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Impact of whole spine screening and role of radiologist in taking axial cuts at suspected tandam pathology while doing whole spine screening in the same setting

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Abstract
Purpose: Determines the prevalence of incidental findings (IF) which need attention or concurrent treatment i.e. meaningful coexisting spine lesion (MCSL) reported in the MRI's with spinogram. Determine role of radiologist in providing axial cut at same time in tandem lesions. Also determine what percentage of treating clinician order a spine MRI without a spinogram.
Methodology: It is a retrospective analytic study carried out at Department of spine surgery in our institution. Accumulation of data from two MRI centres (A and B) of city done from 1st Jan 2018 to 30thSeptember 2019.We blind the identity of all MRI centres as well as the referring clinicians. Of those clinician ordering only regional MRI were counted. MRI centre 'A' routinely providing us axial cuts of tandem pathologies of MCSL apart from dedicated area along with whole spine screening in same setting. All number of such reports counted and compared with reports of MRI centre 'B' who doing repeat MRI at tandem lesions when we advised only. All the MRIs reports segregate between MRIs with spinogram and only regional or area specific MRI study. Around 2000 MRI films were studied Statistical analysis of data carried out to determine the prevalence of incidental findings of coexisting spine lesion in MRI's spinogram. Data was analysed using chi square test to determine the correlation between the findings, P value <0.05 considered significant.
Results: Total 2000 MRI films were studied in which regional MRI were done in 445 (22.3%) and regional along with whole spine screening were done 1555(77.7%) patients .Around 6 out of 36 (15.7%) treating physician ordered only regional MRI investigations. Number of primary spine lesions seen in area specific MRI 708(45.5%) which were radiologically significant. MRIs with IF of meaningful coexisting spine lesions" (MCSL) 274 (17.6%). Area wise distribution of MCSL were, cervical spine 84(5.2%), thoracic spine24 (1.5%), lumbar spine 168(10.8%). There were 274(17.7%) MCSL lesions out of 1545 MRIs of whole spine group, which was significant (p<.05) compared to number of primer lesion i.e. 708, found in same group. Total number of patients who had done repeat MRI at tandem lesion were 154 of which centre 'A' performed 34(20%) and centre 'B' 122(79%) which was statically significant.
Conclusion: Whole spine MRI screening is useful for diagnosis of coexisting spinal diseases to avoid, missing of an asymptomatic but significant lesion. Considering the potential advantages in identifying significant IF and the minimal extra time spent to perform whole spine screening as well as taking axial cut at same time which save extra time and cost. Its application can be considered to be incorporated along with regional studies of spine. Role of radiologist cannot be neglected in taking axial cuts at Grade 3 and 4 MCSL at same time.

Keywords: Spinogram, incidental finding (IF), tandem stenosis, meaningful coexisting spine lesions (MCSL), axial cuts

Introduction
Symptomatic spinal disorders with radiculopathy and myelopathy often warrant a radiological investigation. MRI is the mainstay of investigation for these pathologies. Most of the time MRI was advised, of the area where the clinician is suspecting a problem overlooking the rest of spine. In the literatures [1, 2] it is reported that almost 8-26% of subsequent pathologies can be missed if the screening of the entire spine is not added along with the detailed study of the regional spine. Incidental finding of coexisting spine lesions can be asymptomatic but significant enough to cause a cord compression [3].

Also routinely we advise repeat MRI at the level of tandem lesion or at MCSL which were found in whole spine screening to plan surgical intervention levels, for which patient may requires to spend extra time and cost. So can we cut short this extra time and make it cost effective as well and make MRI reporting more productive in one go?

The aim of this study is to assess the advantages of incorporating sagittal screening of the whole spine and axil cut at tandem lesion of MSCL grade 3and 4 as needed by radiologist along with regional MRI study, for patients presenting with low back pain or neck pain.

Materials and Methods

It is a retrospective analytic study carried out at Institute at B.K.L Walawalkar medical college, Dervan, India. Collection of data i.e. MRI reports from MRI centres 'A' and 'B' of the chiplun city was done from 1st Jan 2018 to 30th September 2019. Any additional findings detected on the sagittal screening of the whole spine, which had clinical significance and would otherwise have been undiagnosed, were documented. A "primary spine lesion" was defined as one found on the initially dedicated area-specific MRI (Regional) where treating doctor suspect the pathology and a "coexisting spine lesion or incidental finding " was defined as a lesion found in the other areas through whole spine screening[3]. These verity of coexisting spine lesions was classified into four grades (0-3) according to the degree of spinal canal compression identified by sagittal imaging as shown in table 1. We used the modified criteria of Takahashi *et al*. [4] to grade the degree of spinal canal compression

Table 1: Grades of coexisting spine lesion depending on cord compression

Grade 0	No thecal sac compression (no coexisting lesion)
Grade 1	Minimal subarachnoid space compression
Grade 2	Mild cord compression (thecal sac compression < 50% in the lumbar area)
Grade 3	Moderate cord compression or cord signal change (thecal sac compression ≥ 50% in the lumbar area) Spinal tumour's or other structural lesions that needed to be treated or closely observed were classified as grade 3

Lesions of grade 2 and 3 coexisting on other spinal areas were defined as "Meaningful Coexisting Spine Lesions" (MCSL). Statistical analysis of data carried out to determine the prevalence of the incidental finding of coexisting spine lesion in MRI spinogram like haemangioma, tandem stenosis, fractures, cord myelopathy, tumours of vertebral body and spinal cord etc.

We blind the identity of all MRI centres as well as the referring clinicians. This study conformed to the widely accepted ethical principles that guide human-based research. We received approval for the study from the Institutional Ethics Committee. As this was a retrospective observational study that involves no additional risk to the patients. Data was analysed using chi square test to determine the correlation between the findings, P value <0.05 considered significant

Exclusion criteria

1. MRI suggestive of postoperative changes like laminectomy, inter-body fusion, instrumentation
2. MRI suggestive of congenital deformities of spine, hemi-vertebra, scoliosis, neural tube defects

Results

Total 2000 MRI films were studied in which regional MRI were done in 445(22.3%) and regional along with whole spine screening were done 1555(77.7%) patients. Number of primary spine lesions seen in area specific MRI 708(35.4%) which were radiologically significant. MRIs with IF of meaningful coexisting spine lesions" (MCSL) 274 (13.7%). Male to female Ratio 2.1:1, Mean Age was 48 yr old as shown in Table 2. MRIs with IF of meaningful coexisting spine lesions" (MCSL) mainly shows cervical cord edema in 20(7%) films, intra-Dural tumour in 2(0.12%), ossified posterior longitudinal ligament (OPLL) in 34(2.1%), tandem stenosis in 134(48.9%), C1-C2 instability in 2(0.12%), Os Odontoideum in 1(0.06%), infective pathology in 8(0.5%), Disc herniation in 54(19.7%), syrinx formation 2(0.12%), Arnold Chiari Malformation 1(0.06%),Vertebral fracture in 10(0.6%), Secondaries involvement of spine in 8(0.5%), haemangiomas in 3(0.15%) films as shown in Table 3.Area wise distribution of MCSL were, cervical spine 84(5.2%), thoracic spine 24(1.5%), lumbar spine 168(10.8%) as shown in table 4. There were 274(17.7%) MCSL lesions out of 1545 MRIs of whole spine group, which was significant (p<.05) compared to number of primer lesion i.e. 708, found in same group as shown in table 5. Around 6 out of 36 (15.7%) treating physician ordered only regional MRI investigations as shown in table 6 which was statically significant (p<0.5). Total number of patients who had done repeat MRI at tandem lesion were 154 of which centre 'A' performed 34(20%) and centre 'B' 122(79%) as shown in table 7 which was statically significant.

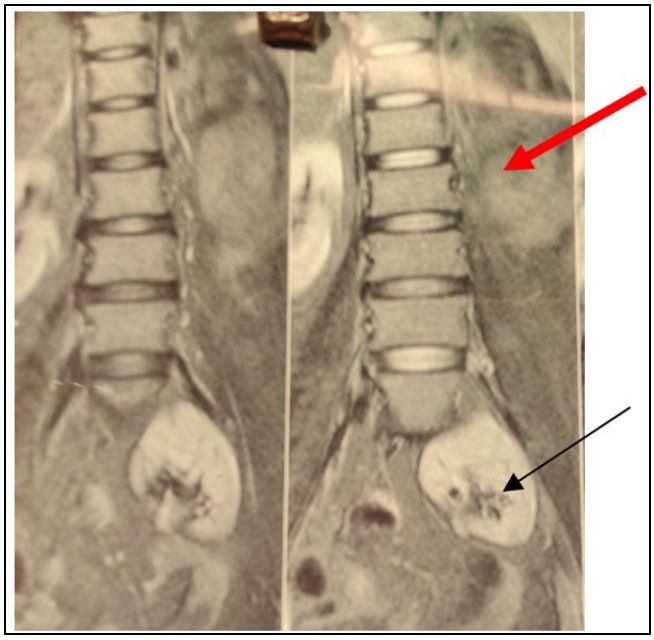

Fig 1: MRI coronal plane, left side Ectopic kidney in pelvis Black arrow while red arrow normal location of right kidney

Fig 2: MRI sagittal plane tandem stenosis and lysthesis at L5 S1, multiple disc herniation, also cervical cord edema

Table 2: Demographic data from MRI films

Parameter	Numerical value	
		Percentage
Dedicated Area specific MRI only	445/2000	22.25%
Dedicated Area + Spinogram (spinogram group)	1555/2000	77.75%
Total number MRI reports	2000	
Number of Primary spine lesion in area specific MRIs of spinogram group	708/1555	45.5%
MRIs with Incidental Finding of MCSL in screening area on spinogram	274/1555	17.6%
Age Group		
< 40 year	450/2000	22.5%
40-60 year	880/2000	44%
>60 year	670/2000	33.5%
Mean Age in year	48	
Male to female Ratio	2.1/1	
clinicians found to be ordering regional MRI study only	6/38	15.7%
Total number of repeated MRI at tandem lesions out of 1555	154/1555	9.9%

Table 3: Incidental finding of meaningful coexisting spine lesions grade 2 and 3 from 1555 MRI films

Spinal cord	Number		Vertebral body	Number	
Cord myelopathy	20	1.2%	Haemangioma	3	0.19%
Intradural tumor	2	0.12%	Ossified ligament OPLL	34	2.18%
Syrinx	2	0.12%	C1-C2 instability	2	0.12%
Arnold-Chiari malformation	1	0.06%	Secondaries involving spine (tumour)	8	0.5%
			Tandem stenosis	134	8.6%
Other Incidental finding			Disc herniation	54	3.4%
Lumbosacral Transitional Vertebra	184	11.8%	Vertebral fractures	10	0.6%
Renal cyst	4	0.25%	Infective pathology	8	0.5%
Ectopic kidney	1	0.06%	Os odontoideum	1	0.06%

Table 4: Anatomic distribution of incidental findings

Anatomical distribution of incidental findings of "Meaningful coexisting spine lesions" (mcsl) in spinogram					
Cervical area		Thoracic area		Lumbosacral area	
82	5.2%	24	1.5%	168	10.8%

Table 5: comparison between primary and coexistent spine lesion in whole spine screening group

Total number of MRI investigated of dedicated + whole spine screening	Primary spine lesion of MCSL in dedicated area specific MRI	Incidental finding of MCSL on spinogram in Non-dedicated area	P Value, significant <0.05 Chi-square test
1555	708	274	0.00001

Table 6: Comparison between doctors who advised whole spine MRIs and dedicated area MRIs

Total Number of Doctors Advised MRI	Number of Doctor Advised screening of whole spine	Number of Doctors who not advised screening of whole spine	P value, Significant <0.05 Chi-square test
38	32	6	0.0004

Table 7: Patient who done repeat MRI at centre 'A' and Centre 'B'

Total number of patient required repeat MRI	Number of repeated MRI by centre 'A'	Number of repeated MRI by centre 'B'	P value <0.05 significant
154	32	122	0.00001

Discussion

The discovery of incidental lesions has always been a part of clinical practice and it is worth noting that sometimes an incidental finding can prove even more important than the suspected condition The necessity of whole spine MRI has been advocated for the precise diagnosis and proper treatment of specific spinal diseases [7-9] However, its routine use for the diagnosis of degenerative spinal diseases is controversial and need clinical correlation with patient symptoms, as radiological finding may be worse compared to clinical finding. The dedicated area-specific MRI still being used popularly but has the possibility of missing these asymptomatic but meaningful coexisting lesions which need close fallow up in future In our study 15.7% of treating physician ordered regional MRI as investigation of choice. In Asian country like India there are multiple parallel medical systems like Homeopathy, Ayurveda, Allopathy, Unani medicine coexist and these number may be a just tip of iceberg needing further evaluation in whole country. When cervical and lumbar lesions coexist, the symptoms from one lesion might be masked by dominant symptoms from the other [12, 13].

Asymptomatic MCSL those do not need specific treatment, are also important because the patients might show delayed aggravation. Bednarik, *et al*. [14]. Reported that in 19.7% of the patients with asymptomatic spondylosis cervical cord compression seen by MRI scans, developed myelopathy within at least 2 years of follow-up. In our study 17.6% MCSL were found while screening the whole spine which were significant $p<0.05$ as shown in table 5.

Concurrent cervical and lumbar spinal stenosis was first described by Teng *et a*l. [15] in 1965, and the prevalence of coexisting cervical and lumbar lesions were reported ranging from 0.12% to 5% [12, 13]. In our study it was around 8.6%.

The prevalence of MCSL increased significantly in patients aged over 40 years compared with younger patients LaBan, *et al*. [16]. Reported that 94% of the patients with coexisting cervical and lumbar stenosis aged over 51 years. In our study average age was 48 year. Which shows incidental finding most common in older age group. Ligament ossification diseases such, DISH, OPLL or OLF showed significantly higher prevalence of coexistence in different Area of spine. Park *et al*. [17] reported a high prevalence of symptomatic thoracic ligament ossification in patients who underwent surgery for cervical OPLL (33.8%) and defined this phenomenon as tandem ossification. In our study OPLL were found to be 2.1%, its prevalence in cervical region 90% as compared to thoracic which was 10%.

Spinal cord neoplasms in the early stage usually present with nonspecific symptoms, including local pain and/or stiffness. These early symptoms mimic degenerative disease of the lumbar spine and are occasionally detected incidentally [18]. Screening of the whole spine during imaging of the lumbosacral spine can prove invaluable in this regard. Sagittal MRI sections of the entire spine may be rapidly visualized for the characterization of these lesions.in our study 0.6% of neoplasm found in whole screening group out which most common were Secondaries 0.5%.

Another incidental finding we observed was myelomalacia in the cervical spine. The onset of myelomalacia is usually so subtle that it is often overlooked. In our study 1.2% of cord myelopathy found in whole spine screening. According Ochiai H *et al*. [19] cervical cord compression patient can present with false localisation sign in the form of lower limb symptoms and truncal band like sensation which requires repeat investigation to rule out cervical cord compression so screening of whole spine can help us to rule out such lesion.

MRI centre 'A' routinely providing us axial cuts of tandem pathologies of MCSL apart from dedicated area along with whole spine screening in same setting as per our special demand and routine protocol discussed with him, as it is needed to plan surgery [20]. All number of such reports counted and compared with reports of MRI centre 'B' which repeat MRI at tandem lesions on demand only requiring reappointment with radiologist and extra cost. In our study total number of patient who did repeat MRI for tandem lesion were 154 of which 32(20%) were from centre 'A' and 122(79%) were from centre 'B'. Because of radiologist from centre 'A' already being aware regarding what we expect in MRI investigations which gives us advantage in view of less repetitions, cost effective and time saving as well, compared with those reported from centre 'B' required more repetitions as shown in table 7.

A limitation of our study was that the findings were not surgically confirmed. The positive findings were diagnosed through MRI only. Because most of the findings were benign, no active surgical intervention was mandated in the majority of these cases. But grade 3 and 4 MCSL cannot be neglected once we diagnosed it by screening of whole spine and before major insult to spinal cord occurs and axial section at these levels helps us to plan the surgery.

Conclusion

Early detection of incidental lesions provides surgeons with an opportunity to offer early intervention to these patients. Whole spine MRI screening is useful for diagnosis of coexisting spinal diseases to avoid, missing of an asymptomatic but significant lesion. Considering the potential advantages in identifying significant IF and the minimal extra time spent to perform whole spine screening, its application can be considered to be incorporated along with regional studies of spine. Role of radiologist cannot be neglected in taking axial cuts at Grade 3 and 4 MCSL.

Recommendation

MRI gives high prevalence of incidental finding in disc herniation as well as degenerative spine disease careful clinical correlation is mandatory when considering treatment option.

References

1. Kanna Kamal RM. The impact of routine whole spine MRI screening in the evaluation of spinal degenerative diseases. Eur Spine J. 2017; 26(8):1993-1998. DOI:10.1007/s00586-017-4944-7
2. Park JY, Chin DK, Kim KS, Cho YE. Thoracic ligament ossification in patients with cervical ossification of the posterior longitudinal ligaments: tandem ossification in the cervical and thoracic spine. Spine, 2008. DOI:10.1097/BRS.0b013e318175c276

3. Ho Han, Sang-Hyun Suh, Keun Su Kim. Types and Prevalence of Coexisting Spine Lesions on Whole Spine Sagittal MR Images in Surgical Degenerative Spinal Diseases, Yonsei medical journal, 2010. DOI:10.3349/ymj.2010.51.3.414
4. Takahashi M, Yamashita Y, Sakamoto Y, Kojima R. Chronic cervical cord compression: clinical significance of increased signal intensity on MR images. Radiology 1989; 173:219-24 DOI:10.1148/radiology.173.1.2781011
5. Akhilesh Rao, Atul Anand Mishra. Incorporation of Whole Spine Screening in Magnetic Resonance Imaging Protocols for Low Back Pain: A Valuable Addition, Asian spine journal, 2017. DOI:10.4184/asj.2017.11.5.700
6. Hee Jin Park, Jeon Y, Joon-Hee Jo. Incidental findings of the lumbar spine at MRI during herniated intervertebral disk disease evaluation. Published 2011 in AJR. American journal of roentgenology DOI:10.2214/AJR.10.5457
7. Siddiqui MA, Sartaj S. Role of Whole-Spine Screening Magnetic Resonance Imaging Using Short Tau Inversion Recovery of Fat Suppressed T2 Fast Spin Echo Sequences for Detecting Noncontiguous Multiple-Level Spinal Tuberculosis .Asian Spine J. 2018; 12(4):686-690. DOI:10.31616/asj.2018.12.4.686
8. Kaila R. The incidence of multiple level noncontiguous vertebral tuberculosis detected using whole spine MRI. J Spinal Disorder Tech. 2007; 20(1):78-81. DOI:10.1097/01.bsd.0000211250.82823.0f
9. Green Saifuddin RA. Whole spine MRI in the assessment of acute vertebral body trauma, Skeletal Radiology. 2004; 33(3):129-135. DOI:10.1007/s00256-003-0725-y
10. Takeuchi A, Miyamoto K, Hosoe H, Shimizu K. Thoracic paraplegia due to missed thoracic compressive lesions after lumbar spinal decompression surgery. Report of three cases. J Neurosurg. 2004; 100:71-4. DOI:10.3171/spi.2004.100.1.0071
11. Deem S, Shapiro HM, Marshall LF. Quadriplegia in a patient with cervical spondylosis after thoracolumbar surgery in the prone position. Anesthesiology. 1991; 75:527-8. DOI:10.1097/00000542-199109000-00022
12. Dagi TF, Tarkington MA, Leech JJ. Tandem lumbar and cervical. spinal stenosis. Natural history, prognostic indices, and results after surgical decompression. J Neurosurg. 1987; 66:842-9. DOI:10.3171/jns.1987.66.6.0842
13. Epstein NE, Epstein JA. Coexisting cervical and lumbar spinal stenosis: diagnosis and management. Neurosurgery. 1984; 15:489-96 DOI:10.1227/00006123-198410000-00003
14. Bednarik J, Kadanka Z *et al*. Presymptomatic spondylotic cervical cord compression .Spine (Phila Pa 1976) 2004; 29(20):2260-9. DOI:10.1097/01.brs.0000142434.02579.84
15. Teng P, Papatheodorou C. Combined Cervical and Lumbar Spondylosis. Arch Neurol. 1964; 10:298-307, DOI:10.1001/archneur.1964.00460150068007
16. LaBan MM, Green ML. Concurrent (tandem) cervical and lumbar spinal stenosis: a 10-yr review of 54 hospitalized patients. Am J Phys Med Rehabil. 2004; 83:187-90. DOI:10.1097/01.phm.0000113405.48879.45
17. Park JY, Chin DK, Kim KS, Cho YE. Thoracic ligament ossification in patients with cervical ossification of the posterior longitudinal ligaments: tandem ossification in the cervical and thoracic spine. Spine (Phila Pa 1976). 2008; 33:E407-10. DOI: 10.1097/BRS.0b013e318175c276
18. Chamberlain MC, Tredway TL. Adult primary intradural spinal cord tumour's: a review. Curr Neurol Neurosci Rep. 2011; 11:320-8. DOI:10.1007/s11910-011-0190-2
19. Ochiai H, Yamakawa Y. Clinical features of the localized girdle sensation of mid-trunk (false localizing sign) appeared in cervical compressive myelopathy patients. J Neurol. 2002; 249(5):549-53 DOI:10.1007/s004150200063
20. Daneal Felbaum R. Relief of Lumbar Symptoms after Cervical Decompression in Patients with Tandem Spinal Stenosis Presenting with Primarily Lumbar Pain, Cureus. 2016; 8(12):e940. Doi:10.7759/cureus.940