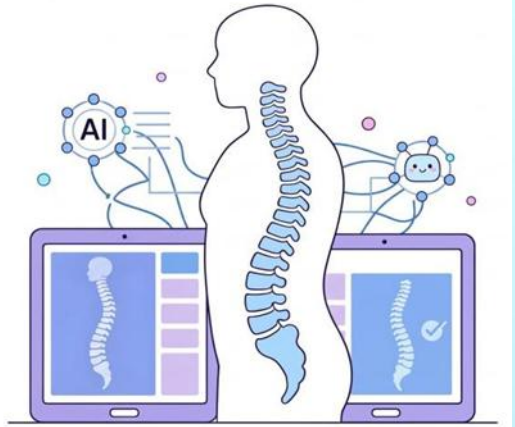
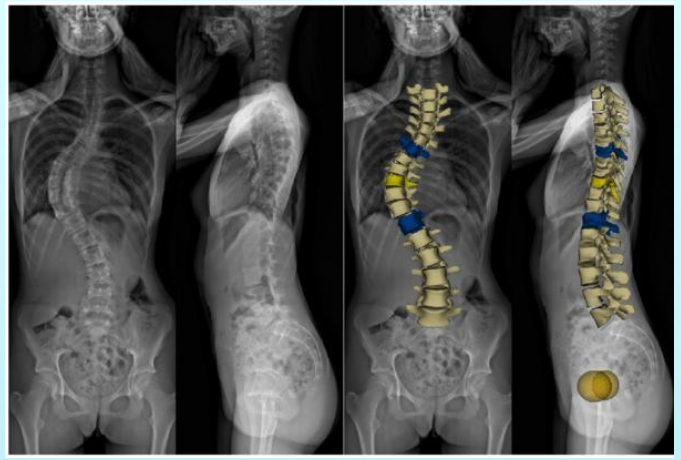


AI-derived Spine Alignment Scanning for Evaluation of Schroth-Based Three-Dimensional Postural Correction in Adolescent Idiopathic Scoliosis

Holly Leung King Ho

SPT, PWH

Background

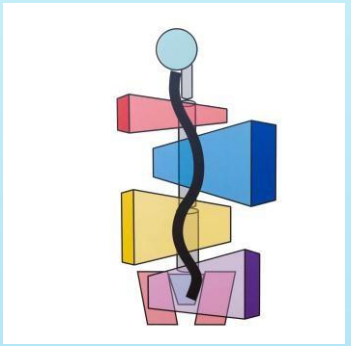


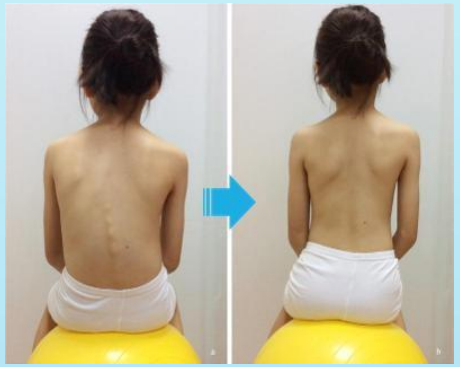
Adolescent idiopathic scoliosis (AIS)

- complex 3D spinal deformity
- often progress during growth

Conservative management

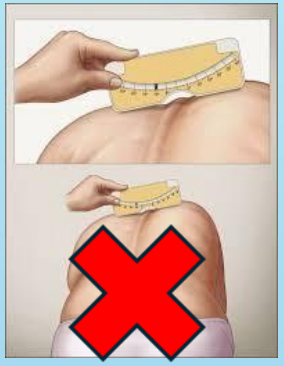
- aims to correct posture, stabilize curve progression, and enhance functional balance
- The **Schroth three-dimensional (3D) correction technique**
- validated physiotherapeutic scoliosis-specific exercise (PSSE)
- emphasizes on rotational angular breathing and targeted muscle activation to achieve spinal realignment





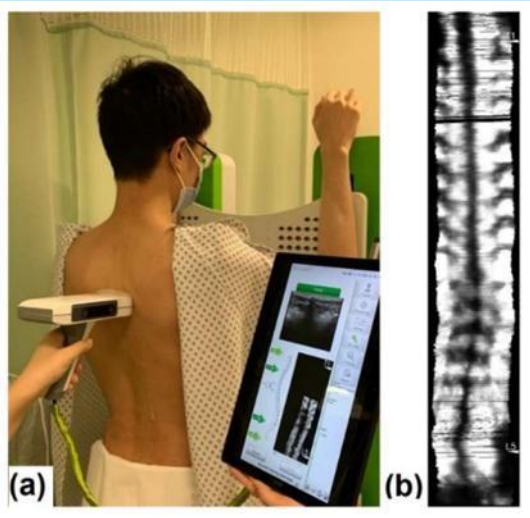
Current Challenges

- EOS Xray less frequent, not feasible for immediate feedback or to facilitate exercise compliance
- Clinical test by ATR not visualized by patient, insufficient to quantify the change from patient's aspect
- **Immediate biomechanical effects ?** inadequately quantified



Objectives of current study

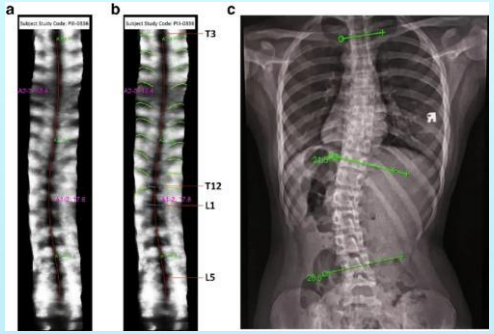
- To investigate the real-time effects of Schroth 3D correction technique on spinal alignment in AIS
- Imaging Technology - *Scolioscan*



AI-driven Scolioscan US imaging system

- **Instant** and **real-time**
- **AI-assisted**, generate curve angle and 3D spine image
- **Radiation-free** US imaging system
- **Dynamic** and **non-invasive** curve assessment

Ai generated 3D spinal imagine



AI generated curve angle compare to XR cobb angle

Dynamic and portable
Real-time result

Safe alternative to EOS
Enhance Patient safety
Real time feedback

Methodology

32 Participants

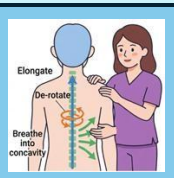
5 M; 27 F

Age 11-22

Baseline mean cobb angle (EOS)
27.59⁰ (SD 10.35⁰)

Intervention

Scolioscan Before



Schroth 3D Correction

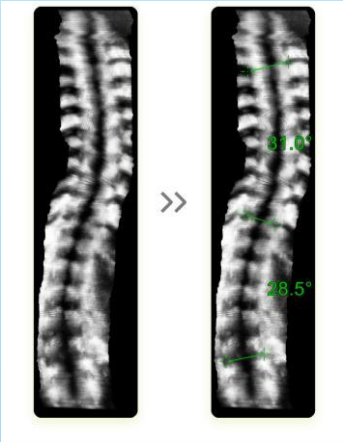
Scolioscan After

4 Therapist

Standardization of Treatment and assessment

Certified Schroth Therapist + **Qualified Scolioscan Operator**

Real-Time Feedback



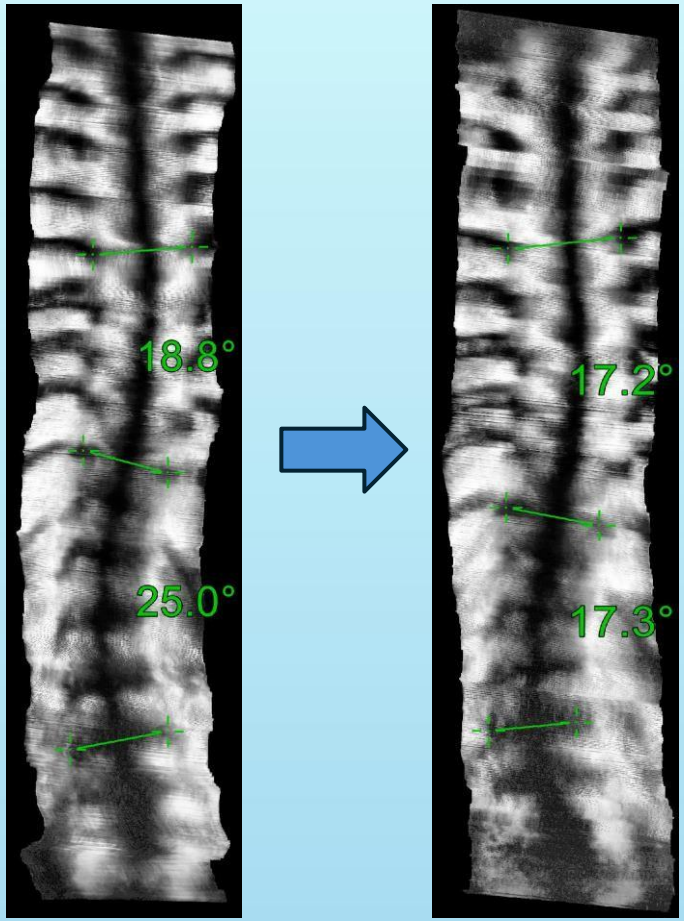
Primary Outcomes:
generated by AI-driven scolioscan
Scolioscan Angle
(pre & post changes)

↑Precision
↑Patient Engagement

Scolioscan Image

PRE

POST

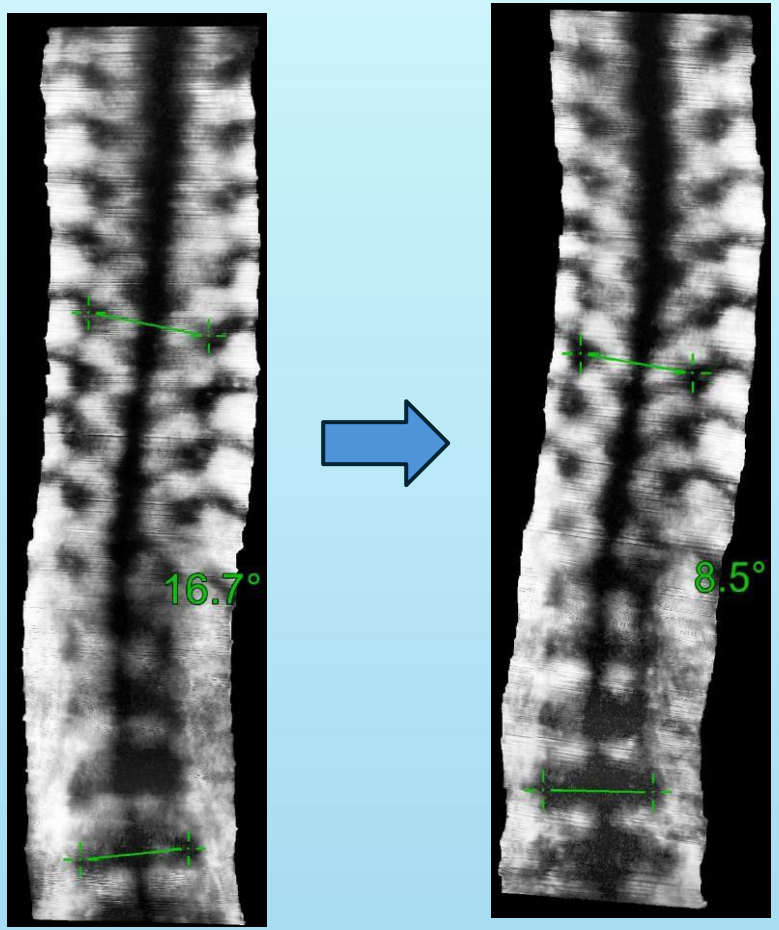


18.8⁰ → 17.2⁰

25.0⁰ → 17.3⁰

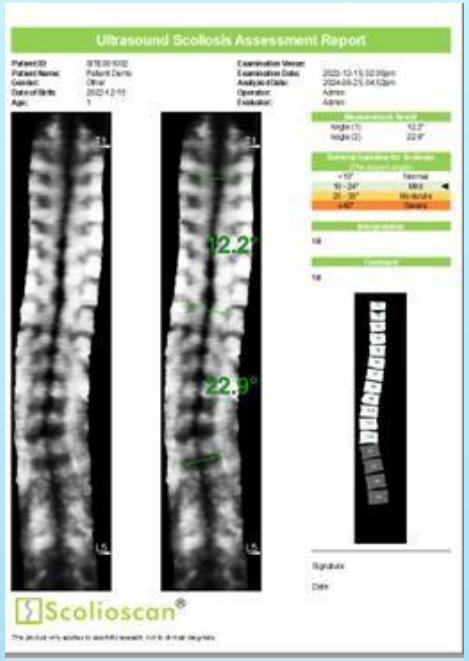
PRE

POST



16.7⁰ → 8.5⁰

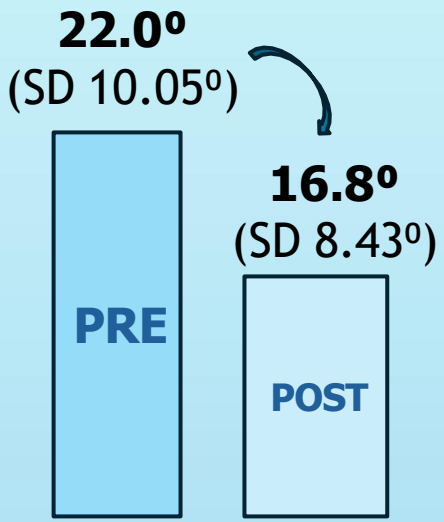
Report



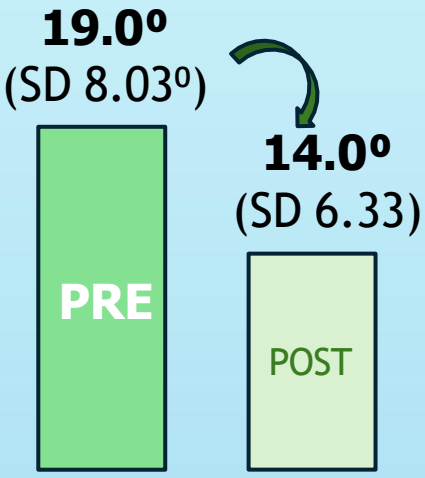
Results

Primary Outcomes:*generated by AI-driven scolioscan*
Scolioscan Angle (pre & post changes)

<Thoracic Scolioscan Angle Changes>



<Lumbar Scolioscan Angle Changes>



Statistical Significance Immediate Improvement by Schroth 3D postural correction technique

Mean Reduction 5.22º (p<0.001)

Mean Reduction 5.03º (p<0.001)

Conclusion

Schroth-Based 3D Postural Correction Technique

- Immediate alignment significant effectiveness

Immediate Alignment Effectiveness

AI-enhanced Scolioscan

- safe, objective dynamic tool

Safe & Objective Tool

Therapy Compliance

Integrating Scolioscan into PSSE practice

- optimizing therapeutic outcomes and precision
- Enhance therapy compliance

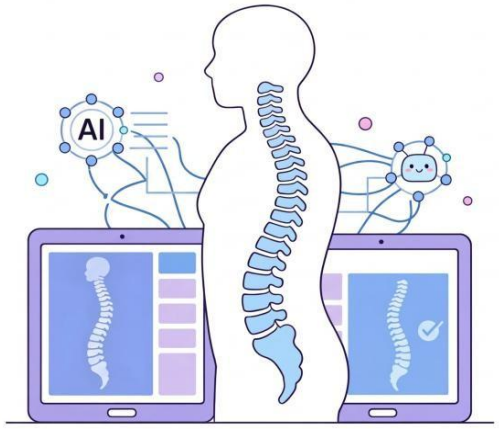
PSSE Integration

Future Direction

- Prospective long-term reassessment
  - **Sustainability** of self-directed postural correction and awareness

- **Empower Patient**
  - Adherence Independence through PSSE

- Promote **lasting functional benefits**
  - Promote carry-over effect on ADL for optimizing functions



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Reference

- Lai, K.K.-L.; Lee, T.T.-Y.; Lee, M.K.-S.; Hui, J.C.-H.; Zheng, Y.-P. Validation of Scolioscan Air-Portable Radiation-Free Three-Dimensional Ultrasound Imaging Assessment System for Scoliosis. Sensors 2021, 21, 2858.
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