Preoperative MRI In Patients With Adolescent Idiopathic Scoliosis

S Bandi, T Sethi, B Davis, V Jasani, J Trivedi, E Ahmed

Citation

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Abstract

Introduction: The literature supporting routine preoperative MRI scanning in patients with late onset idiopathic scoliosis is less certain. Our objective in this study is to evaluate the need for routine use of preoperative MRI in patients with adolescent idiopathic scoliosis

Methods: Retrospective study of patients' notes and MRI scans presenting with adolescent idiopathic scoliosis from 1999-2004.All patients were evaluated with MRI of brain and whole spine. Those with neural axis abnormalities on MRI were referred for a neurosurgical opinion

Results: Eight (20%) of the thirty- nine patients were found to have a neural axis abnormality on MRI. Four patients (10%) required neurosurgical intervention prior to scoliosis correction.

Discussion and Conclusion: Failure to identify neural axis abnormalities prior to surgical correction of scoliosis places the patient at risk of neurological complications.

We feel from our experience that MRI scanning is mandatory in the preoperative assessment for those being considered for surgery for adolescent idiopathic scoliosis.

INTRODUCTION

The value of magnetic resonance imaging (MRI) in the assessment of infantile or early onset scoliosis is now well established [1, 2]. Equally, thorough clinical examination is an essential part of the evaluation of patients with idiopathic scoliosis, as subtle signs such as abnormal abdominal reflexes are known to be suggestive of neural axis abnormalities [3, 4].

The literature supporting routine preoperative MRI scanning in patients with late onset idiopathic scoliosis is less certain, but based on Do's review of 327 patients with adolescent idiopathic scoliosis, the low incidence of abnormalities (2%) and lack of necessity for additional surgery in this series led to the conclusion that routine MRI scanning of these patients was unnecessary [5] whilst Hausmann et al advocated routine preoperative screening of such patients [6]. The prevalence of intraspinal pathology associated with scoliosis has been reported to be as high as 26% in some series [7].

Our objective in this study is to determine the incidence of neural axis abnormalities and the abnormalities which require neurosurgical intervention prior to scoliosis surgery in patients with adolescent idiopathic scoliosis without neurological findings on history and examination and to determine the need for the routine use of preoperative MRI in these patients.

PATIENTS AND METHODS

The notes and MRI scans of the patients who were diagnosed to have adolescent idiopathic scoliosis from 1999-2004 were retrospectively reviewed. A history was obtained to exclude other possible causes for scoliosis. A complete physical examination and review of systems, including a careful neurological examination was performed. The orthopaedic examination consisted of a complete evaluation of the back. The neurological examination consisted of motor, sensory, and reflex evaluation of upper and lower extremities and abdominal reflexes. The

examination was performed by trained and experienced spinal surgeons. All patients who had a negative clinical history (no radicular pain, altered sensations, or weakness in the back or lower extremities), a normal physical and neurological examination (without the findings of muscle atrophy, sensory or motor defecits, or reflex changes), and a typical adolescent idiopathic scoliosis curve pattern were included in the study. Patients with incomplete records of neurological examination were excluded. 39 patients fulfilled all requirements for participation in the study.

Anteroposterior and lateral radiographs of the entire spine were performed to evaluate the Cobb angle and to exclude vertebral anomalies.

Magnetic resonance imaging of the brain and the spinal cord was performed (Phillips Intera/Achieva 1.5 tesla unit coil with a dedicated posterior phased array cervicothoracolumbar spine coil) as part of their preoperative work-up for examination of neural axis abnormalities from skull to coccyx.

The appearance of the cord, the level of the conus medullaris, and the presence or absence of syringomyelia, diastematomyelia, or Arnold-Chiari malformations were evaluated on the magnetic resonance images by the trained and experienced Neuro and Musculoskeletal radiologists. Those with neural axis abnormalities on MRI were referred for a neurosurgical opinion. All these patients along with their MRI scans were examined by the trained and experienced neurosurgeons to decide the need for surgical intervention prior to scoliosis correction.

RESULTS

Eight (20.5%) of the thirty- nine patients were found to have neural axis abnormalities on MRI. This group included three patients with an Arnold-Chiari malformation, two with the Arnold-Chiari malformation associated with syrinx, one with diastematomyelia, one with a plexiform neurofibroma and one with an arachnoid cyst. Four out of the eight patients (10.2%) required neurosurgical intervention. Cranio cervical decompression was performed in one patient with Chiari malformation and two patients with Chiari malformations associated with syrinx. Excision of the spur was performed in the patient with diastematomyelia.

Figure 1

Abnormalities of Neural Axis	Number of patients with abnormalities
Arnold-Chiari Type-1 malformation	3 (7.69%)
Arnold-Chiari Type-1 malformation with Syrinx	2 (5.12%)
Diastomatomyelia	1 (2.56%)
Arachnoid cyst	1 (2.56%)
Plexiform Neurofibroma	1 (2.56%)

Male to female ratio was 3.3:1 (9 males and 30 females). Out of 9 males 2 had abnormalities on MRI and one of these required neurosurgical intervention. Out of 30 females 6 patients had abnormalities and 3 required intervention. Average age of the patients was 14 years (range 11 years to18 years) average cobb angle was 63° degrees (range 43 to104 degrees) Convexity was to the right side in 32 and to the left in 7 patients. Out of 32 right sided curves 7 had abnormalities and 3 required intervention and out of 7 left sided curves 1 had abnormality which required intervention.

Planned corrective surgery with spinal fusion and segmental instrumentation was performed in all the thirty nine patients. All of them, including the patients who underwent neurosurgical treatment preceding the scoliosis correction, tolerated the surgery well. There were no changes in the intraoperative somatosensory evoked potentials, monitored through out the operation on all patients and there were no perioperative complications.

DISCUSSION

MRI scanning being a relatively restricted resource, and as such, based on the above literature, we investigated whether the use of routine MRI scanning in our series of patients with idiopathic late onset scoliosis was justified. While all abnormal findings are of interest to the surgeon, clearly only those requiring additional surgery prior to scoliosis correction are indicative of the need for preoperative MRI scanning. Failure to identify such neural axis abnormalities prior to surgical correction of scoliosis places the patient at risk of neurological complications [8, 9].

Variable reports of prevalence of neural axis abnormalities associated with idiopathic scoliosis were found in literature along with recommendations, both in support and against for the routine use of preoperative MRI in these patients [10, 11, 12, 13, 14]. The results of the present study indicate a 20.5% prevalence of neural axis abnormalities in otherwise asymptomatic patients with Adolescent Idiopathic scoliosis. Because of the high prevalence of abnormalities detected on MRI and the fact that four of the eight patients with

abnormal findings required neurosurgical intervention, we recommend a total spine magnetic resonance imaging evaluation for all patients with adolescent idiopathic scoliosis preoperatively, even if the findings of neurological examination are normal.

CONCLUSION

We feel from our experience that MRI scanning is mandatory in the preoperative assessment for those being considered for surgery for adolescent idiopathic scoliosis not only because of the high prevalence of neural axis abnormalities but also because of the potential need for treatment. Clinical history and examination is essential but may not exclude abnormalities of the neural axis.

CORRESPONDENCE TO

Mr Surendra Bandi, C/o Secretary to Mr. EB Ahmed, Hartshill Orthopaedic and Surgical Unit, City General Hospital,Newcastle Road, Stoke-on-Trent,ST 4 6TA Tel (00 44) 7753 196776 E-mailsbandi9@gmail.com

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Author Information

Surendra Bandi, MS (Orthopaedics), MRCS
Department of Orthopaedics, University Hospital of North Staffordshire

Tapan D. Sethi, MRCS
Department of Orthopaedics, University Hospital of North Staffordshire

Ben J. Davis, MRCS
Department of Orthopaedics, University Hospital of North Staffordshire

Vinay Jasani, FRCS (Orth)
Department of Orthopaedics, University Hospital of North Staffordshire

Jayesh B. Trivedi, FRCS (Orth)
Robert Jones and Agnes Hunt Orthopaedic hospital

El-Nasri B. Ahmed, FRCS (Orth)
Department of Orthopaedics, University Hospital of North Staffordshire