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Neural Axis Abnormalities in Early Onset Scoliosis Patients Can Be Detected With Limited MRI Sequences

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Background

- Neural axis abnormalities in 20-47% of EOS patients → routine spine MRI screening¹
- MRIs are expensive, lengthy, and often require general anesthesia



Background

Repeated exposure to general anesthesia may be associated with neurocognitive damage^{2,3}



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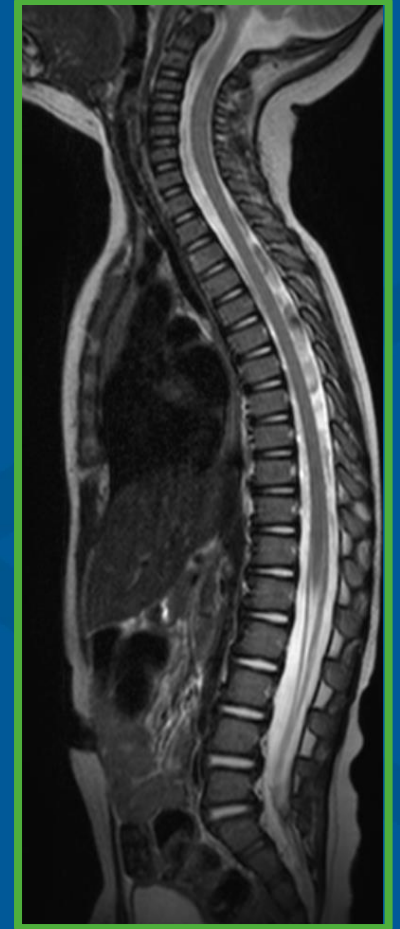
FDA review results in new warnings about using general anesthetics and sedation drugs in young children and pregnant women

Safety Announcement



Objective

To determine if neural axis abnormalities in EOS patients can be detected with limited spine MRI sequences



- Retrospective review
- Consecutive EOS patients with MRI of cervical, thoracic, and lumbar spine in 2017
- 50 EOS patients



Methods

- Individual sequences of previously reviewed MRIs were read by an attending pediatric neuroradiologist **blinded** to full report
- Findings compared to full MRI report



Results – Demographics

- Etiology:
 - 19 congenital
 - 19 idiopathic
 - 10 neuromuscular
 - 2 syndromic
- Age:
 - Mean: 6 years
 - Range: 9 months – 10 years
- 27 females, 23 males



Results

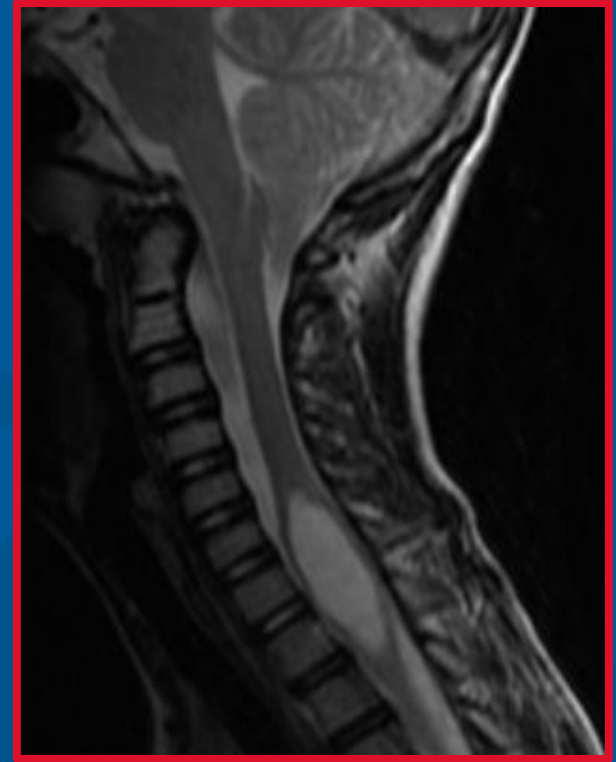
Sagittal T1 + Sagittal T2 images were 100% sensitive and specific for the detection of neural axis abnormalities



Results

- Full spine MRI (all sequences):
 - Mean duration: 66 minutes
 - General anesthesia in 62% of MRIs
 - Mean anesthesia duration: 90 minutes

- Limited sequence MRI (Sagittal T1+ T2)
 - Mean duration: 21 minutes
 - 68% shorter than full MRI ($p < .0001$)



Results :

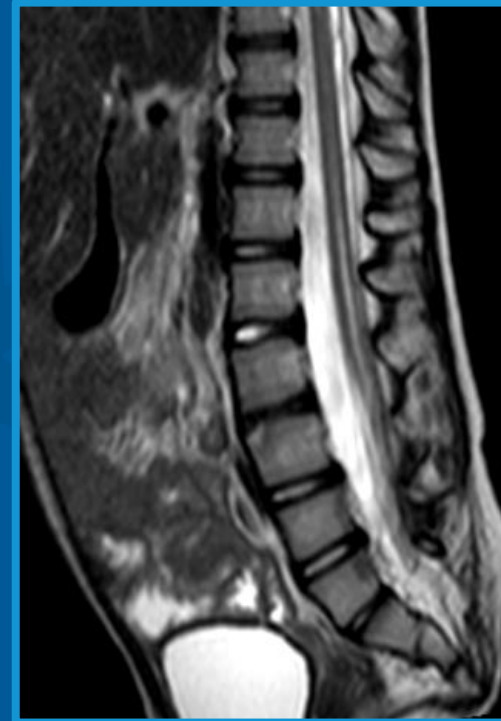
Neural Axis Abnormality Prevalence

10 patients (20%) neural axis abnormalities

Etiology	Prevalence (%)	N
Congenital	26%	5/19
Neuromuscular	20%	2/10
Idiopathic	16%	3/19
Syndromic	0%	0/2

Results – Neural Axis Abnormalities

- 4 fatty filum
- 2 low lying conus medullaris
- 2 syrinx
- 1 cerebellar tonsillar ectopia w/ syrinx
- 1 low lying conus medullaris w/ syrinx



Limited MRI vs Full Sequence MRI

Not detected on Limited MRI

- 11 segmentation anomalies
- 6 non-neural axis abnormalities
 - 3 kidney abnormalities
 - 1 pectus excavatum
 - 1 femoral head dislocation
 - 1 hepatic cyst



Conclusions

- Limited sequence MRIs with sagittal T1 + T2
 - 100% sensitivity and specificity for the detection of neural axis abnormalities
 - 68% reduction in MRI duration
 - Significant reduction in anesthesia time

References

1. Liu, Y.T., et al., *A retrospective study of congenital scoliosis and associated cardiac and intraspinal abnormalities in a Chinese population*. Eur Spine J, 2011. 20(12): p. 2111-4.
2. Bjur, K.A., et al., *Anesthetic-Related Neurotoxicity and Neuroimaging in Children: A Call for Conversation*. J Child Neurol, 2017. 32(6): p. 594-602.
3. Stratmann, G., et al., *Effect of general anesthesia in infancy on long-term recognition memory in humans and rats*. Neuropsychopharmacology, 2014. 39(10): p. 2275-87