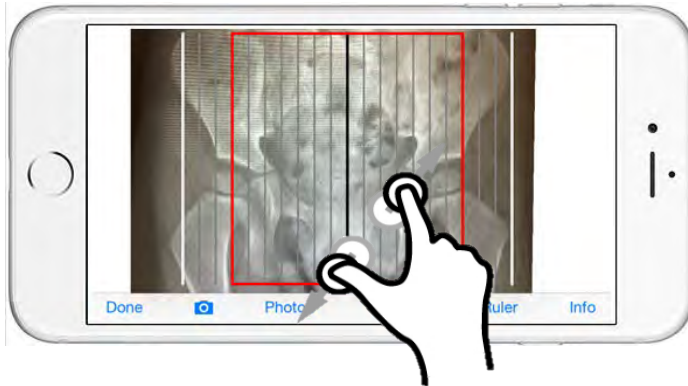
Press “Ruler” to toggle this feature on and off.

The right half of the ruler is used for the hip on the right side of the screen.

The left half of the ruler is used for the hip on the left side of the screen.



Use the familiar touchscreen features to pinch-zoom and pan the image so that:



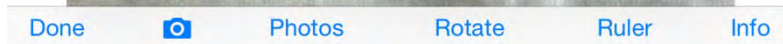
White line touches the lateral border of the femoral head ossific nucleus

**Black** line touches the **medial** border of the femoral head ossific nucleus

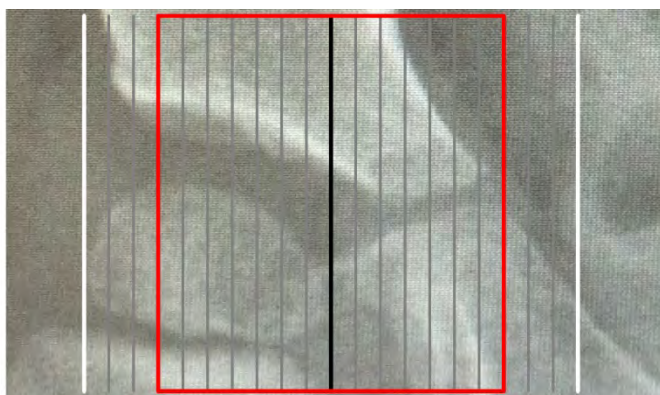


Remember,  
you can toggle  
the ruler on  
and off.

You can also  
Pinch-Zoom  
and Pan with  
or without the  
ruler.

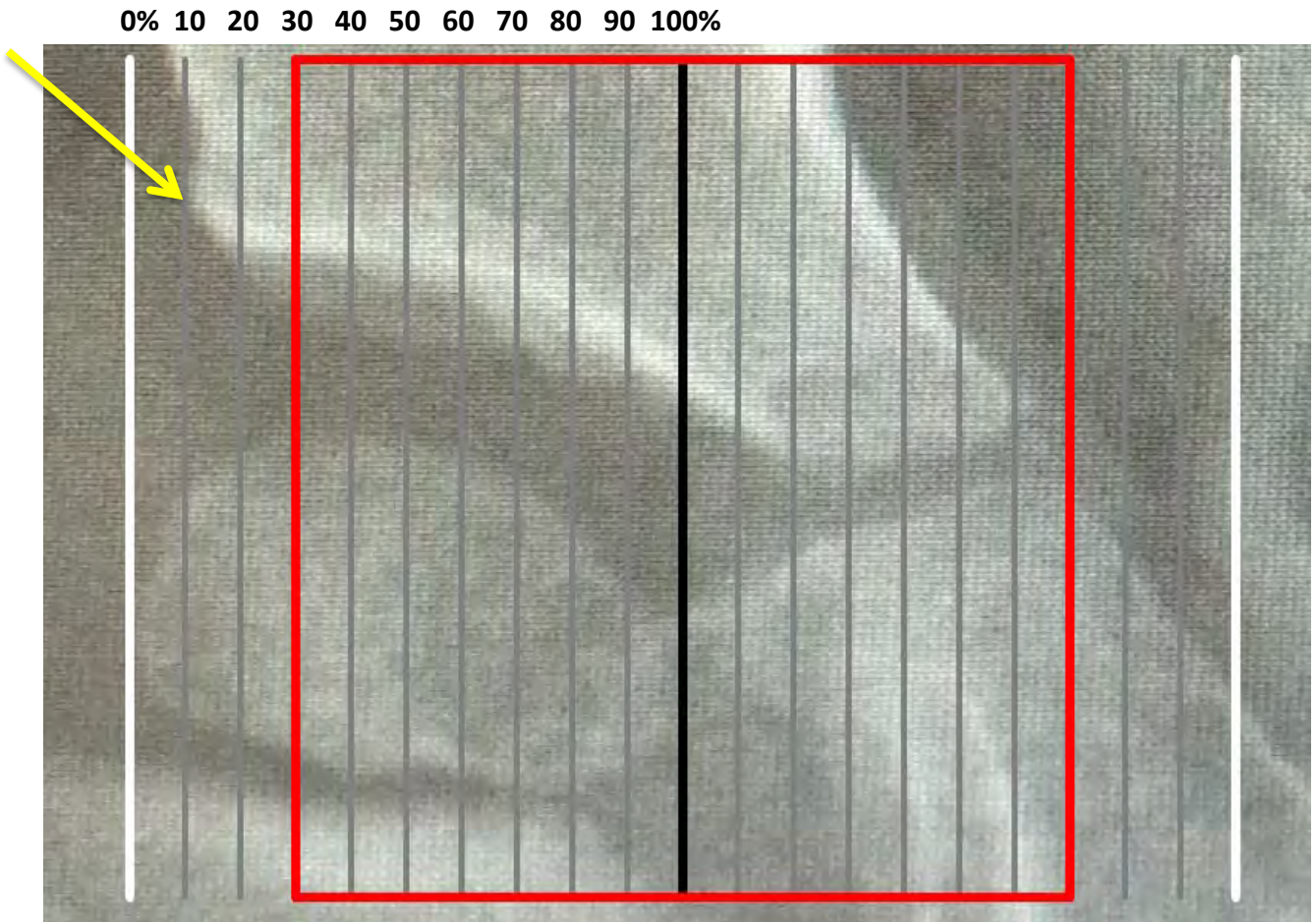


Without Ruler Overlay



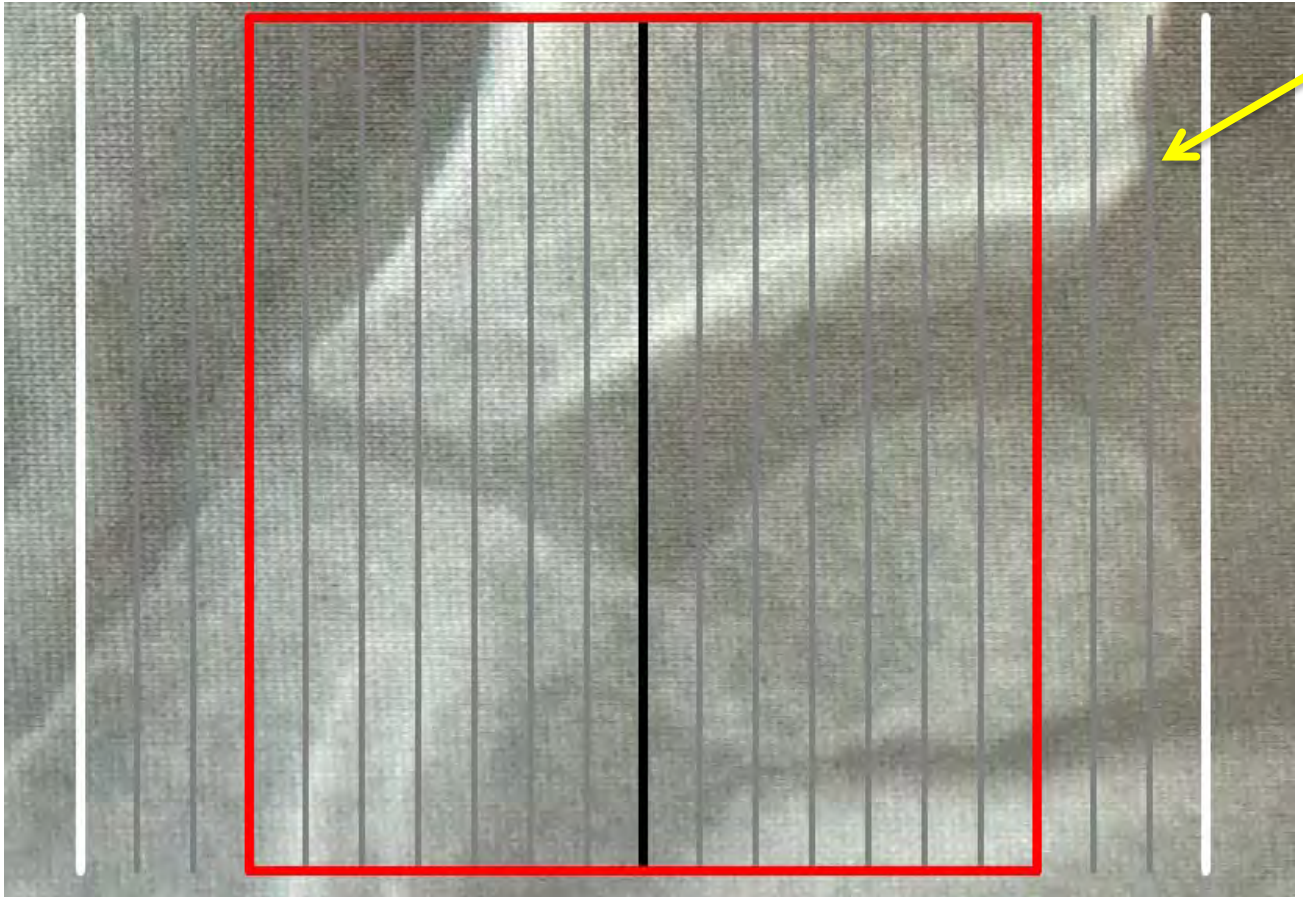
With Ruler Overlay

When the femoral head ossific nucleus is appropriately positioned between the white and black lines, notice that the vertical lines divide the femoral head into 10% increments.



The lateral edge of the acetabulum touches the 10% line, therefore, 10% of the femoral head is outside the edge of the acetabulum. The Migration Percentage is 10%.

For the hip on the other half of the screen, the other half of the ruler is used to measure the Migration Percentage.

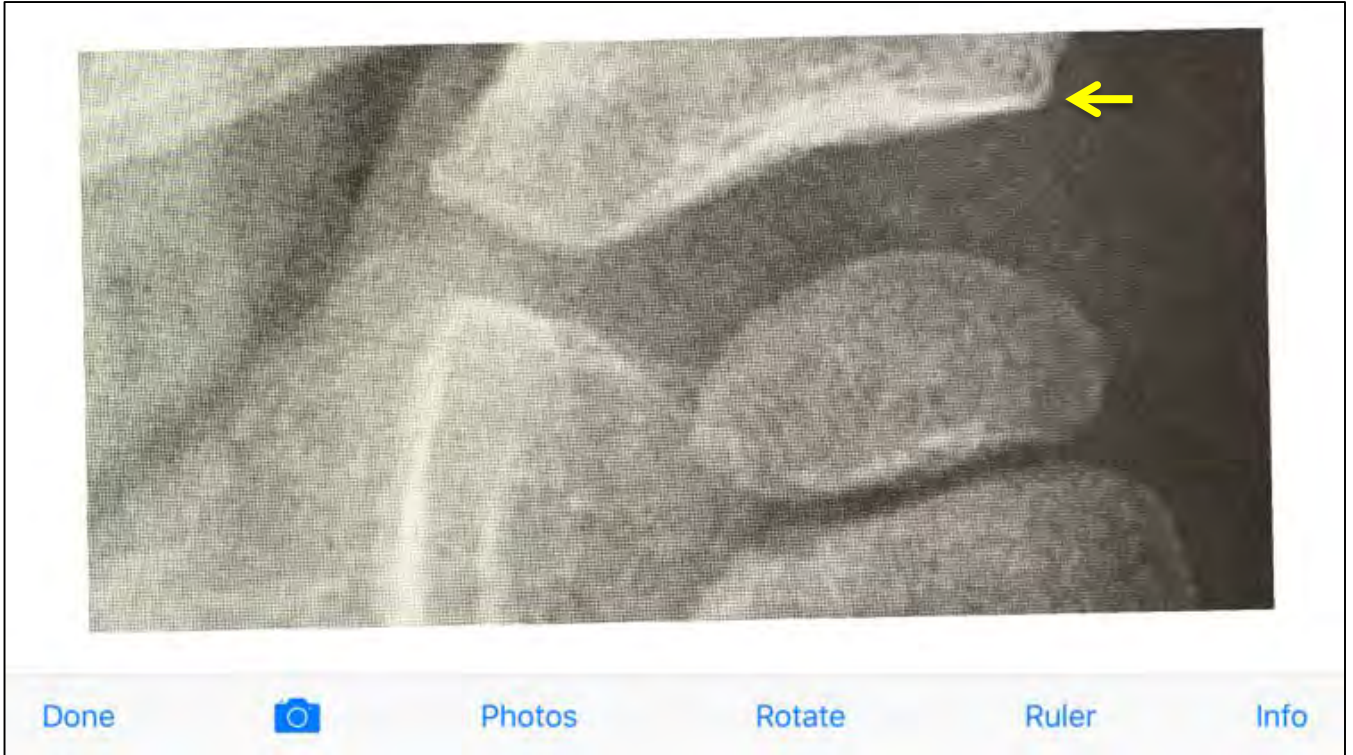


The Migration Percentage is 10% again, because the first gray line touches the lateral edge of the acetabulum.

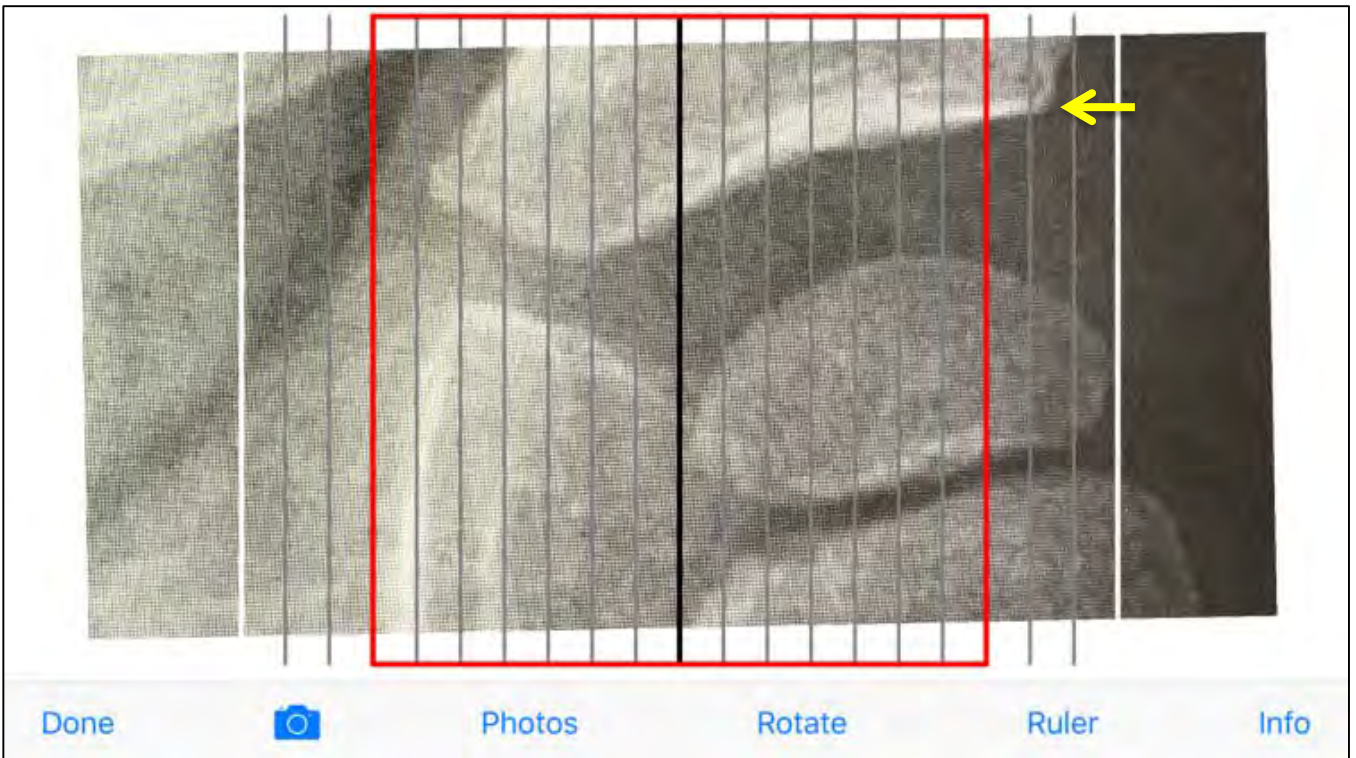
On the following pages, you will see hips with Migration Percentages of varying degrees.

# 15% Example

Without Ruler Overlay

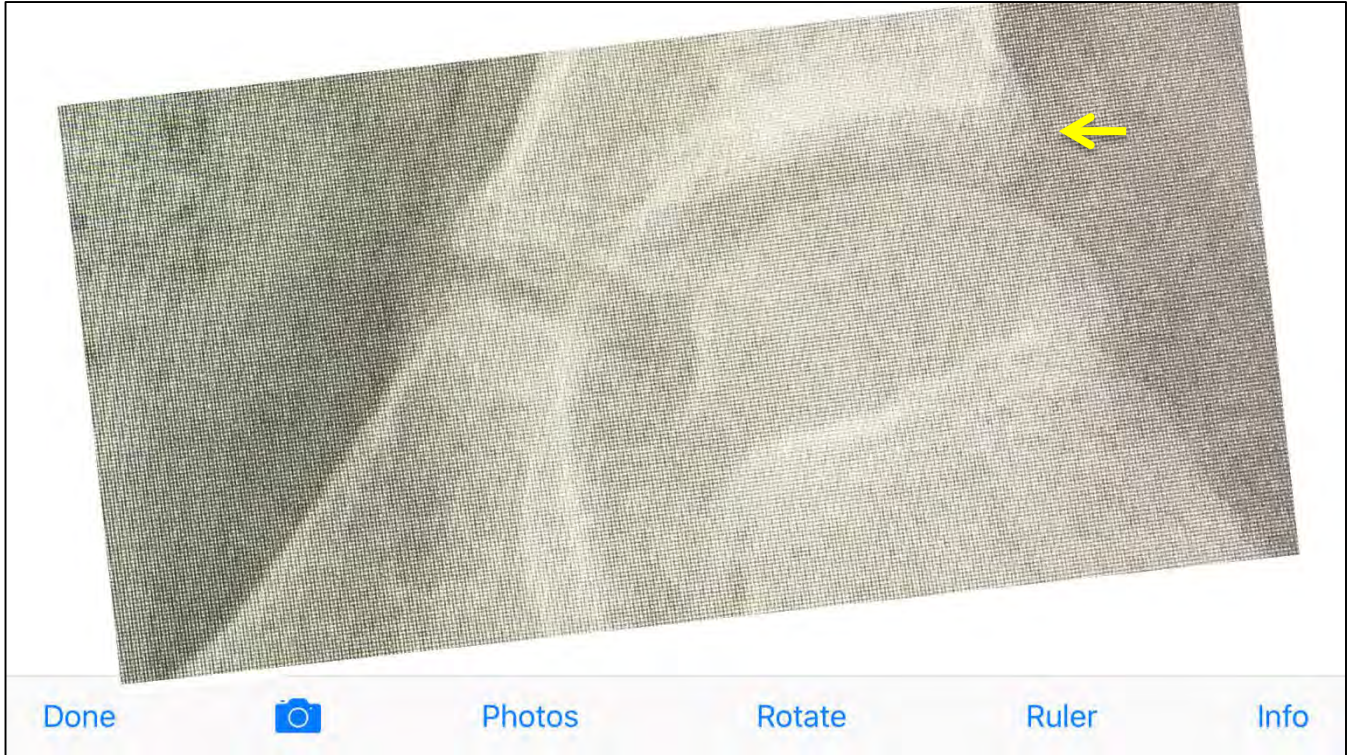


With Ruler Overlay

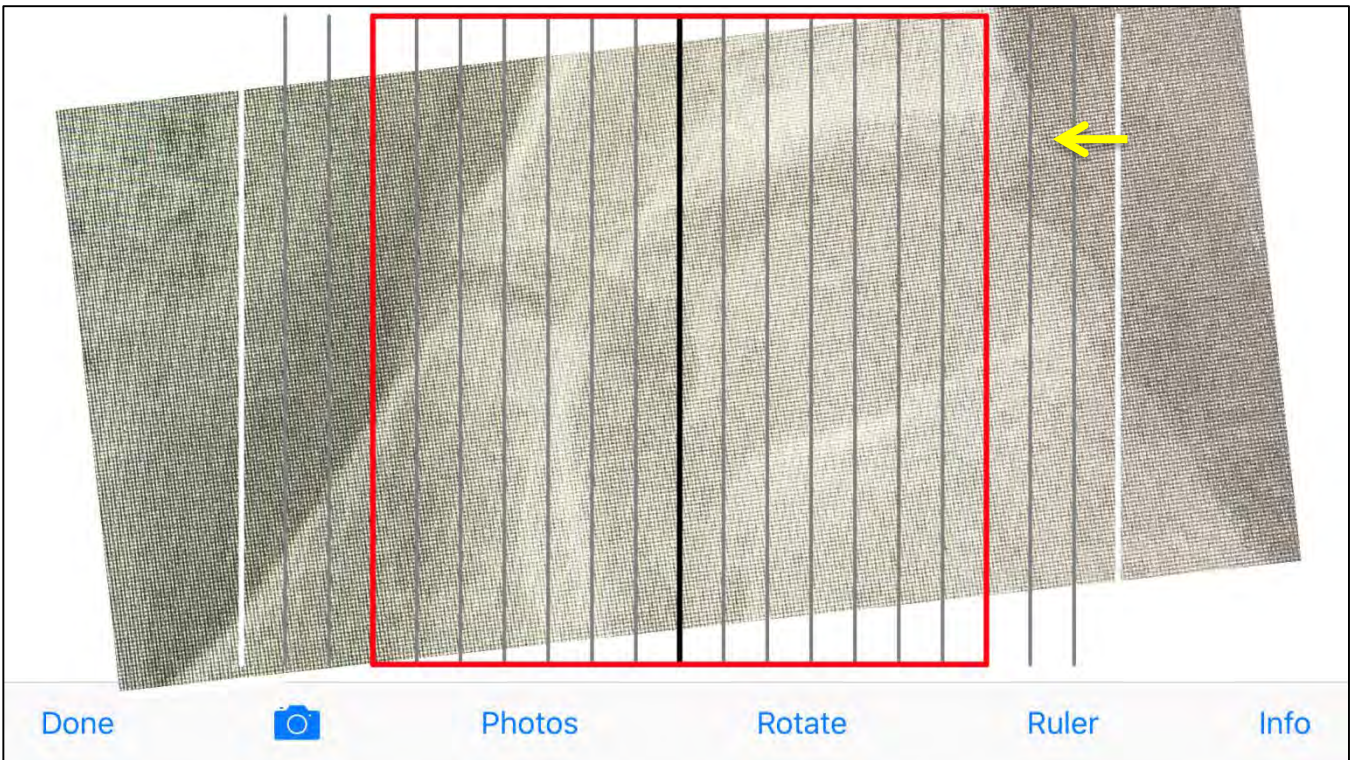


# 20% Example

Without Ruler Overlay



With Ruler Overlay

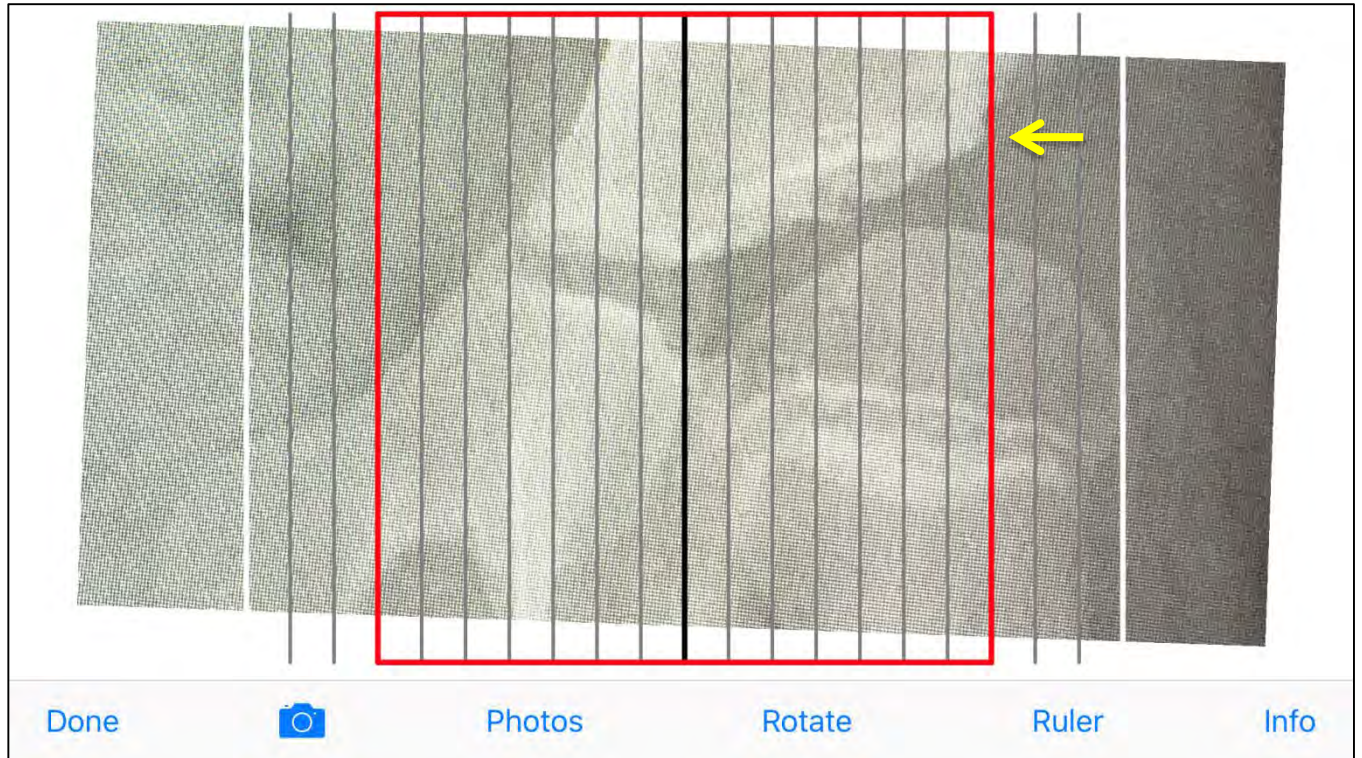


# 30% Example

Without Ruler Overlay

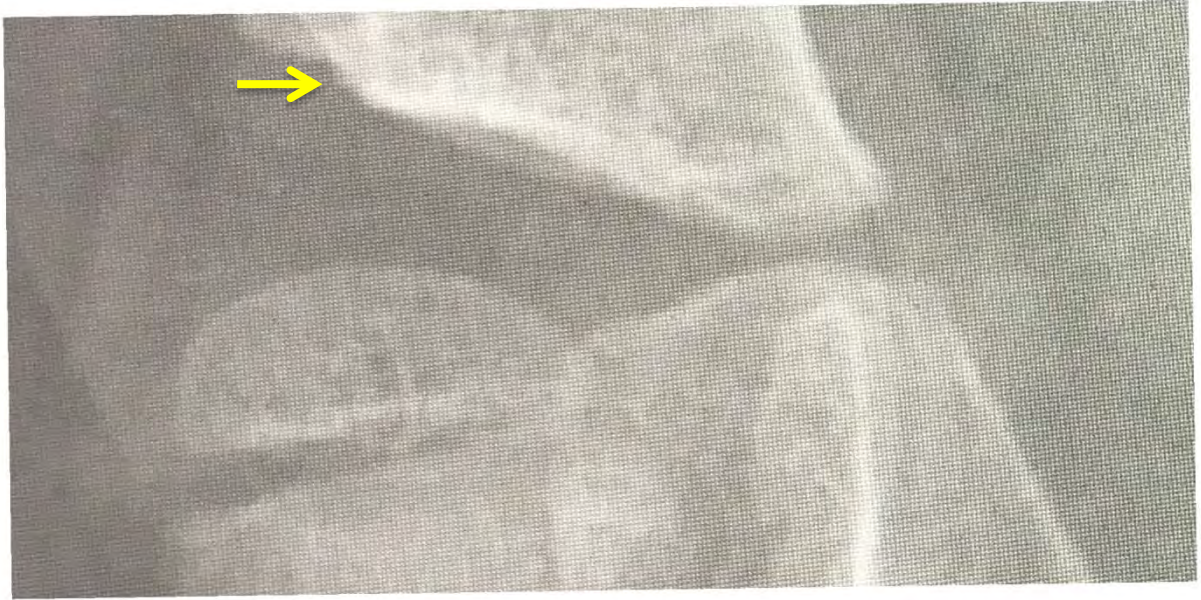


With Ruler Overlay



# 40% Example

Without Ruler Overlay



Done



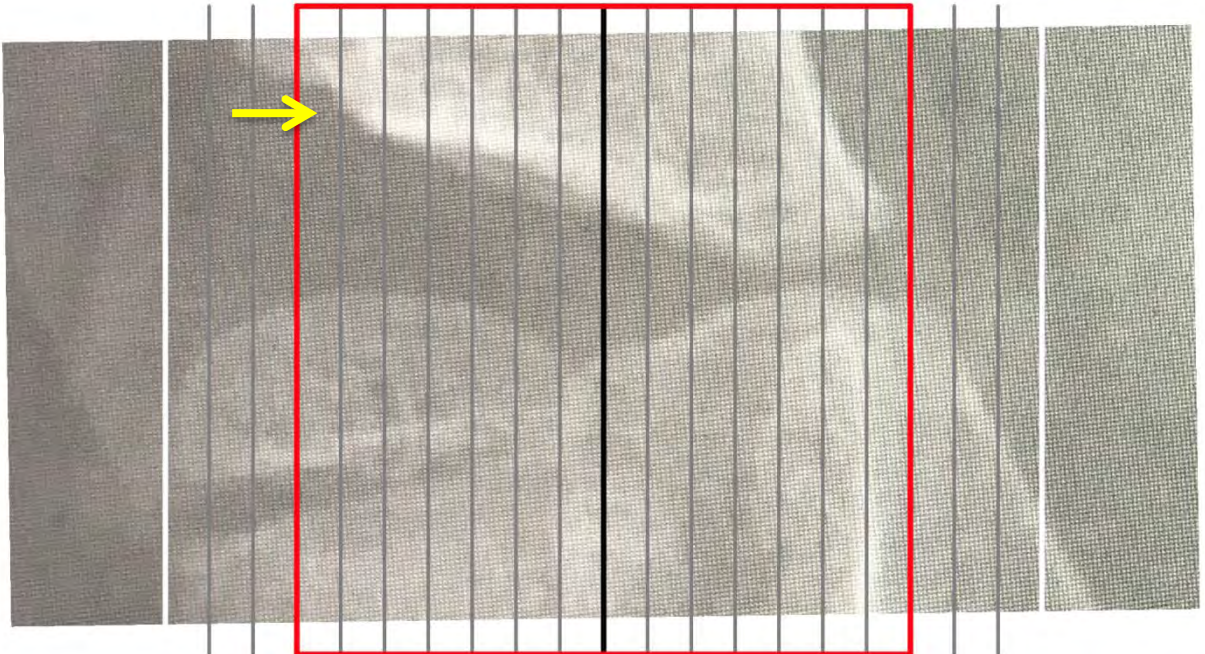
Photos

Rotate

Ruler

Info

With Ruler Overlay



Done



Photos

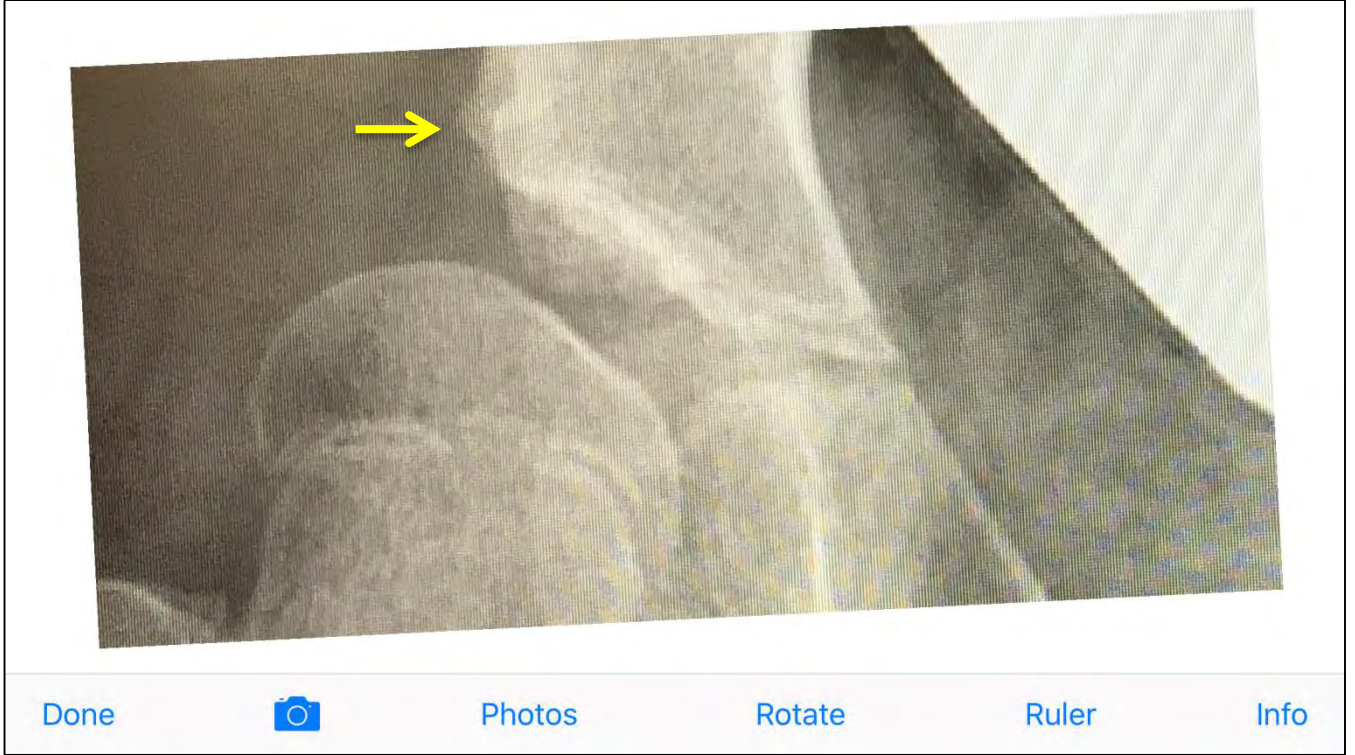
Rotate

Ruler

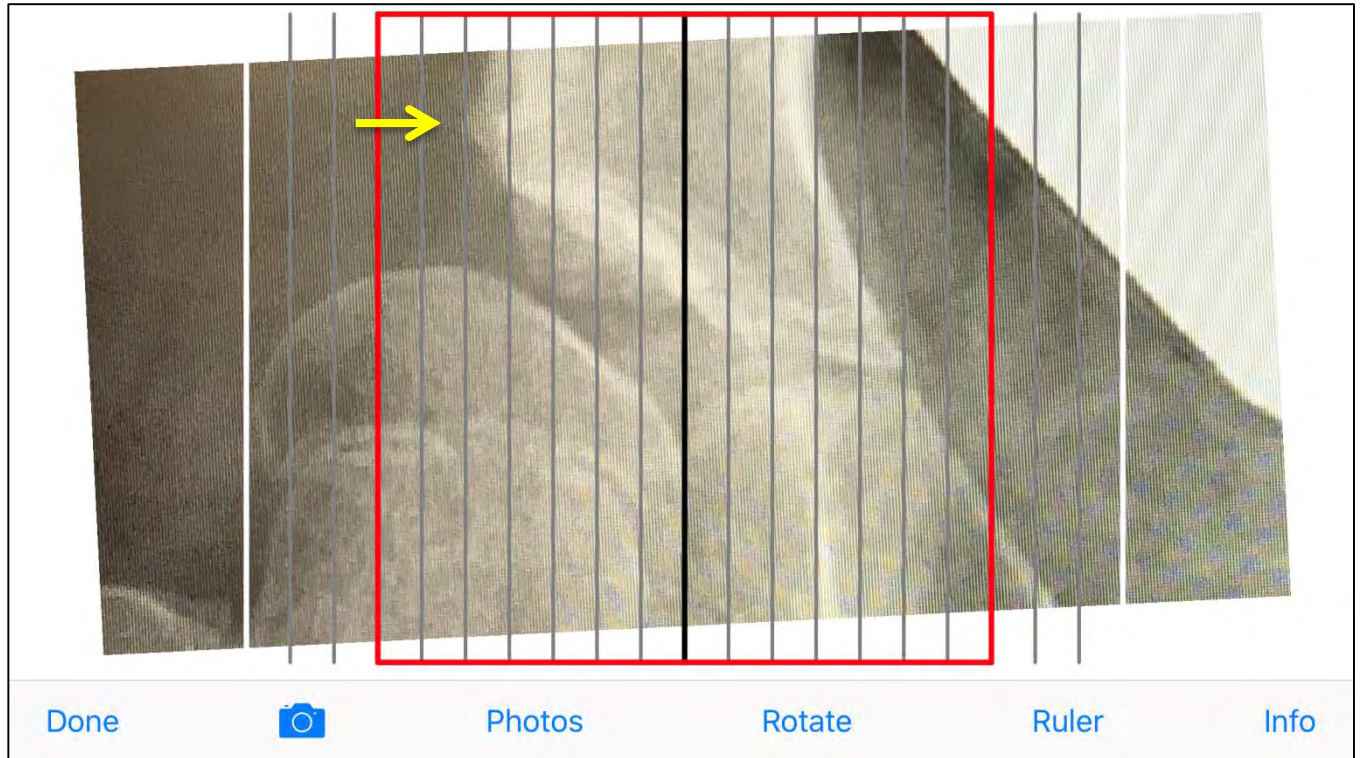
Info

# 50% Example

Without Ruler Overlay



With Ruler Overlay

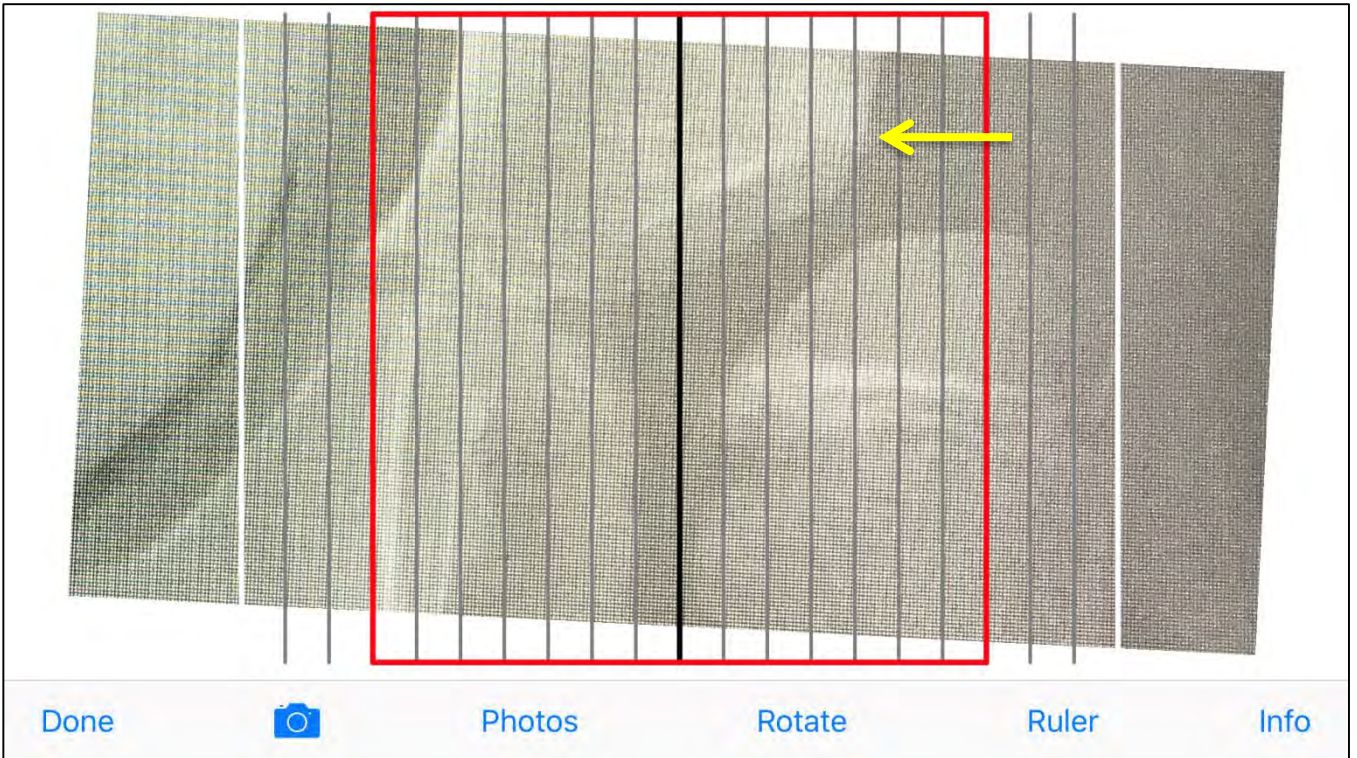


# 60% Example

Without Ruler Overlay

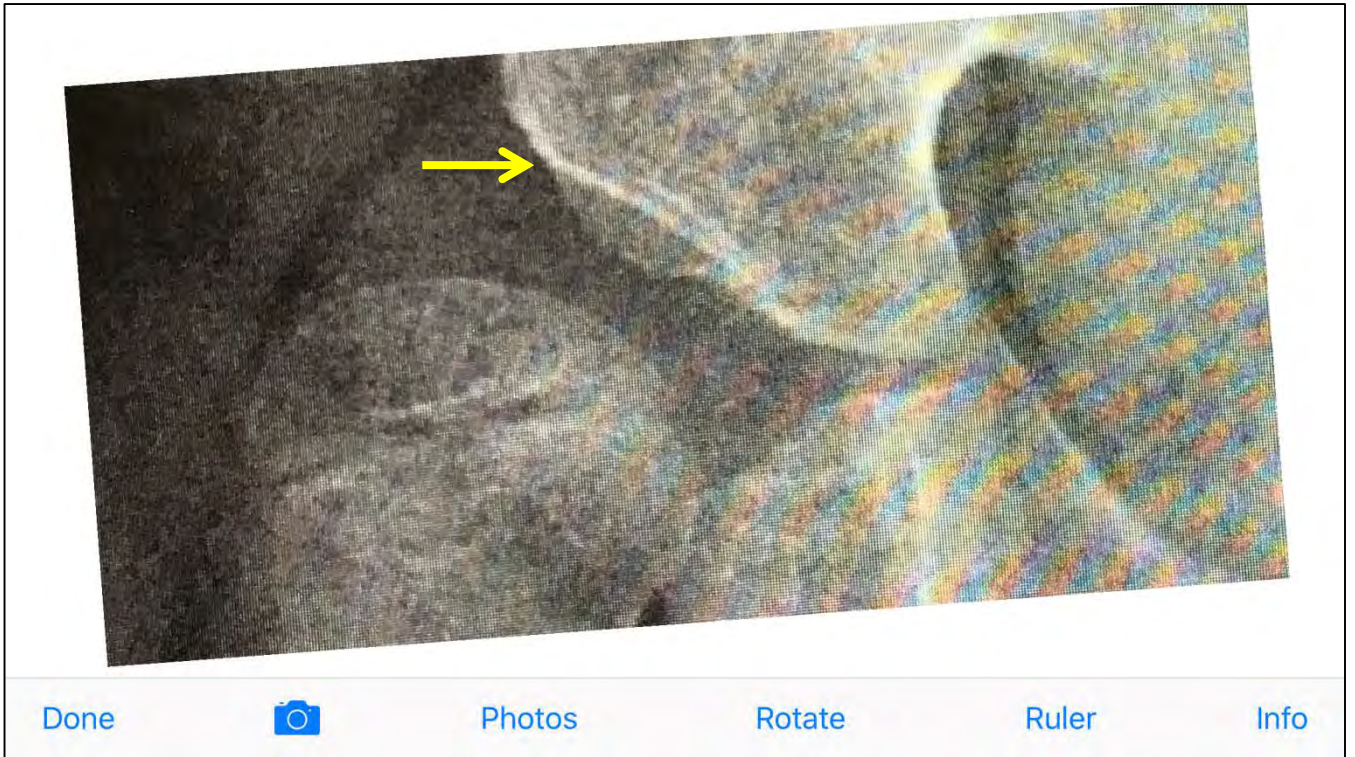


With Ruler Overlay

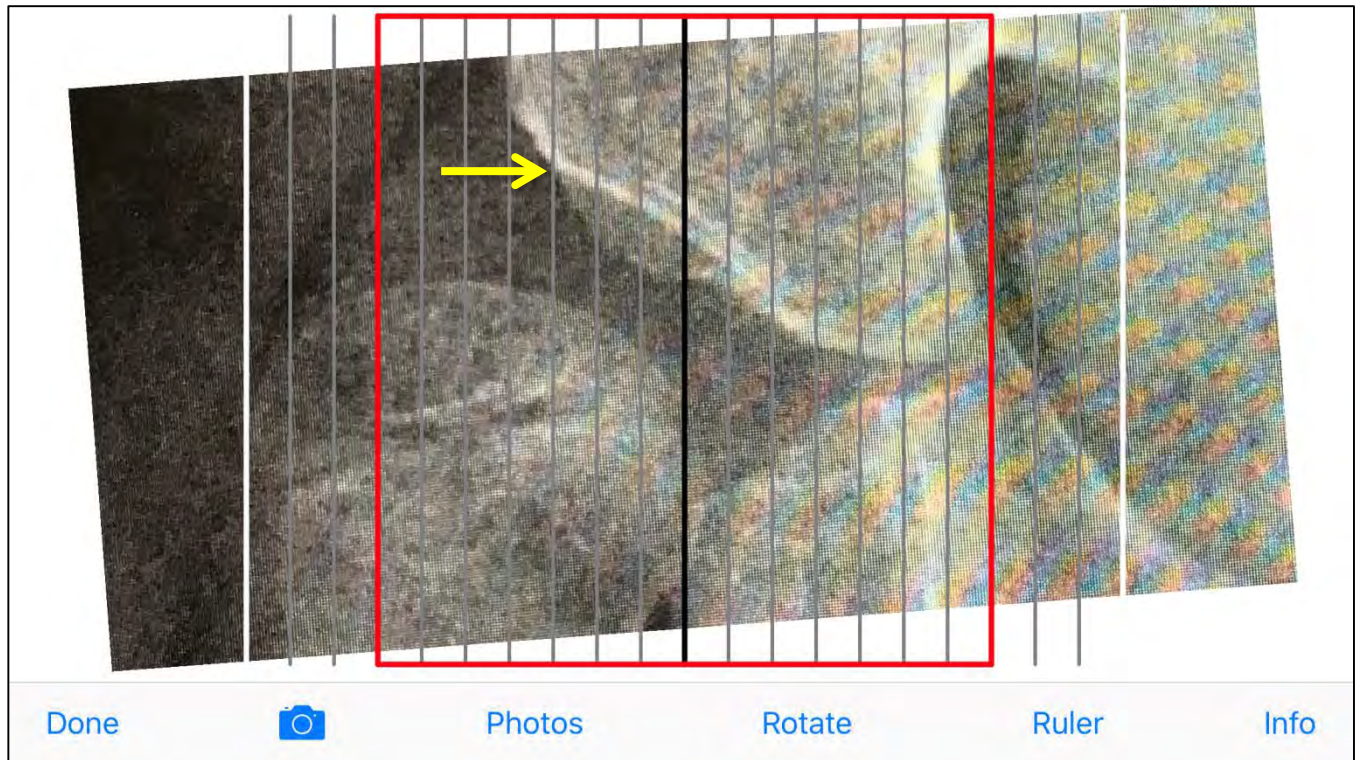


# 70% Example

Without Ruler Overlay



With Ruler Overlay



# 90% Example

Without Ruler Overlay



Done



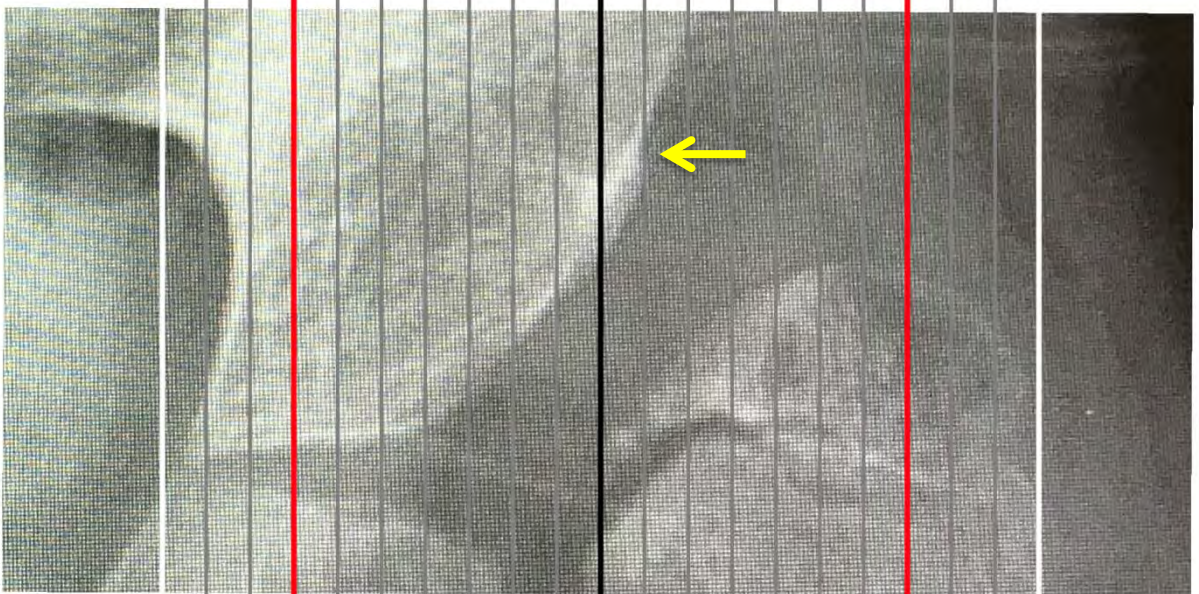
Photos

Rotate

Ruler

Info

With Ruler Overlay



Done



Photos

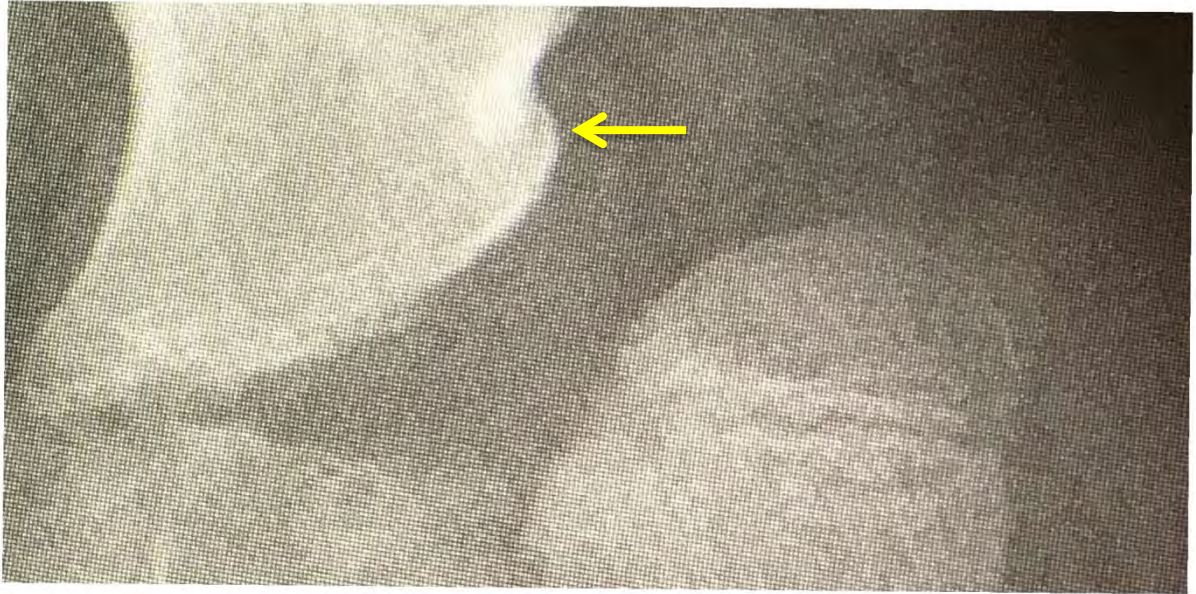
Rotate

Ruler

Info

# Over 100% Example

Without Ruler Overlay



Done



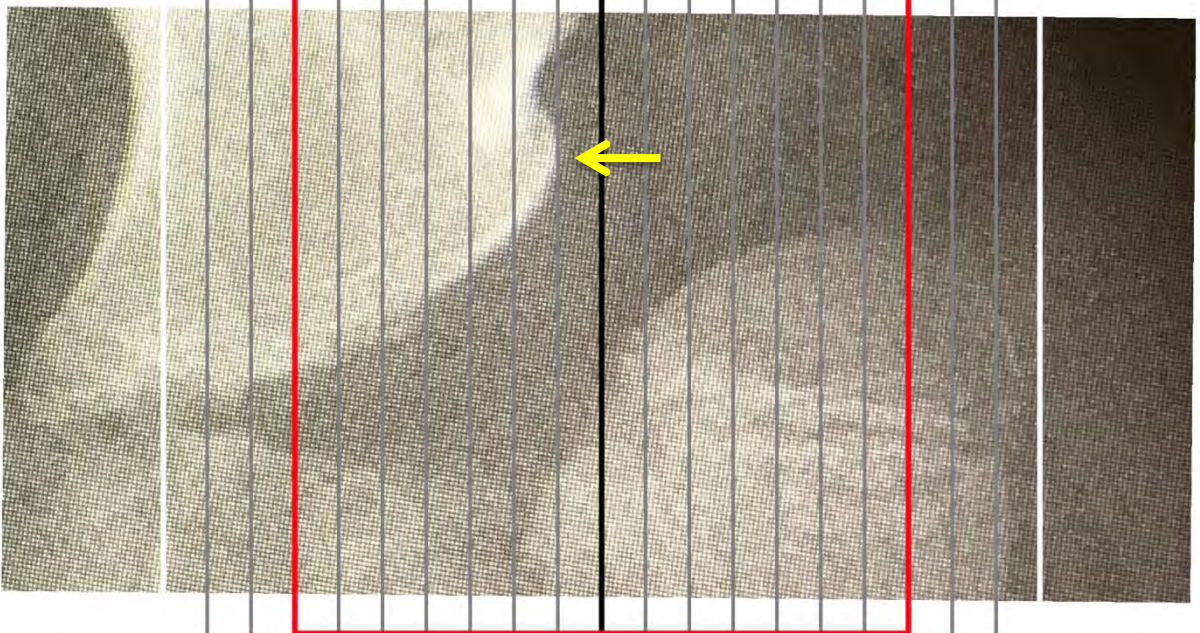
Photos

Rotate

Ruler

Info

With Ruler Overlay



Done



Photos

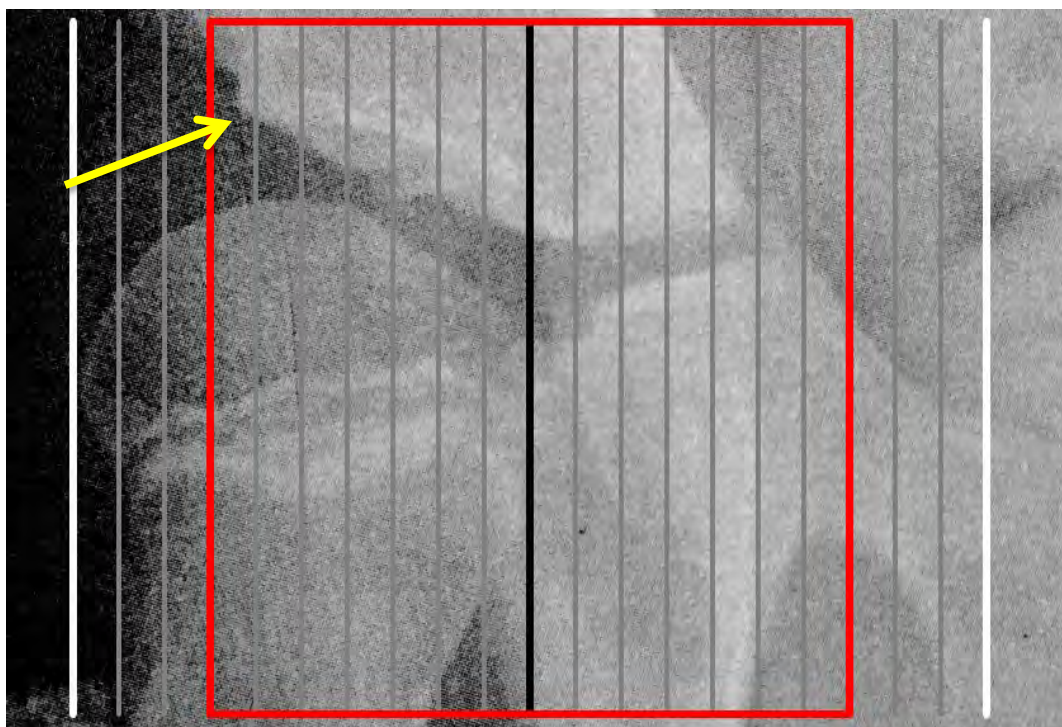
Rotate

Ruler

Info

Remember, 30% is the critical Migration Percentage for a hip at risk of displacement. To make it easier to see, a “red box” contains the high risks zones for both hips.

If the edge of the acetabulum lies within the red box, the Migration Percentage is over 30%.

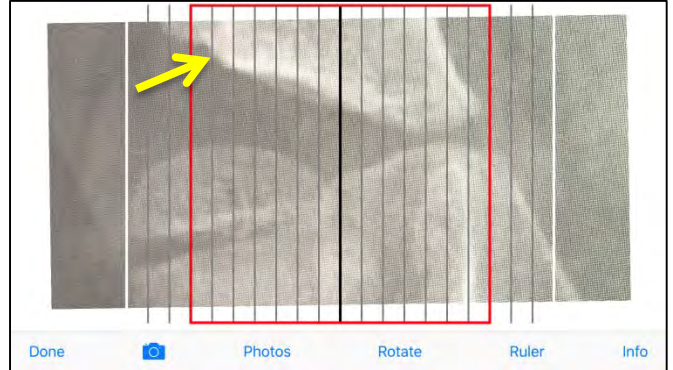
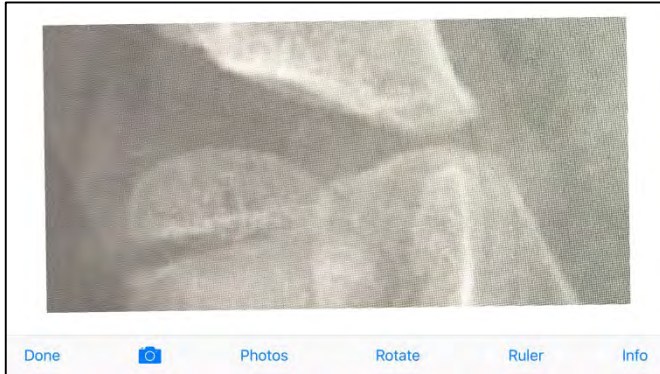


If the lateral edge of the acetabulum is inside the red box, the migration percentage is above 30%.

Without Ruler Overlay

**40%**

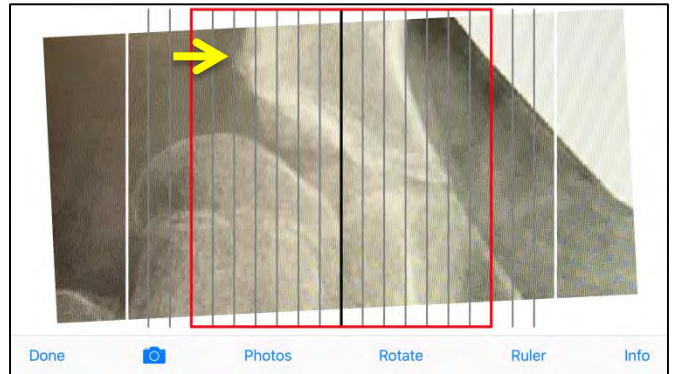
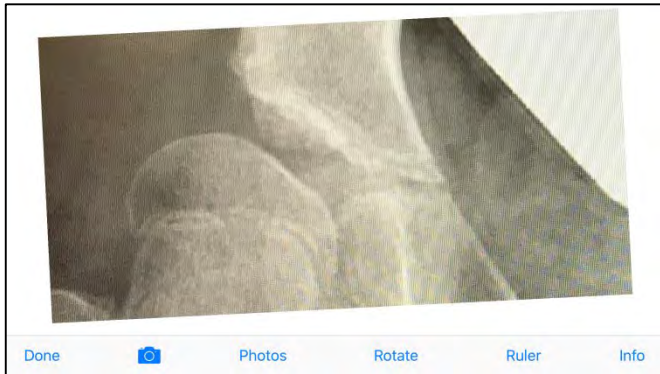
With Ruler Overlay



Without Ruler Overlay

**50%**

With Ruler Overlay

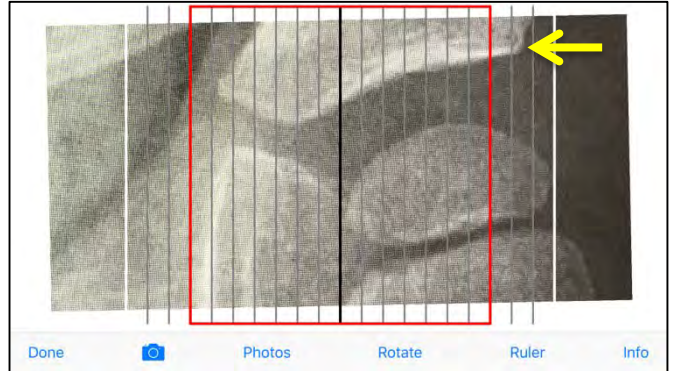
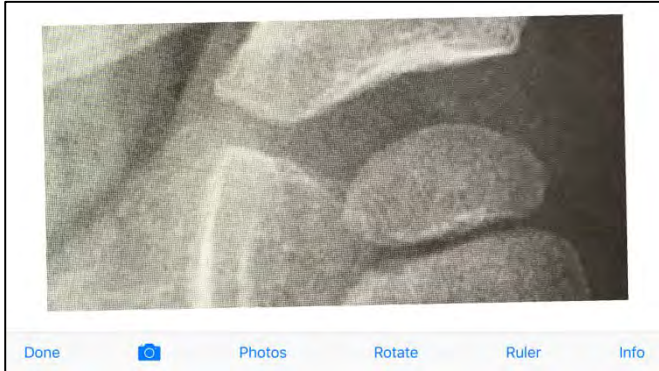


If the lateral edge of the acetabulum is outside the red box, the migration percentage is below 30%.

Without Ruler Overlay

**15%**

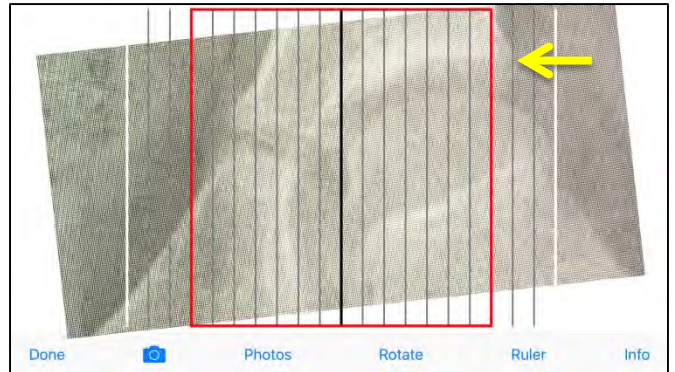
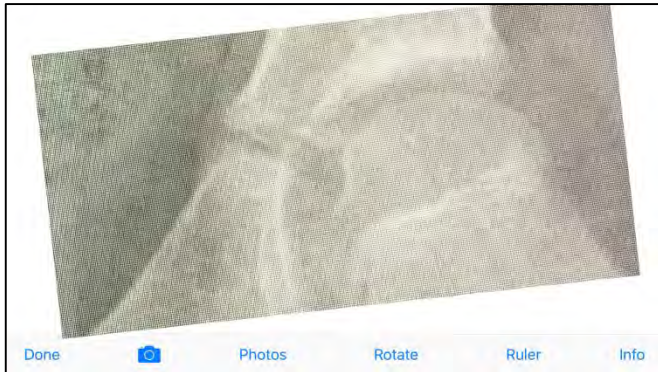
With Ruler Overlay



Without Ruler Overlay

**20%**

With Ruler Overlay





# *When to Refer to Pediatric Orthopaedics*

A referral should be made to a pediatric orthopaedic surgeon if:

- The migration percentage on x-ray is over 30%
- The hip abduction motion is less than 30 degrees
- There is hip pain or decreased function
- There is deterioration in hip motion
- There is asymmetry in hip motion (one side moves less than the other)