Regional symmetry of the pelvis

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Abstract

Understanding the left-right symmetry of the pelvis can assist with the virtual reconstruction of fractured pelvises in the future. Further specifying the different regions can give more information regarding the anatomy of the bone. CT scans of intact pelvises are turned into 3D models using a computer program called Mimics. The femurs and spine are removed manually to isolate the bone. The model can then be analyzed and the regions defined. The pelvis is split into three pieces using the program Geomagic, the iliac, acetabular, and pubic rami regions. The two cuts are made based around the highest and lowest points of the acetabular cup. From here each cut piece can be mirrored and aligned with the opposing side of the pelvis. Colour deviation maps can then be generated to visualize the asymmetry, as well as the RMS value and the percentage of points within a 2 mm deviation threshold. The average RMS values are below 2 mm and the percentage of points within 2 mm is high. My research reflects that the pelvis is symmetrical and may be used to assist in the surgical planning process of pelvic fractures.

Key words:
Pelvis, symmetry, pelvic fracture, left-right symmetry, virtual reconstruction, Iliac, Pubic Ramus, Pubic Rami, Acetabulum

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Introduction

- Severe pelvic fractures are often treated with surgery in attempts to stabilize the bone.
- With knowledge of the symmetry of pelvis, the intact side can be used as a basis of the fractured side.

Objective

Understand the left-right symmetry of the pelvis to assist with the virtual reconstruction of fractured pelvises.

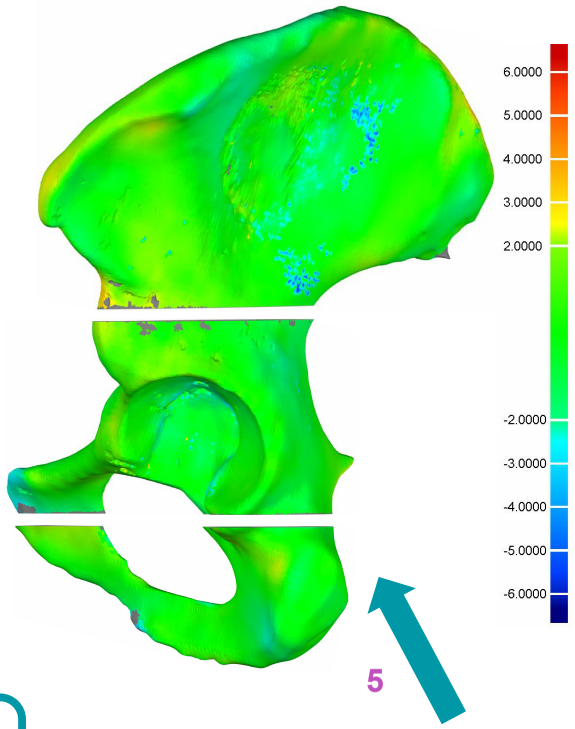
Methods

1) CT scans of intact pelvises are imported into Mimics® and 3D models are created.
2) Spine and femurs are removed to isolate the pelvis.
3) Model is imported into GeoMagic® and the regions are defined.
4) The segments from either side are aligned.
5) Colour deviation maps of each segment are generated.

Results and Conclusion

Region	RMS (mm)	% of Points Within ± 2 mm
Iliac	1.29	85.8
Acetabulum	1.02	92.4
Pubic Ramus	1.04	91.4

- The average RMS values are below 2 mm and the percentage of points within 2 mm is high.
- The results imply that the pelvis is symmetrical and may assist in the surgical planning process of pelvic fractures.



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