

# Is the Surface Topography a helpful tool for the management of scoliosis?

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The aim was to reveal the importance  
of surface topography  
in complement to the x-rays

# MATERIALS AND METHODS

616 Patients

432 females 

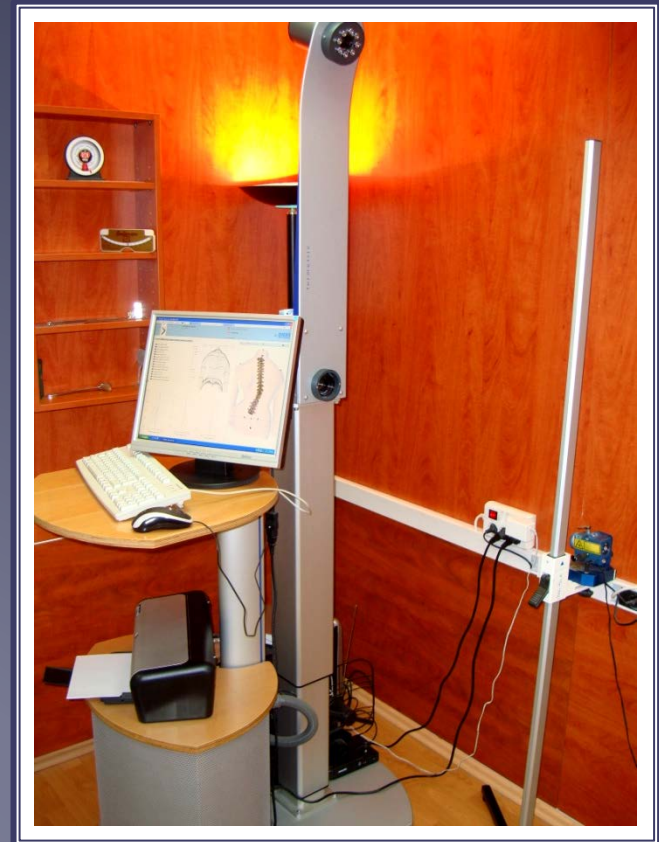
184 males 

Age

5 y - 21 y (average **14,7** y)

# Measurements

We have used the **Formetric 4D Dicom II system**, which is supplied as well with Cobb angle measurement.



# Measurements

The patients have been visited clinically by:

- *Inspection*
- *Adams forward bending test*
- *Bunnell scoliometer*
- *SpineScan scoliometer*



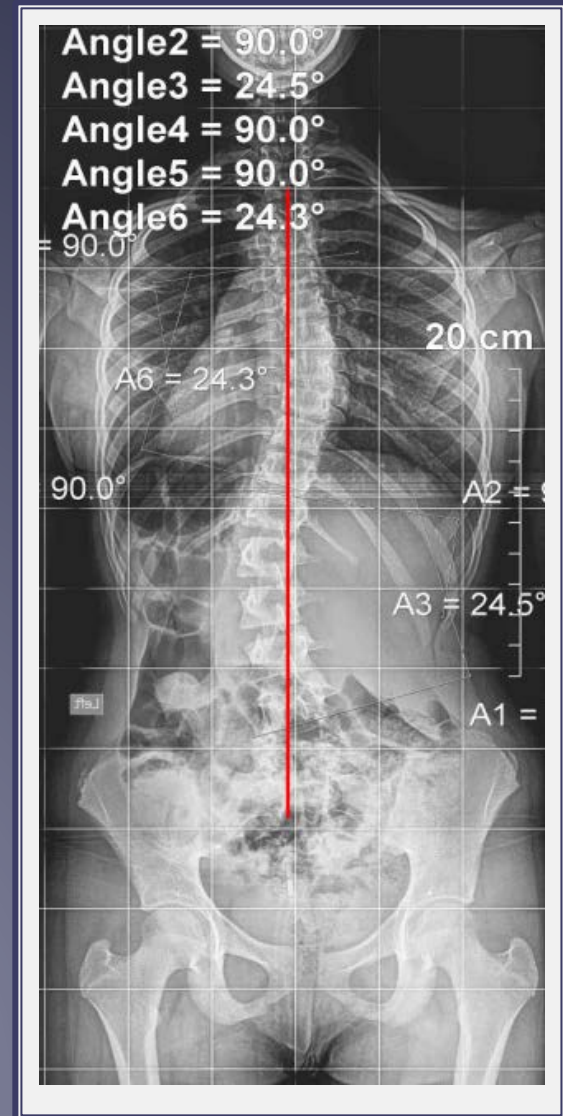
Bunnell scoliometer



SpineScan scoliometer

# Measurements

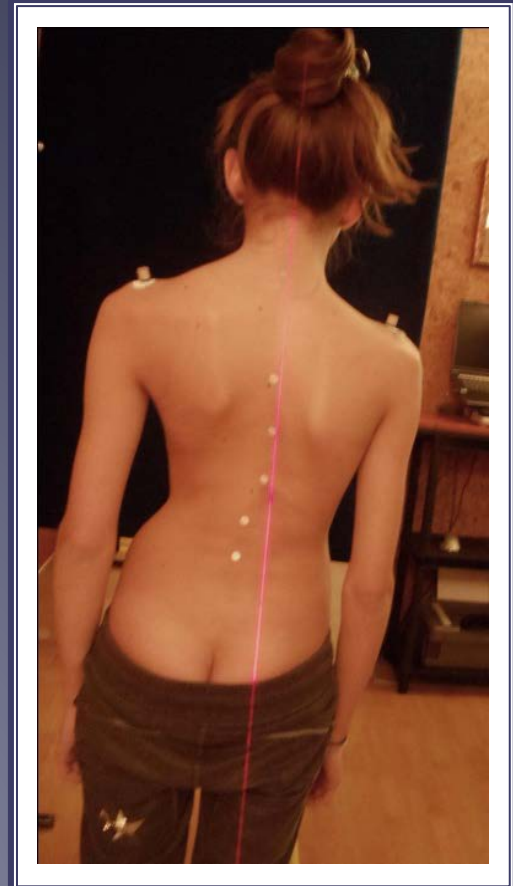
For the Cobb angle we have used **Digital X-rays** in which we have measured the Cobb angle with absolute accuracy





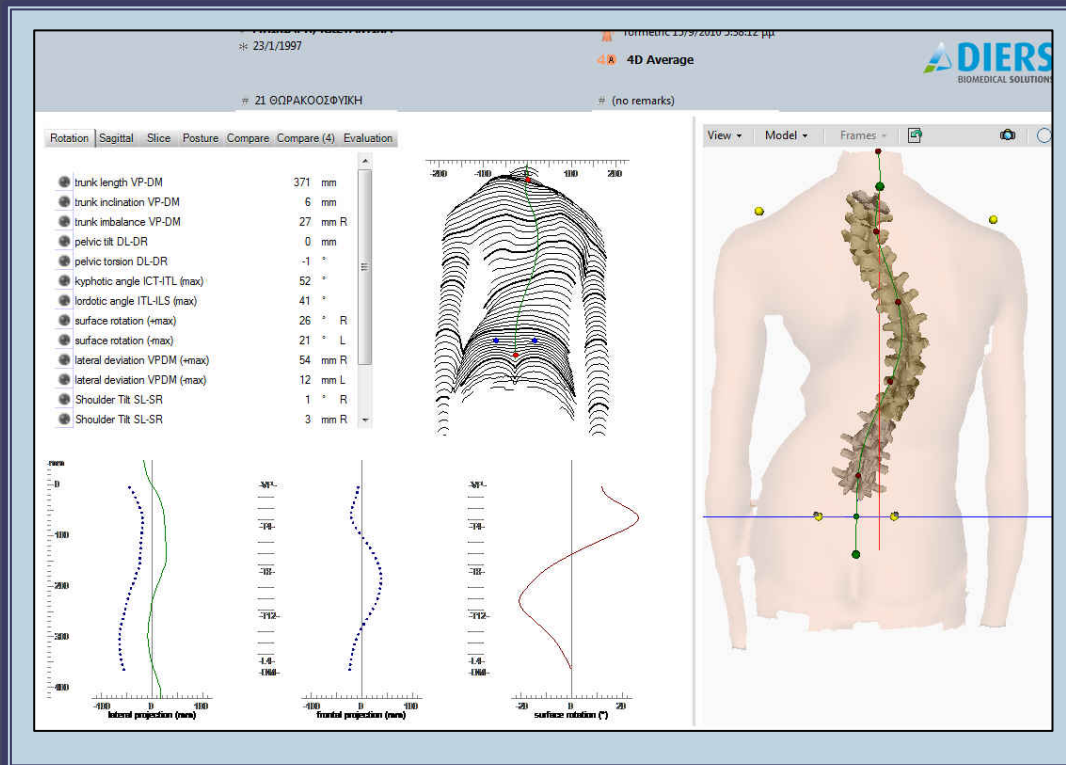
## Measurements

We have fit to every patient, **4-8 markers** from the apex of T1 through L4 spinal process and 2 **shoulder reflectors**, to get the possibility for lateral Cobb angle measurement with the Formetric 4D.



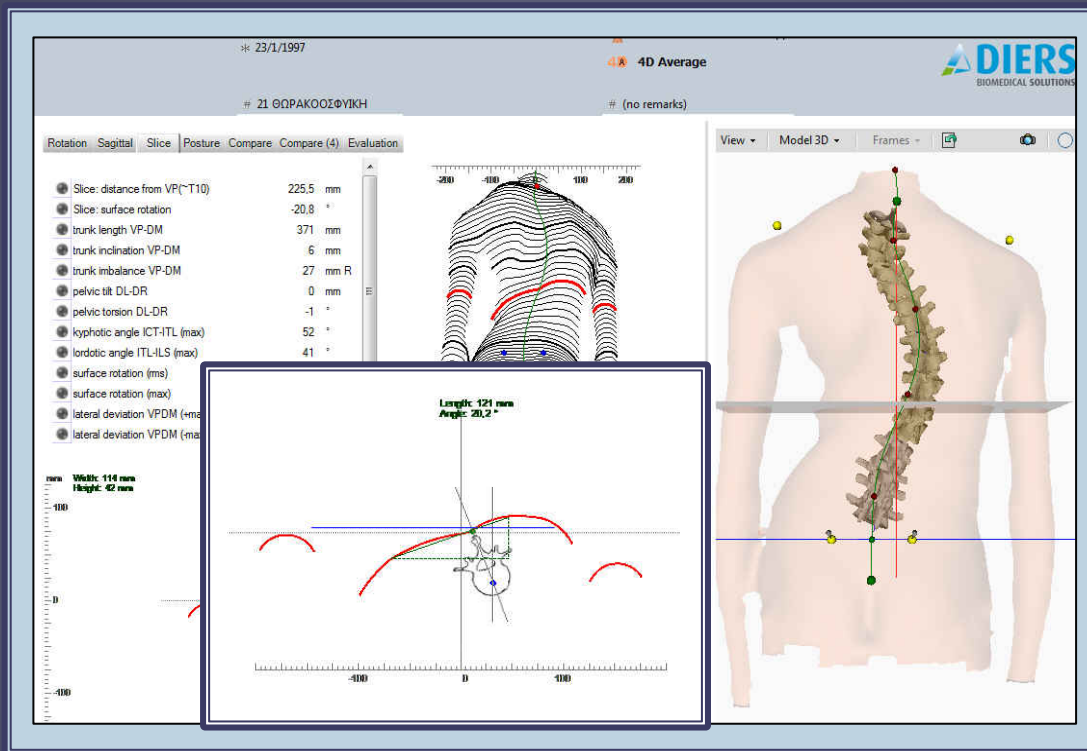
# Measurements

We have had various data through surface topography



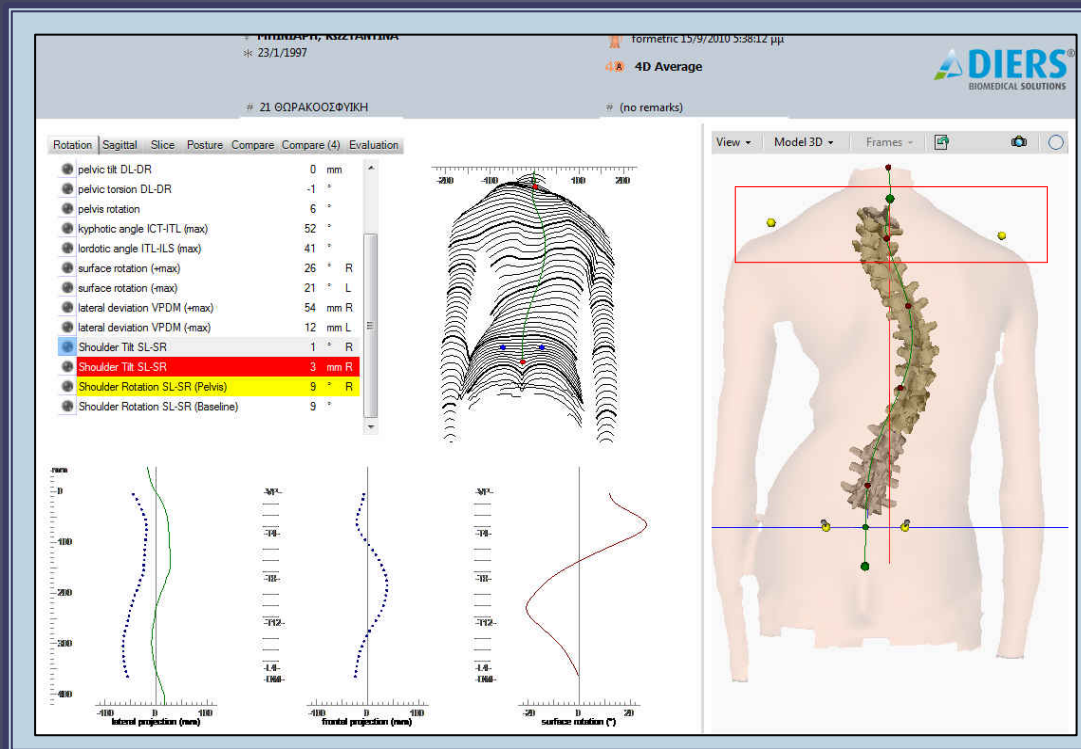
# Measurements

## Surface rotation



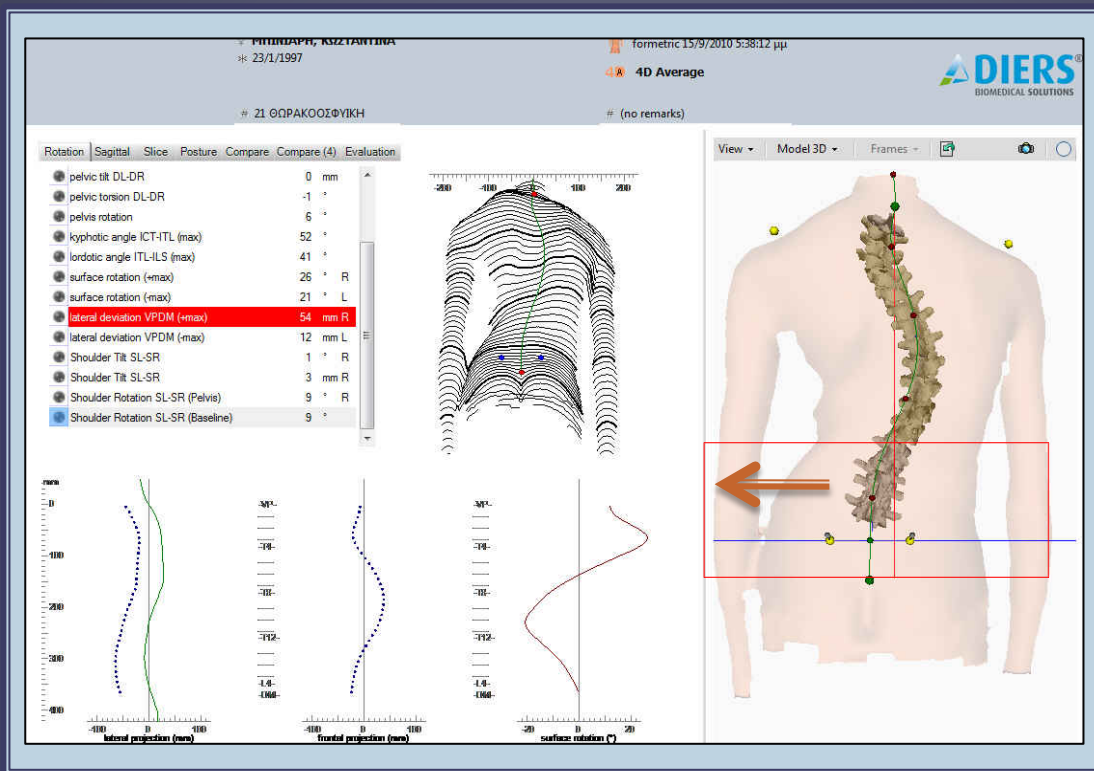
# Measurements

## Shoulder Tilt and Rotation



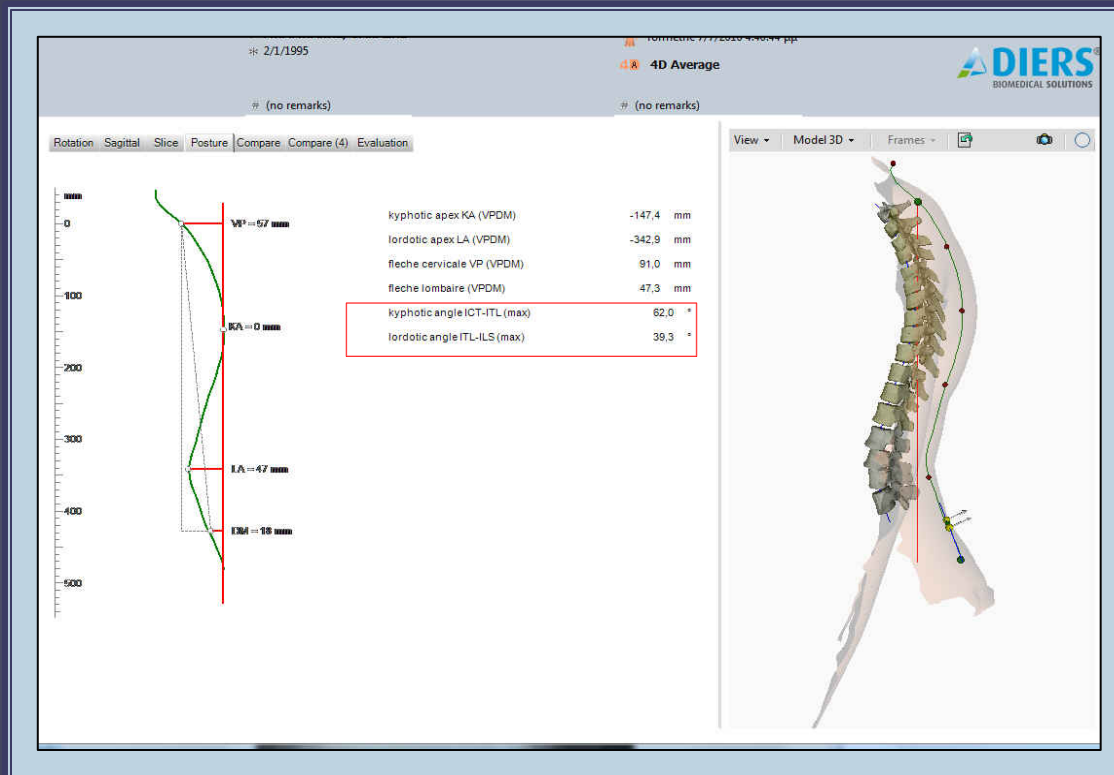
# Measurements

## Pelvis rotation and lateral deviation



# Measurements

## Kyphotic and Lordotic angle



# RESULTS

We have divided the Results in:

- 1- Scoliosis Cobb angle between  $23^{\circ}$  -  $45^{\circ}$
- 2- Scoliosis Cobb angle  $> 45^{\circ}$
- 3- Scoliosis Cobb angle  $< 23^{\circ}$

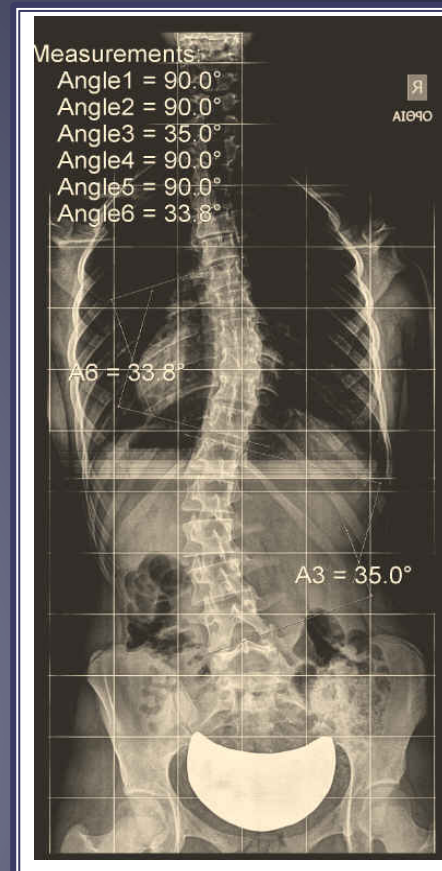
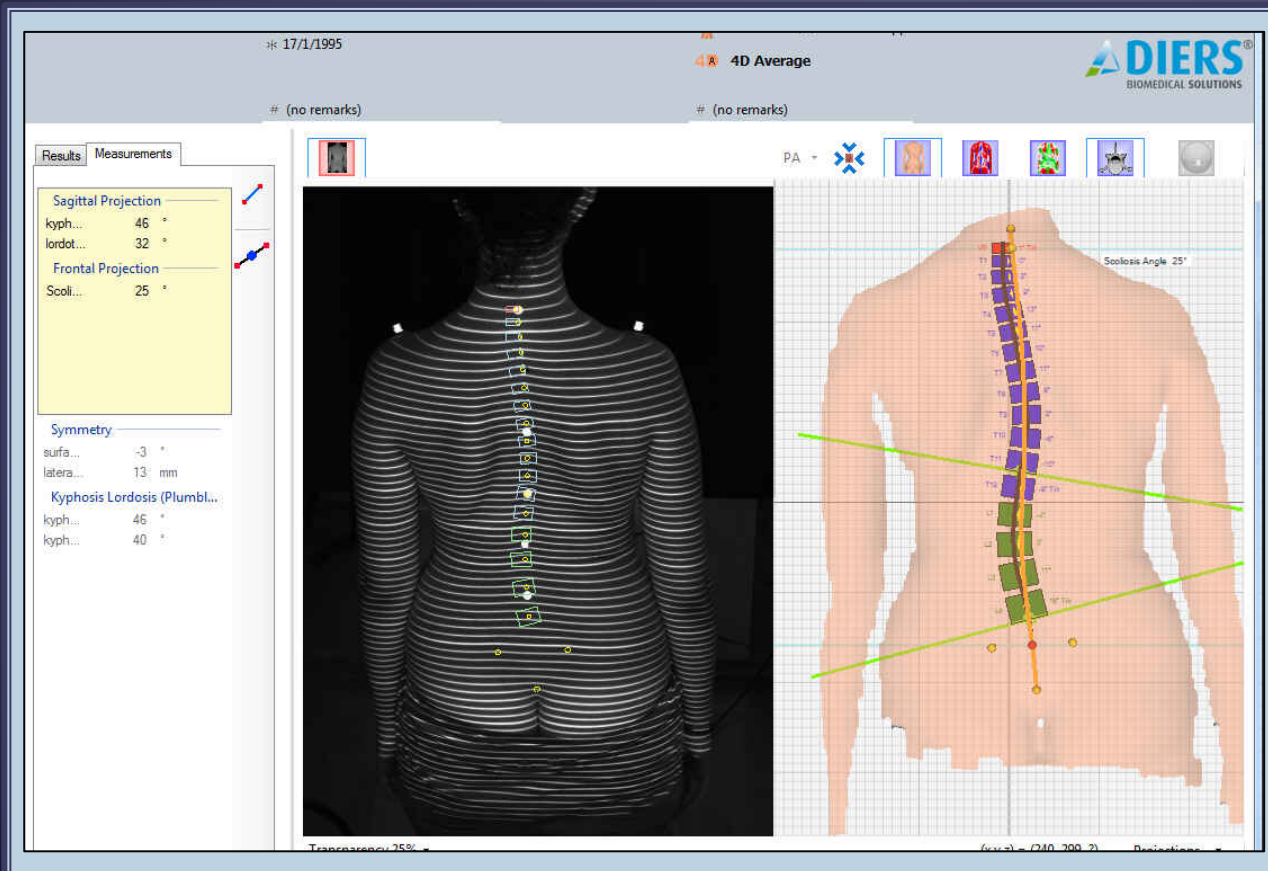


Scoliosis Cobb angle:  $23^{\circ}$  -  $45^{\circ}$

We had a  $> 95\%$  accuracy in Scoliosis between  $23^{\circ}$  and  $45^{\circ}$  Cobb angle.

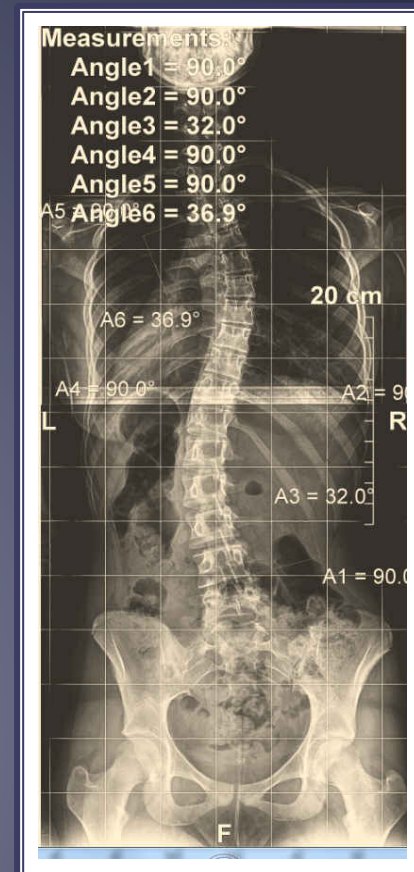
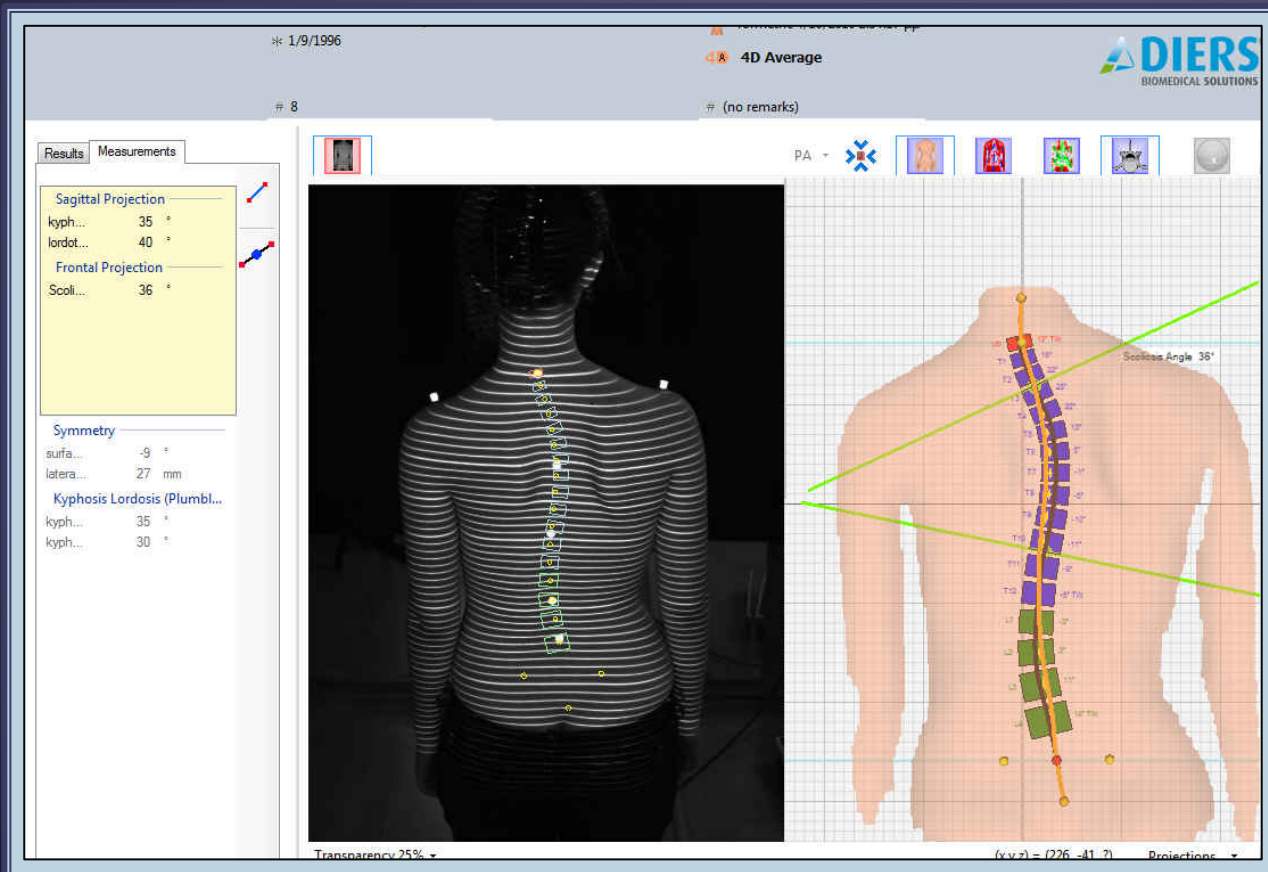
23° - 45° Cobb angle

72 %



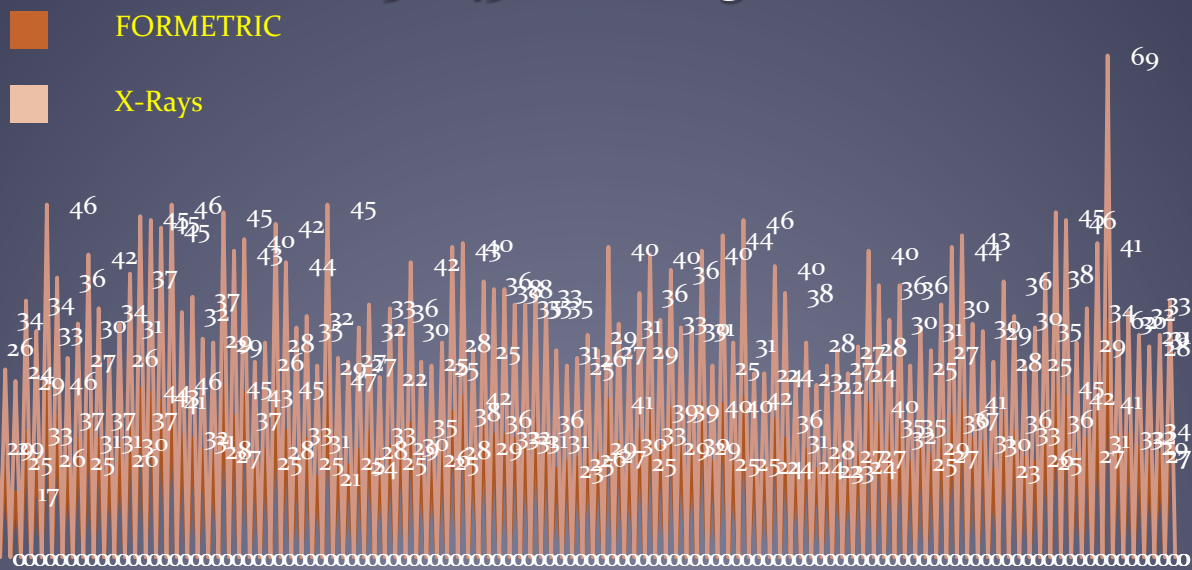
23° - 45° Cobb angle

100 %



# 23° - 45° Cobb angle

## 23° - 45° Cobb angle



Average: 92 %

Scoliosis Cobb angle  $> 45^\circ$

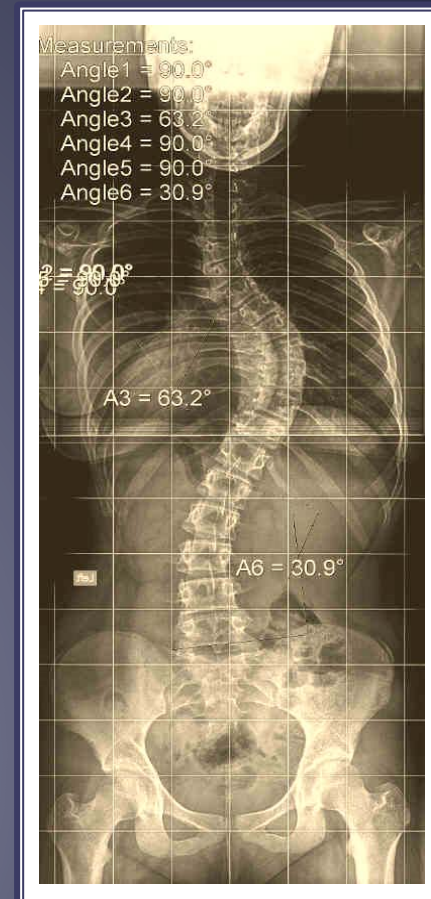
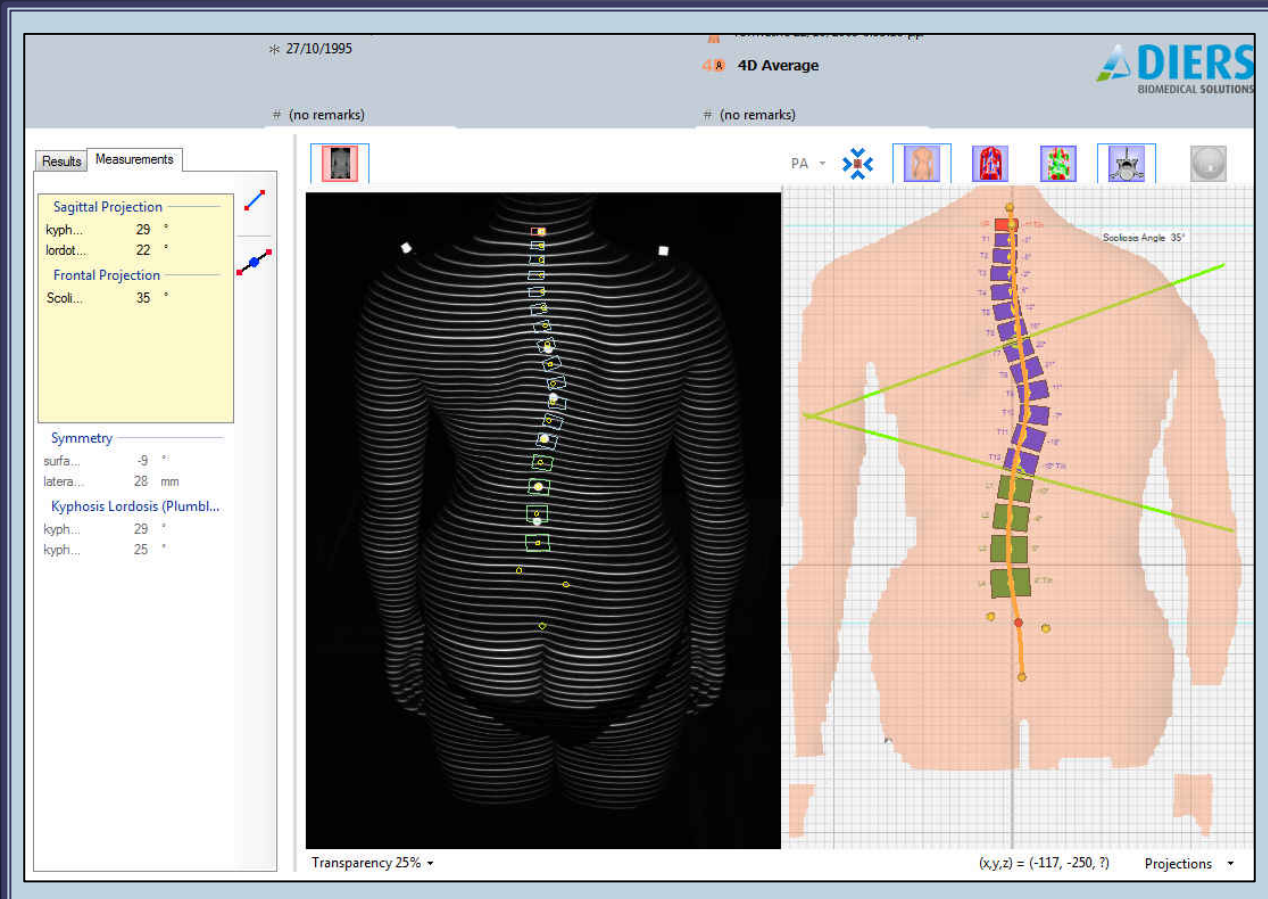
The accuracy was lower,

between 61% - 100%,

if the measured angle was  $> 45^\circ$

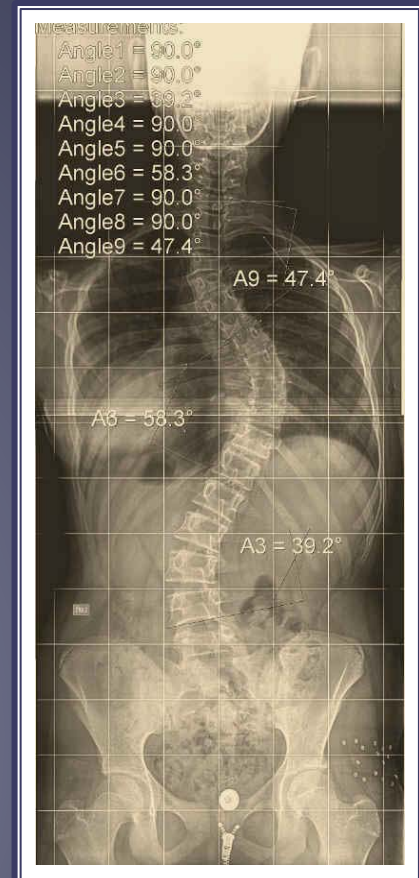
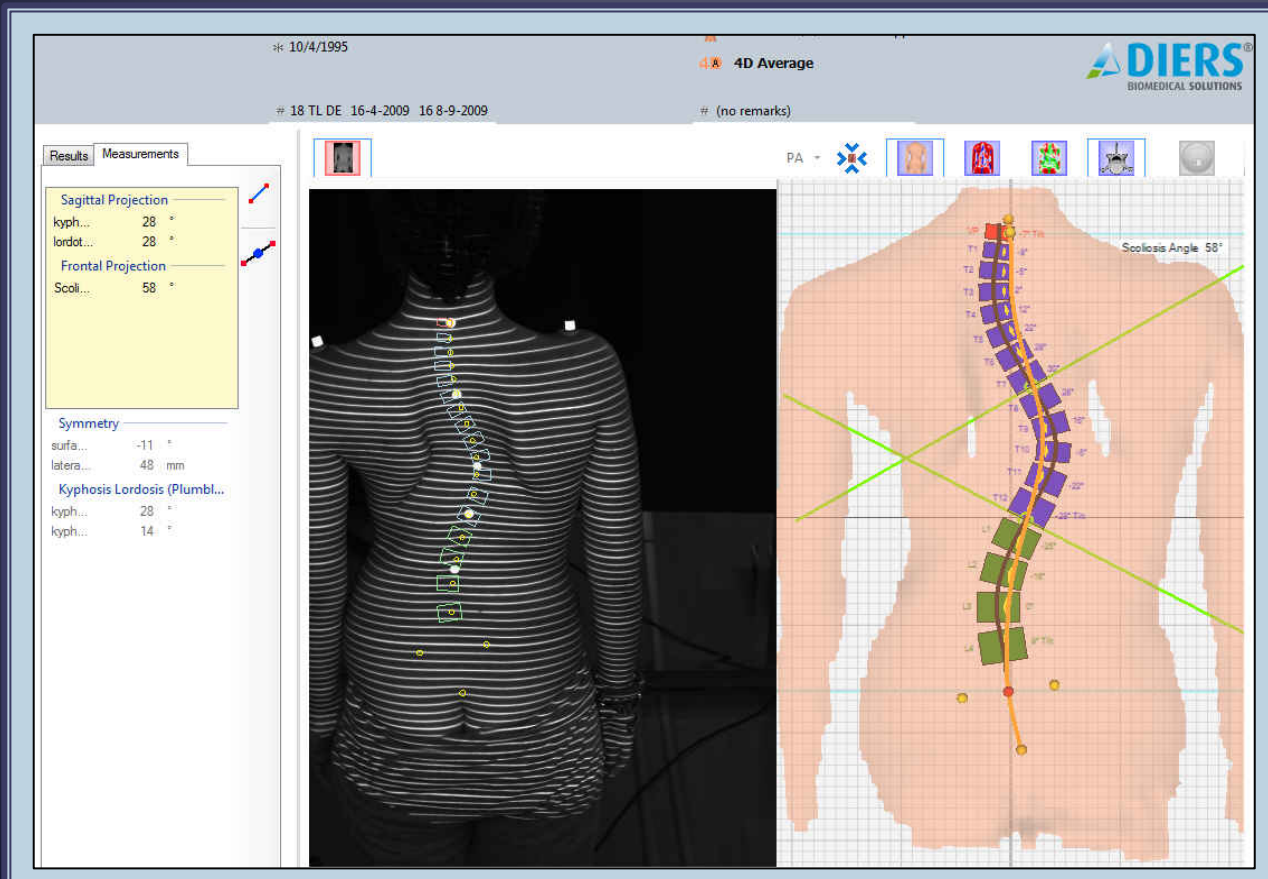
> 45° Cobb angle

61%



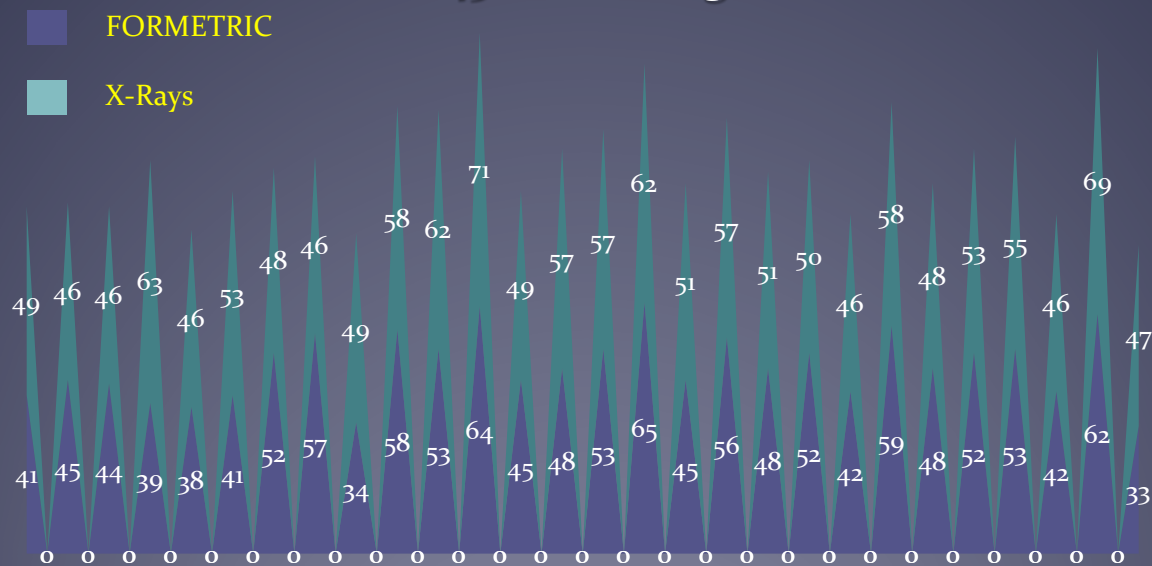
> 45° Cobb angle

100 %



> 45° Cobb angle

> 45° Cobb angle



Average: 89 %



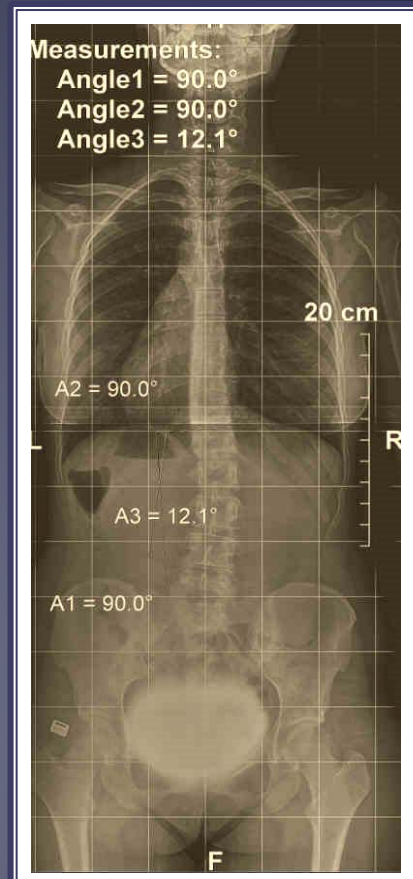
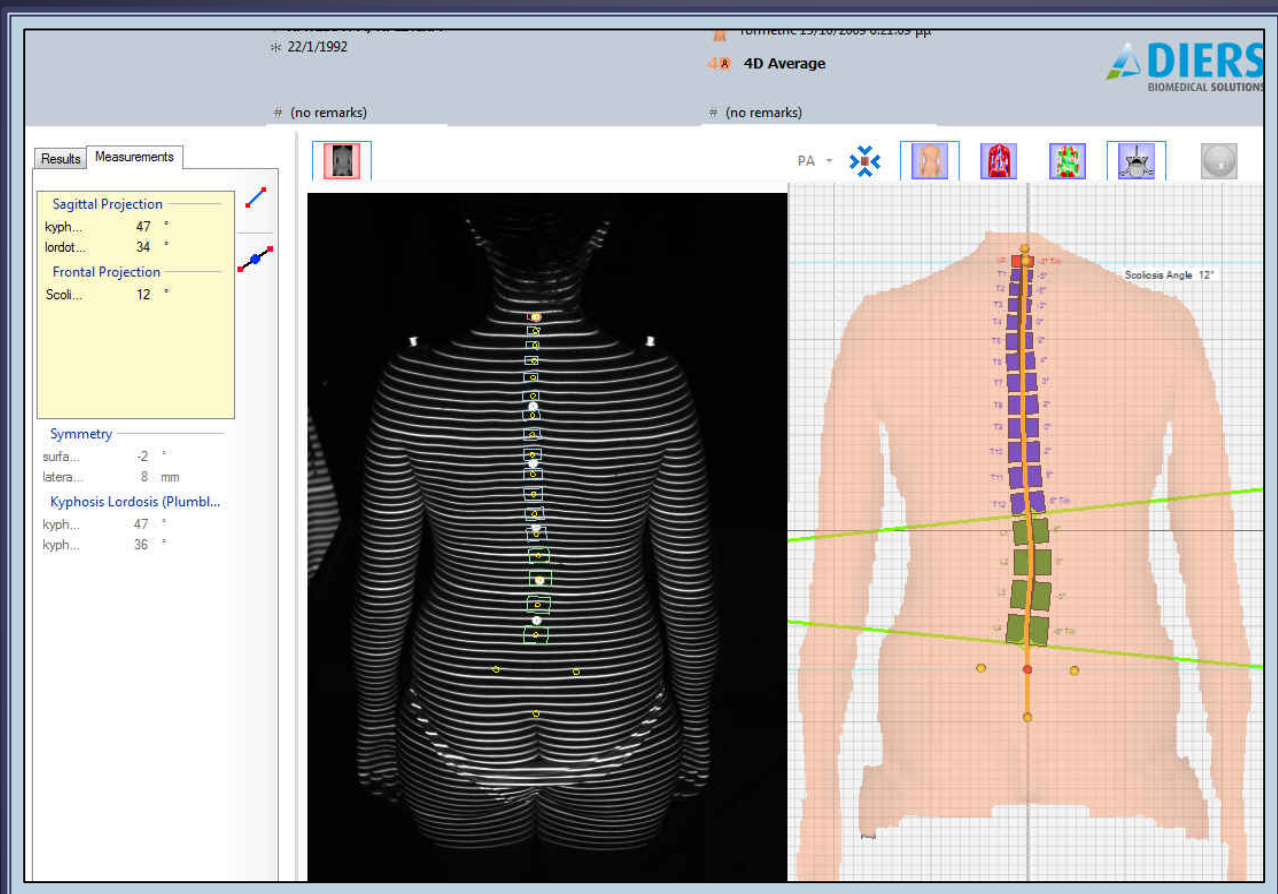
Scoliosis Cobb angle  $< 23^\circ$

The accuracy was **even less** in some cases, when the measured angle was  $< 23$



< 23° Cobb angle

100 %

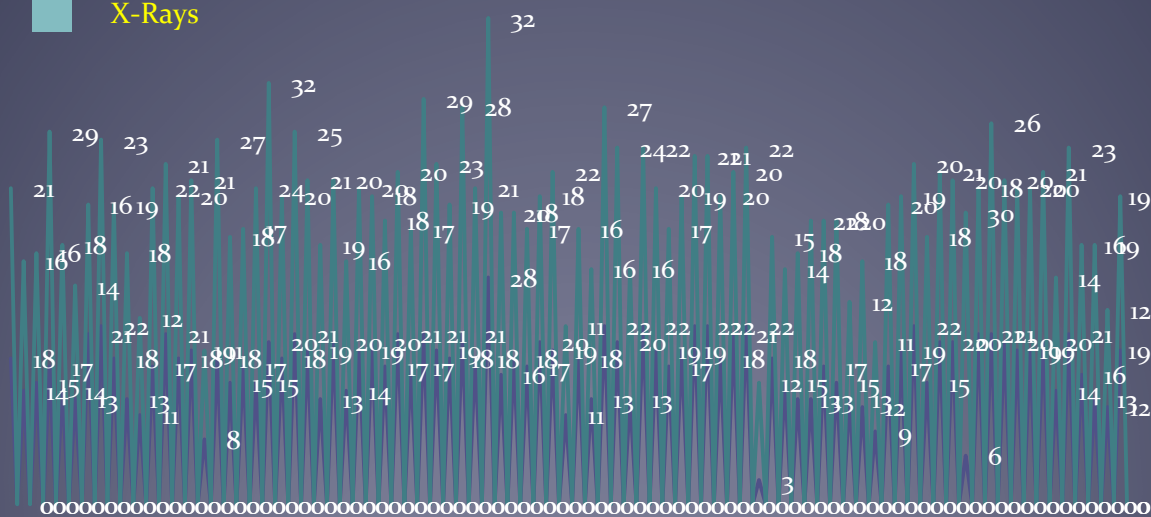


< 23° Cobb angle

< 23° Cobb angle

FORMETRIC

X-Rays



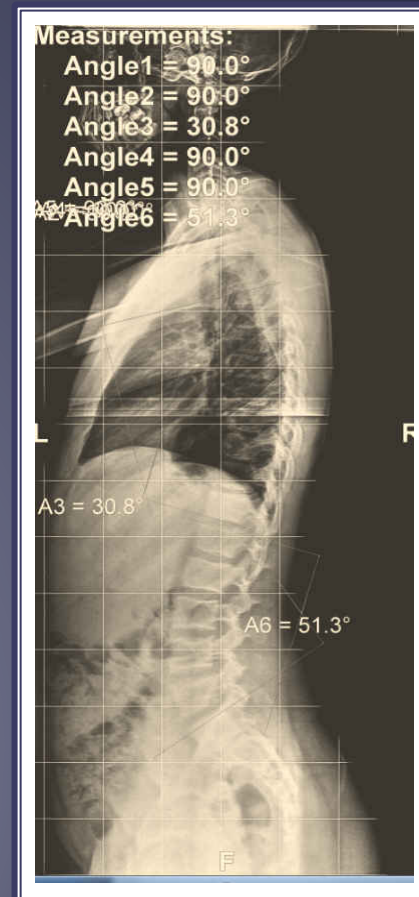
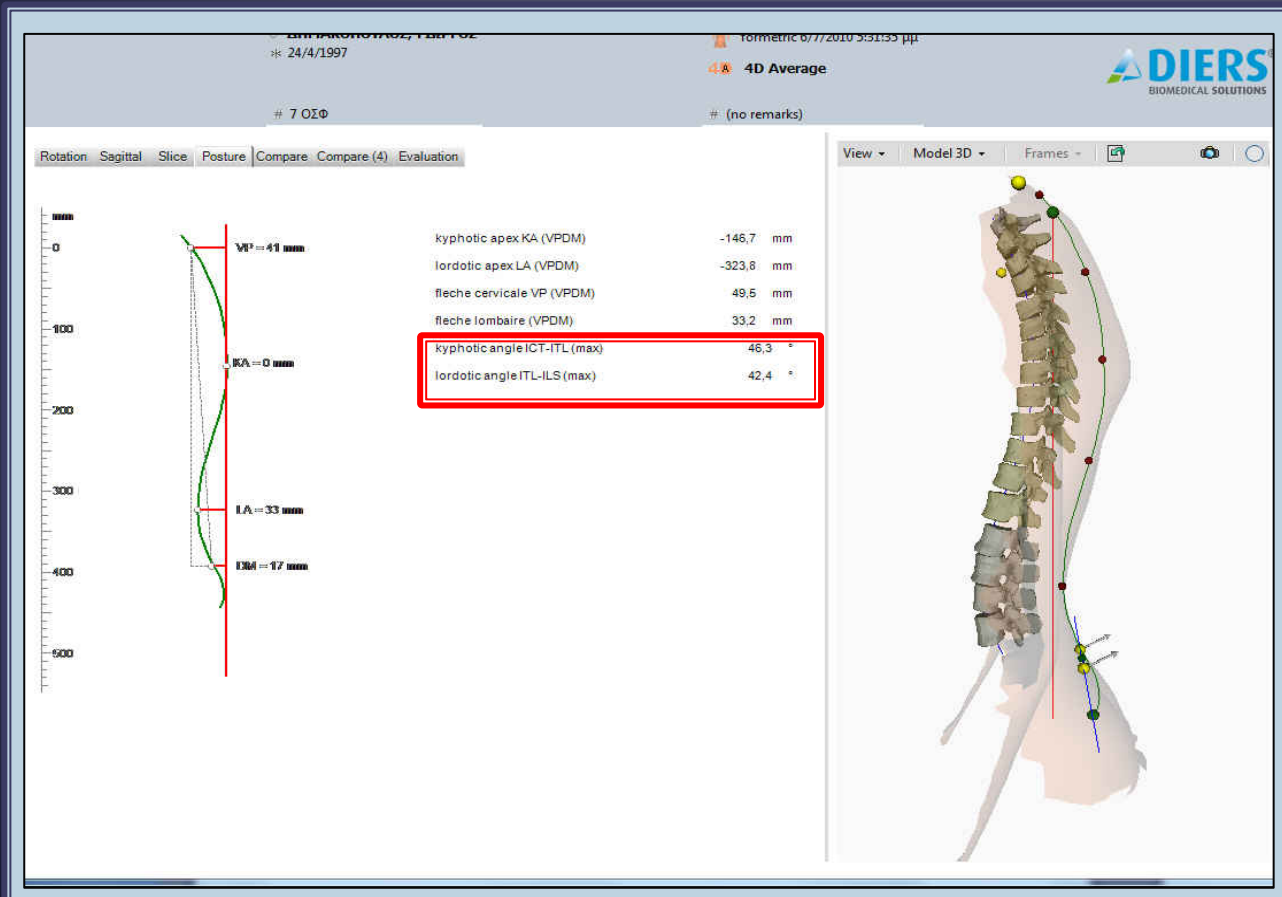
Average: 86 %

# Kyphosis Cobb angle

As it concerns the Kyphosis,  
the cob angle was very accurate  
as it was exceeded **90%**

# Kyphosis

65 %



# Kyphosis

100 %

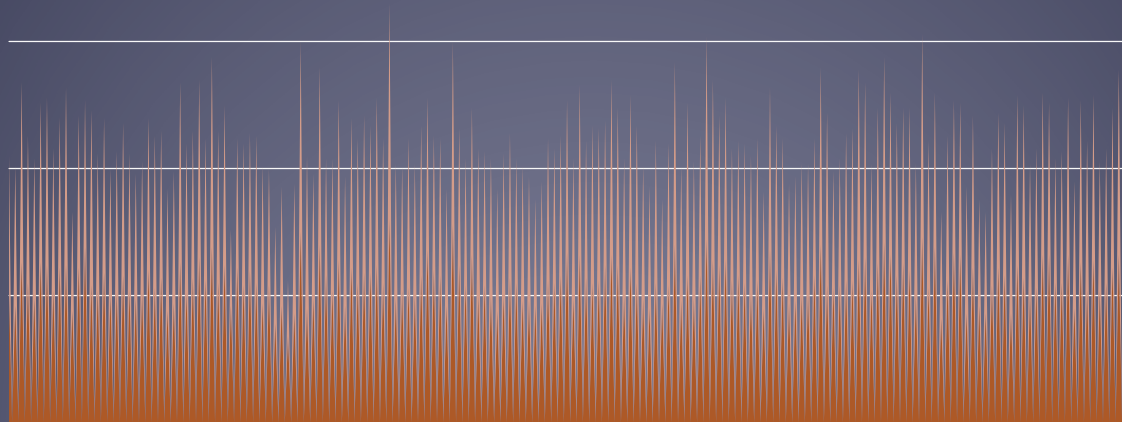


# Kyphosis

## Kyphosis

 FORMETRIC

 X-Rays



Average: 93 %



# DISCUSSION

There was significant difference, between Formetric and X-rays in Scoliosis, when the **patient was obese** and was very difficult to find the spinous apophysss for landmarks.

In Kyphosis the difficulty was when the patient could **not relaxed enough** and was straitening his back at the moment of the examination

We have got several data like rotation, shoulder tilt pelvic tilt and deviation etc, which are most important in the management of Scoliosis as a **3D deformity** and especially when we are using the compare program for different visits.

It is very important  
**the experience of the examiner**  
as the position of the markers is crucial for the  
accurate Cobb angle measurement

# CONCLUSION

We believe that the surface topography  
is a **precious tool** for the diagnosis and follow up  
of a complex three dimensional skeletal deformity,  
such as Scoliosis.

The accuracy of the Cobb angle measurement  
of Formetric surface topography  
is excellent and  
we believe that we must move to the next step,  
which is the **3D dimension management**



Thank you