Pulmonary Function Outcomes in Early-Onset Scoliosis (EOS) – Operative versus Non-operative Treatment

Charles E. Johnston, MD

Anna McClung BSN, RN

Scott Paradise

Disclosures

• Anna McClung BSN, RN	No Disclosures
• Charles E. Johnston, MD	a,e Medtronic; e, Elsevier
• Scott Paradise	No Disclosures

a) Grants/Research Support
b) Consultant
c) Stock/Shareholder
d) Speakers' Bureau
e) Other Financial Support

Background

- Recognized relationship between spine/chest deformity and pulmonary impairment in EOS
- However, little in the literature regarding correlation between radiographic measures and pulmonary outcomes
- We demonstrated correlation between thoracic height and width and CT lung volumes, however calculations based on x-ray parameters were too variable to replace the need for CT (IMAST, ICEOS-2010)
- Purpose of this study is to examine plane film parameters to PFT outcomes

Objective

- Compare pulmonary function tests (PFT) from EOS patients treated operatively those treated non-operatively, and correlate with anatomic indicators on x-ray

- Hypothesis: patients with less deformity and larger thorax have improved PFT values

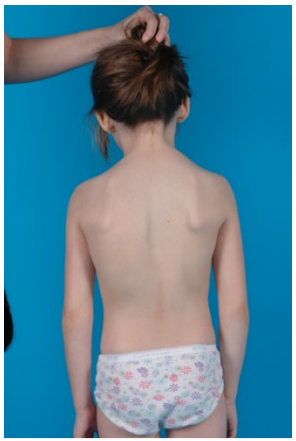
Methods

- IRB prospective single institution study
- All EOS patients with at least 2 serial PFTs from 2004 to present
- Neuromuscular patients excluded
- Radiographic parameters documenting thoracic deformity correlated to FVC and FEV1 absolute volumes (AV) and percentage predicted (%)

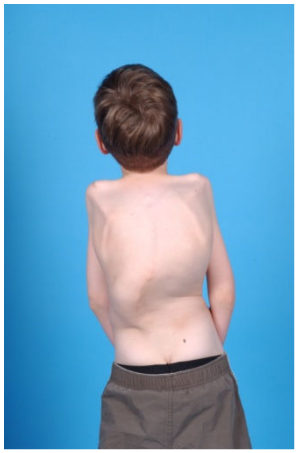
Clinical Results

- Non-operative (observation, cast, brace) = 25 with 65 PFTs
- Operative (growing construct) = 19 with 78 PFTs
  - 9 patients with both preoperative and postoperative PFTS
- Age at PFT (7.8±1.1yrs vs. 7.5±1.5yrs, p=0.34)

Non-op Brace Pt



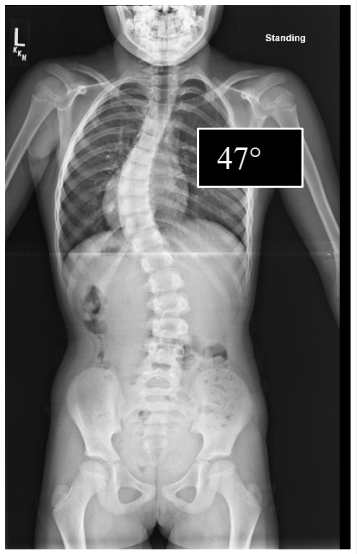
Preop G.R. Pt



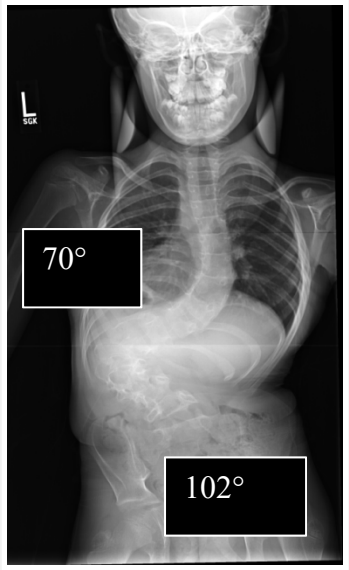
Radiographic Results

	Non-Operative	Operative	P-value
Major Cobb°	41.1±20.2	54.9±15.9	**.008**
Kyphosis°	37.8±14.6	53.8±19.4	**.003**
Thoracic Height cm	18.7±2.2	17.3±3.2	**.064**
MC End Vertebra	10.9±3.5	10.8±2.0	.927

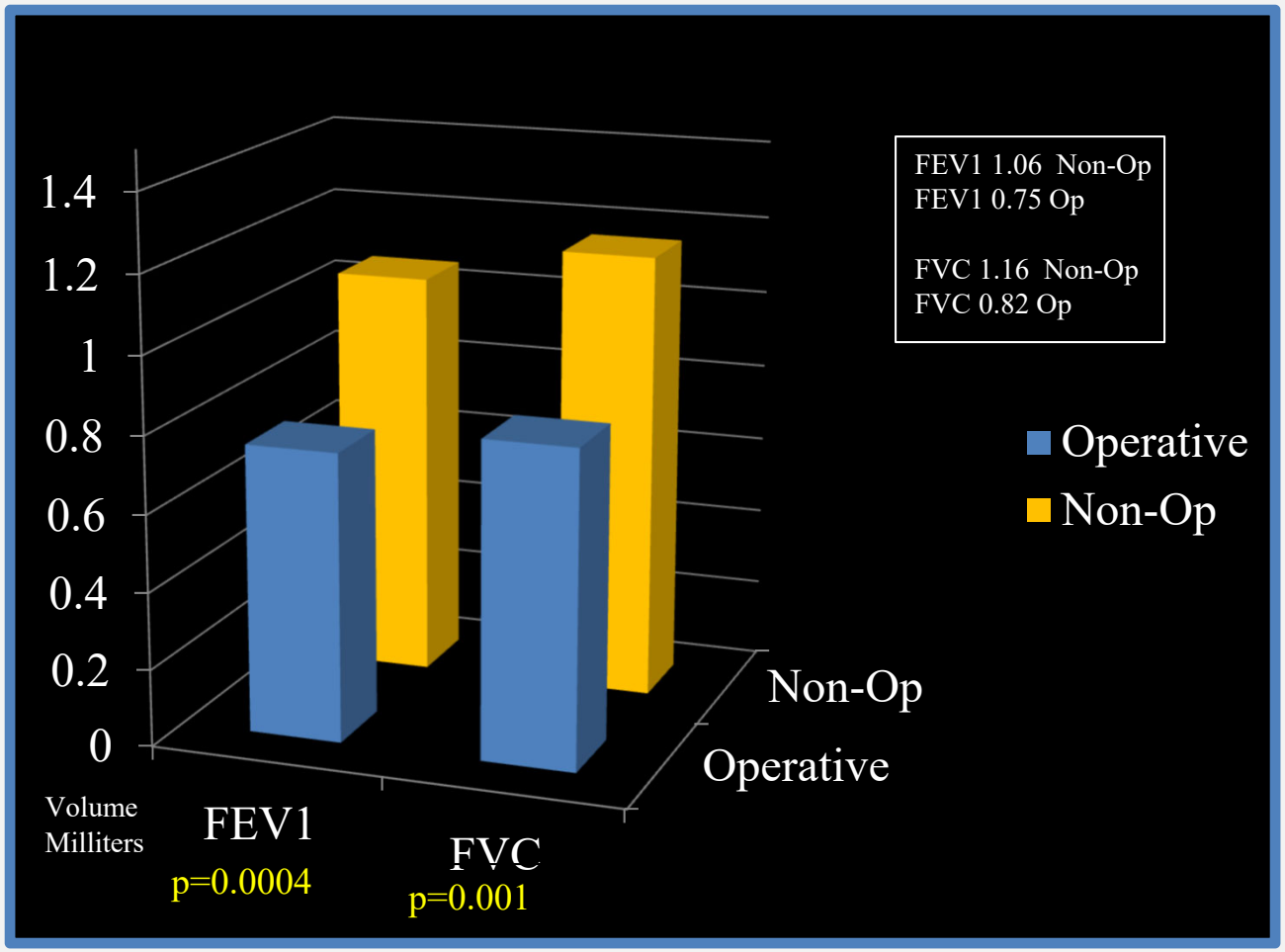
Non-op Brace Pt



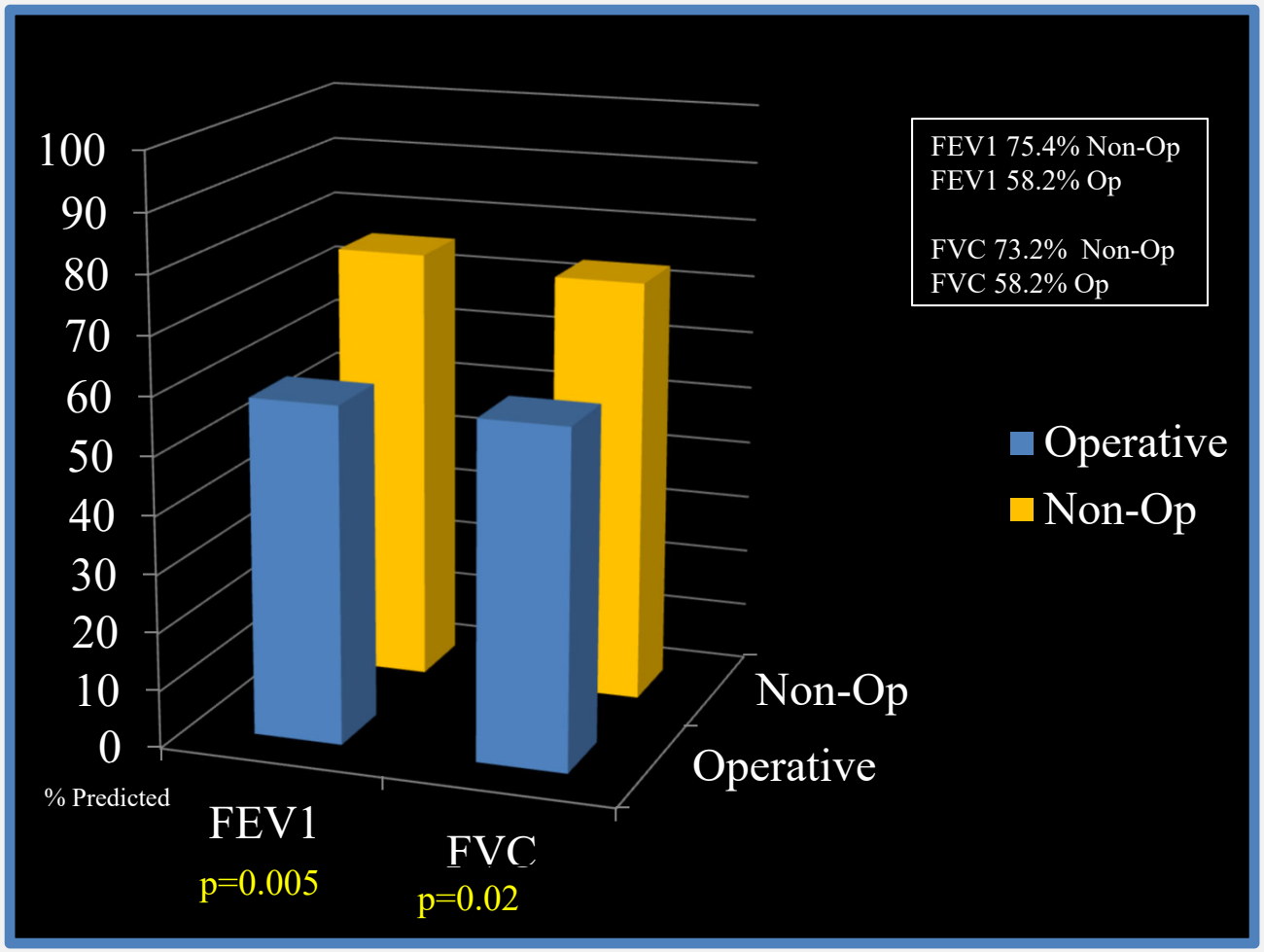
Preop G.R. Pt



PFT Absolute Volumes



PFT % Predicted



Non-Operative Correlations

- More distal end vertebra ($p=.01$, $R=0.47$) and gains in T6 width ($p<.009$, $R=0.56$) predicted better FEV1/FVC AV
- Gains in thoracic height ($p<.0002$, $R=69$) predicted better AV and % FEV1/FVC
- Increase in Cobb angle ($p<.02$, $R>50$) predicted no gain in AV and % FEV1/FVC

- No effect: Age, kyphosis and T6 depth

Operative Correlations

- Gain in thoracic height ($p<.003$, $R=.68$) predicted improved AV FEV1/FVC
- Gain in T6 width ($p<.02$, $R=43$) predicted improved AV and % FEV1/FVC

- No effect: Age, end vertebra, Cobb, kyphosis and T6 depth

Preoperative vs. Postoperative Correlations

- Increase in thoracic height and width at postop corresponded to improved AV FEV1/FVC ($p<.01$, $R>.77$)

- Loss of correction of major curve related to decrease in % predicted FEV1/FVC ($p=0.009$, $R>.65$)

Conclusions

- Patients with less severe EOS have better pulmonary function compared to their peers who require surgical intervention

- Significant relationships found between PFT outcomes in both groups and:
  - Major curve magnitude
  - Thoracic height
  - Thoracic width
- The above verifies the value of these parameters and confirms the study hypothesis

Significance

- In patients with growing constructs increasing chest diameters leads to improved absolute values on PFTs

- This is the first study to document that anatomic improvement leads to enhanced physiologic function