Title

Ben Church1, Andras Lasso1, Christopher Schlenger2,   
Daniel P. Borschneck3, Parvin Mousavi4, Gabor Fichtinger1,3, Tamas Ungi1,3

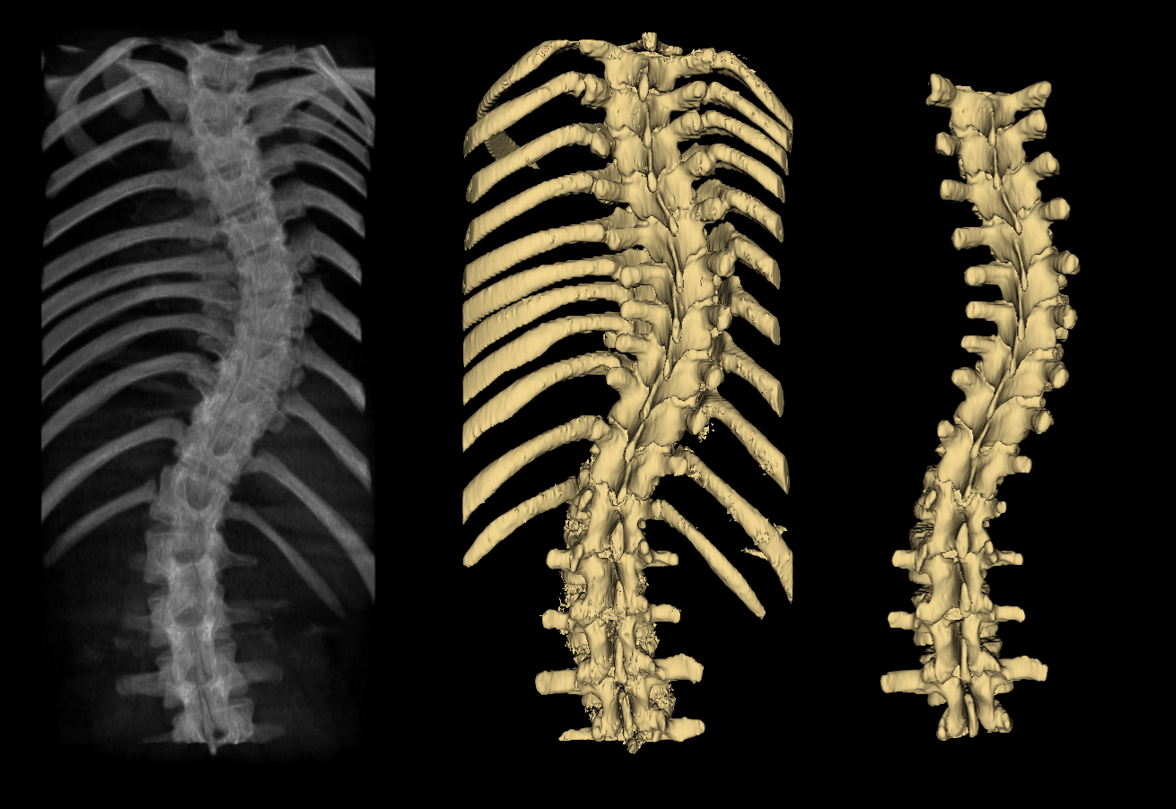
1. Laboratory for Percutaneous Surgery, School of Computing,  
    Queen’s University, Kingston, ON, Canada
2. Premier Chiropractic, Stockton, CA, USA
3. Department of Surgery, Queen’s University, Kingston, ON, Canada
4. Medical Informatics Laboratory, School of Computing,   
   Queen’s University, Kingston, ON, Canada

**ABSTRACT**

# Introduction

The health risks resulting from using X-ray for regular assessment of adolescent idiopathic scoliosis have motivated research into using spatially tracked ultrasound as an alternative method. Wang et al. [1] and Cheung et al. [2] examine several methods which use wide-transducer, spatially tracked ultrasound probes to scan patients’ spines in an axial orientation. The series of axial images are used to render a coronal representation of the spine, which could be examined at various depths of the remaining anterior-posterior dimension. Operators then located various skeletal landmarks identifiable from ultrasound. Estimated of the spines’ curvatures are extracted from the landmarks’ locations, and the angles of the curvatures were compared to the Cobb angle for validation of the particular method. Ungi et al. [3] scanned scoliotic phantom models with the tracked ultrasound probe in a sagittal orientation to locate the transverse processes. When the operator was confident the transverse process was centered in the ultrasound image, a snapshot with position information was captured. Multiple snapshots could be taken of a given transverse process as necessary to confidently locate all of the landmarks within a range of interest. With the snapshots represented in a 3D environment, operators located the transverse processes, placing points at them from which an angle of curvature was extracted and compared to the Cobb angle.

These methods may be useful for quantitative, radiation-free, assessment of scoliosis, but they do not provide a macroscopic visualization of the patient’s spinal pathology in the way X-ray imaging, or better still, CT, do. X-ray and CT, despite their health risks, provide clinicians with an overall impression of their patient’s scoliosis. In [4], authors developed a method for producing such informative, macroscopic visualizations of spinal anatomy using radiation-free, ultrasound-accessible skeletal landmarks, namely, the transverse processes. The visualizations produced by their method, while not a substitute for standardized, quantitative measures such as angle of curvature, they may accompany these measures to give clinicians, patients, and their parents a visual understanding of the nature of the disease. Such a method might also be used to illustrate approximately how a spine’s curvature is expected to change before and after, or in the absence of, a treatment.



# Methods

# Results

# Discussion

# Conclusions

# References

1. Wang Q, Li M, Lou EHM, Wong MS. “Reliability and Validity Study of Clinical Ultrasound Imaging on Lateral Curvature of Adolescent Idiopathic Scoliosis”. PLOS ONE. 2015 Aug; 10(8):1-16.
2. Cheung CW, Zhou GQ, Law SY, Mak TM, Lai KL, Zheng YP. “Ultrasound Volume Projection Imaging for Assessment of Scoliosis”. IEEE Trans Med Imaging. 2015 Aug; 34(8):1760-8.
3. Ungi T, King F, Kempston M, Keri Z, Lasso A, Mousavi P, Rudan J, Borschneck DP, Fichtinger G. “Spinal curvature measurement by tracked ultrasound snapshots”. Ultrasound in Medicine and Biology. 2014 Feb; 40(2):447-54.
4. Anonymous