

## Anatomic determinants of sacral dysmorphism and implications for safe iliosacral screw placement



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Disclosures:

M Gardner: consultant for Synthes, Stryker, RTI Biologics, DGIMED Ortho, Lippincott

Other authors: none

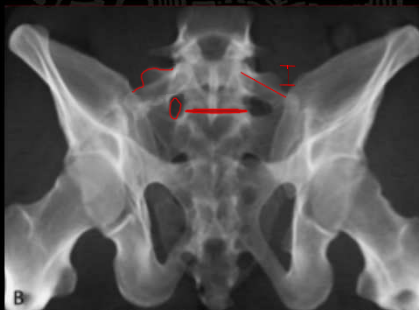


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### Background

- Qualitative Characteristics\*:

  - Sacrum NOT recessed in the pelvis
  - Presence of mamillary processes
  - An acute alar slope
  - A residual disc between S1/S2
  - Non-circular sacral foramina



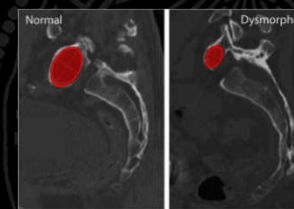
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### Background

- Quantitative Characteristics:

  - Narrower corridor
  - Increased angulation



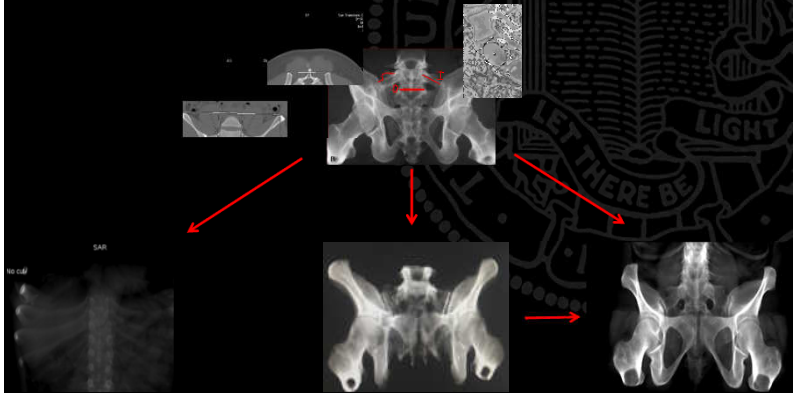
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### Hypothesis

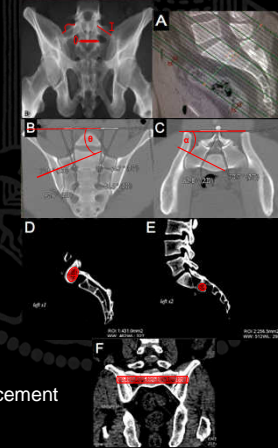
- Pelves can be quantitatively grouped by anatomic measurements.



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### Methods: 104 CT scans

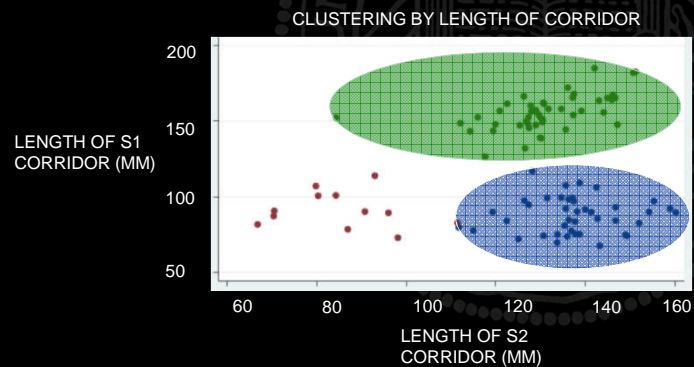
- Qualitative characteristics from outlets
- Quantitative characteristics from CT reformats:
  - Coronal and axial angulation of the safe corridor
  - Cross sectional area of the safe corridor
  - Length of safe osseous corridor for iliosacral screw placement



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### Results

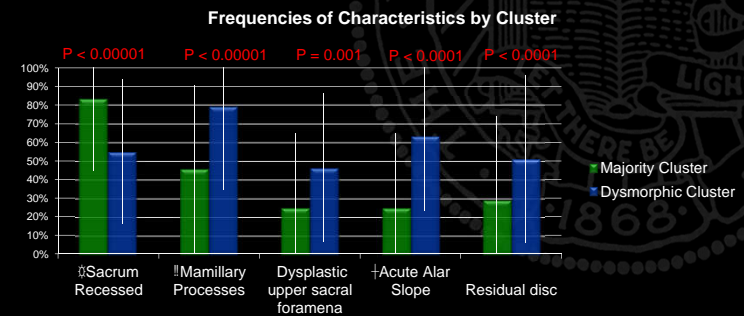
- Cluster analysis



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### Results

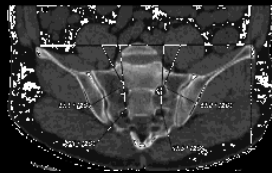
- Dysmorphic Cluster (41%)
- Significantly greater frequency of all 5 qualitative characteristics



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### Results

- Principal components Analysis (PCA):
- Main component: S1 coronal angulation, S1 axial angulation



• 74% correctly classified

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### Results

- Sacral Dysmorphism Score = (S1 coronal angle) + 2(S1 axial angle)

**Sacral Dysmorphism Score by Quintile of Cohort**

Quintile	% Trans-sacral	Min Score	Max Score
1	95%	1.8	18.0
2	80%	18.6	32.3
3	45%	34.3	43.3
4	15%	44.6	70.4
5	0%	72.2	116.5

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### Conclusions

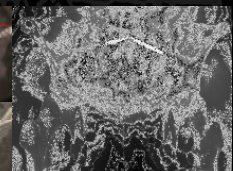
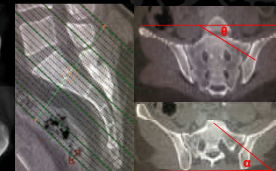
- Sacral Dysmorphism is best defined by a short safe S1 osseous corridor
- Dysmorphic pelvises DO have a higher incidence of the classic characteristics of dysmorphism on the outlet image.



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### Conclusions

- Pelves can be distributed along the spectrum of morphology best by measuring the coronal and axial angulation of the s1 osseous corridor.
- The Sacral Dysmorphism Score  $(\Theta + 2\alpha)$
- Predicts the absence of a safe long corridor, and can help plan safe ISS placement



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Orthopaedic Trauma Institute  
UCSF + SAN FRANCISCO GENERAL HOSPITAL

Thank You!

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