

Incidental findings on magnetic resonance imaging of lumbosacral spine in patients with back pain and/or radiculopathy

Received: 28/12/2016

Accepted: 30/4/2017

Araz Rafiq Abdullah*

Hayam Yousif Odish*

Haveen Azo Mohamedamin*

Abstract

Background and objective: An incidental lesion is an asymptomatic lesion found while examining a patient for an unrelated reason. Lumbar spine imaging may reveal either clinically insignificant spine incidental abnormalities and/or extra-spinal Incidental finding that, at times, may even explain the patient's symptoms. This study aimed to evaluate the frequency and types of incidental findings in lumbosacral magnetic resonance examination and to find the correlation between the frequency distribution of findings in terms of age and sex.

Methods: This cross-sectional study involved 1250 persons who were referred for lumbosacral spine magnetic resonance imaging because of low back pain and/or radiculopathy. The magnetic resonance images were viewed to evaluate the frequency of incidental findings which were divided into extra and intraspinal findings.

Results: Incidental findings were noted in 332 (26.6%) patients of the 1250 comprising 94 (28.3%) males and 238(71.7%) females. Some of them had more than one incidental finding. Cortical and para pelvic renal cysts were the most common extra spinal incidental findings, while vertebral hemangioma was the most common intraspinal incidental finding.

Conclusion: Incidental findings were common in magnetic resonance imaging examination of the lumbar spine, and most were clinically insignificant; however some of these findings may be more significant than the spinal problems being evaluated and can have a significant impact on patient management. Therefore, they should be included in the reports since they will give additional and valuable information.

Keywords: Incidental finding; Extraplinal; Intraspinal; Magnetic resonance imaging.

Introduction

Back pain is one of the most common health problems in developed countries.¹ Different imaging modalities have been used in patients with back pain and neurological disorders. Plain radiography and computed tomography (CT) have a serious burden of ionizing radiation for the patient in various doses.¹ Magnetic resonance imaging (MRI) provides multiplanar, non-ionizing imaging for both bone and soft tissues, and it has become the most validated and preferred imaging modality because it permits extra spinal evaluation.² An incidental lesion is an asymptomatic lesion found while examining a patient for an unrelated reason.³ Incidental findings at imaging are defined

as previously undetected abnormalities that are unexpectedly discovered and are unrelated to the purpose of the examination. Lumbar spine MRI may reveal either clinically insignificant spine incidental abnormalities and/or extra-spinal Incidental finding that, at times, may even explain the patient's symptoms.⁴ Lumbar MRI obtained for low back pain may reveal findings within any of the organ systems included in the field of view.⁵ The kidneys, uterus, ovaries in lumbosacral exams and of course lymph nodes may be visible in any of the spinal MRI exams.⁶ Most of these incidental findings are benign. Investigating benign findings may lead to unnecessary medical costs and anxiety in patients. However, extraspinal

* Department of Surgery, College of Medicine, Hawler Medical University, Erbil, Iraq.

malignancies are sometimes found incidentally on routine lumbar spine MRI and often overlooked in initial reports because the lesions are outside the region of the initial clinical interest.⁷ Careful observation of anatomic structures outside of the immediate region of interest creates opportunities for early detection of potentially life-threatening conditions such as malignancies and aneurysms.⁸ This study aimed to evaluate the frequency and types of incidental findings in lumbosacral MRI and to find the correlation between the frequency distribution of findings in terms of age and sex.

Methods

This cross-sectional study involving 1250 persons was conducted at the Radiology Department of Rizgary Teaching Hospital in Erbil, Kurdistan region of Iraq from January to December 2016. Patients referred for lumbosacral spine MRI because of low back pain and/or radiculopathy/regardless of age and sex were included in the study. Patients with a history of acute trauma and those with previously known malignancy were excluded from the study. MRI was performed using a 1.5 Tesla magnet unit (Siemens Avanto) and 1.5 Tesla magnet (Siemens AraeSingo) with 32 element design using spine matrix coil. The routine MRI protocol for the lumbar spine imaging in our hospital included the following MR sequences, sagittal plane: T1 weighted spin-echo (TR/TE, 650/11) and T2 weighted (2400/88), and the axial plane, T2 weighted turbo spin-echo (TR/TE, 4000/97) While the patient was in a supine position for sagittal imaging a field of view of 320 and slice thickness of 4 mm were used; for axial imaging, a field of view of 210-280 and slice thickness of 4 mm was used. The MR images viewed to evaluate the frequency of incidental findings, which were divided into extra and intraspinal. The extraspinal includes any findings in nearby organs, like any lesions related to kidneys, liver, spleen, adrenals, lymph nodes,

vessels, urinary bladder, prostate and pelvic organs of females. Intraspinal findings include vertebral hemangioma, perineuracyst, and lipoma of filum terminale. The association of incidental findings was evaluated with regards to age group and sex, and the proportion and percentage of each finding were studied. This study was approved by the institutional ethics review board. There was no requirement for informed patient consent. The patients' information including their age, gender, and the incidental findings were analyzed using the statistical package for the social sciences (version 19) from IBM Corp., Armonk, NY, USA and Microsoft Excel for Windows 8. A *P* value of ≤ 0.05 was considered as statistically significant.

Results

From the total of 1,250 patients, 349 (27.9%) were males, and 901 (72.1%) were females. The mean age of patients was 49.14 years (range 16 - 82 years). The incidental findings were noted in 332 (26.6%) patients of the total of which 94 (28.3%) were males and 238 (71.7%) were females. A total of 293 patients had one incidental finding, while 37 patients had two incidental findings and two patients had three incidental findings. A total of 373 incidental findings were found in 332 patients; 266 in females and 107 in males. A total of 242 (19.4%) were extraspinal incidental findings, and 131(10.5%) were intraspinal. Regarding the extraspinal incidental findings, cortical and parapelvic renal cysts were the most common incidental pathological findings (n= 90, 7.2%); five of these were more than 5 cm, and two were not simple. This was followed by ovarian cysts in female patients (n= 39, 3.1%); three of these were more than 5cm, and nine were complex cysts. Then nabothian cyst (n= 19, 1.5%) and uterine fibroid (n= 15, 1.2%). Incidental extraspinal congenital anomalies and anatomical variations were retro aortic left renal vein (RLRV),

retroverted uterus (in female patients), horseshoe kidney, renal rotational anomalies, and kidney agenesis. Few cases of liver cysts, gallstones were found with one case of liver mass (Table 1 and Figures 1-5).

Table 1: List of extraspinal incidental findings classified according to the organ/system involved

Organ/system Incidental Findings	Frequency N = 1250	Percent
Kidney		
Renal cyst	90	7.2
Hydronephrosis	12	1.0
Atrophied kidney	3	0.2
Small hypoplasticKidney	6	0.5
Horseshoe	3	0.2
Pelviureteric junction obstruction	3	0.2
Absent Kidney	2	0.2
Pelvic Kidney	1	0.1
Malrotated kidney	1	0.1
Female Reproductive System		
Ovarian cyst	39	3.1
Polycystic ovaries	3	0.2
Hydrosalpinx	1	0.1
Nabothian cyst	19	1.5
Retroverteduterus	9	0.7
Uterine fibroid	15	1.2
Thick endometrium	3	0.2
Adenomyosis	2	0.2
Liver and Gallbladder		
Liver cyst	9	0.7
Gall stone	2	0.2
Liver mass	1	0.1
Riedel liver lobe	1	0.1
Vascular		
Aortic aneurysm	2	0.2
Aortic dilation	1	0.1
RLRV	7	0.6
Pelvic fluid	1	0.1
Prostate (Enlarged)	1	0.1
Urinary bladder		
Thick wall	2	0.2
Diverticulum	1	0.1
Psoas muscle atrophy	2	0.2
Total	242	19.4

Regarding the intraspinal incidental findings, vertebral hemangioma was the most commonly reported ($n = 105$, 8.4%), followed by perineural cyst ($n = 25$, 2%) and one case of lipoma of filum terminale (Table 2). No significant correlation was observed between the patient's sex and

incidental findings ($P = 0.852$). However, a significant correlation was observed between the frequency distribution of incidental findings in terms of age group ($P = 0.034$), in which incidental findings were more common in older age group as provided in tables 3 and 4.

Table 2: The types, frequency, and percent of intraspinal incidental findings.

Intraspinal Incidental Findings	Frequency N = 1250	Percent
Perineural cyst	25	2.0
Vertebral Hemangioma	105	8.4
Lipoma of filum terminale	1	0.1
Total	131	10.5

Table 3: Incidence of incidental findings categorized by sex.

Sex	Any Incidental Findings				Total		P value
	No		Yes		No.	%	
	No.	%	No.	%			
Male	255	73.1	94	26.9	349	100.0	0.852
Female	663	73.6	238	26.4	901	100.0	
Total	918	73.4	332	26.6	1250	100.0	

Table 4: Incidence of incidental findings categorized by age.

Age group	Any Incidental Findings				Total		P value
	No		Yes		No.	%	
	No.	%	No.	%			
=<30	138	81.7	31	18.3	169	100.0	0.034
31-60	597	72.3	229	27.7	826	100.0	
61 and more	183	71.8	72	28.2	255	100.0	
Total	918	73.4	332	26.6	1250	100.0	

Discussion

Our study showed that extraspinal incidental findings were (242, 19.4 %) and intraspinal were (131, 10.5%). The rate of extraspinal incidental findings was nearly the same as the values reported by Tuncel et al. (19.8%)⁸ and Dilli et al. (19%).¹ Similar to other published reports, we observed that renal cyst made up the largest proportion of incidental findings (7.2%) which is the same result seen in a study done by Joori et al.⁶ Early recognition of hydronephrosis, symptomatic renal cysts are important in order to avoid a long-term risk of renal damage. The detection of hydronephrosis or atrophy of one kidney is essential in addressing potential health problem in the other kidney. Although the etiology of hydronephrosis may remain undefined on lumbar MRI images, its presence may guide the clinician to identify and treat the underlying cause before the permanent loss of the kidney function. An aortic aneurysm and dilation rate in our data was about 0.2% and 0.1% respectively. The abdominal aorta should be examined during routine lumbar MRI evaluations in older patients. An aortic aneurysm can cause complications that may be life-threatening.^{1,4,8} We had no case of the adrenal lesion. As the adrenals located at upper lumbar levels and more easily identified on the axial images, the axial images of our patients MRI were directed only towards the intervertebral discs, and as the degenerative changes are more at lower lumbar levels this might be the cause in which the adrenals were not captured in most of the patients. Two cases of psoas muscle atrophy were seen, weakness of the iliopsoas muscle secondary to neurogenic compromise of the L2-4 spinal roots has been described as a clinical feature of lumbar spinal stenosis. Degenerative disease of the hip also can be associated with a reduction of strength in the iliopsoas muscle. Because the psoas muscle attaches to the anterior portion of the transverse processes of all lumbar vertebra and intervertebral discs,

it can contribute to mechanical lumbopelvic-hip dysfunction and pain.¹⁰ A left renal vein passing behind the abdominal aorta is termed RLRV, and this anomaly is a relatively uncommon condition. Recent advances in computed tomography and MRI techniques make it possible to visualize the vascular structure in detail. RLRV anomalies, although usually overlooked, are not rare. However, only a few cases showing clinical symptoms with this anomaly have been reported. It is also of surgical importance when a left renal surgery is considered. Failure to recognize these anomalies may lead to severe renal damage. Compression of the RLRV between the aorta and the vertebra is known to be the cause of urological problems such as hematuria, varicocele, and ureteropelvic junction obstruction. RLRV is usually asymptomatic. It may sometimes cause hematuria, flank pain, and vascular dilations (varicocele).¹¹ Our study shows incidence of RLRV in 7 cases (0.6%), the incidence of RLRV has been reported from (0.5% to 3.6%).¹² Regarding intraspinal incidental findings, vertebral hemangioma was the most common finding in our study, reported in 105 patients (8.4%), in a study conducted by Sobhan et al, the frequency of vertebral hemangioma was 9.5%.⁹ Vertebral hemangiomas are benign vascular tumors that have been shown in 11% of spines at autopsy; despite their common occurrence and usually benign course, they occasionally produce spinal cord compression. Less than 1% of vertebral hemangiomas produce symptoms owing to collapse (pathologic fracture or cord compression).³ Perineural cysts are cysts arise from the spinal nerve root or dorsal root ganglion. They have a meningeal lining and contain CSF that is in variable communication with CSF of the thecal sac, and nerve rootlets and ganglion cells lie in the cyst or within the cyst wall.¹³ These cysts are asymptomatic in most people. When these cysts develop they start to exert pressure on the adjacent

nerve fibers and causes symptoms such as pain, weakness and sensory dysfunction.⁹ According to the literature, the frequency of these cysts is reported 1-5 %.⁹ Perineural cysts prevalence in our study was reported in 25 patients (2.0%), same as result of Park et al. in which the incidence was 2.1%.³ Fat within the filum terminale is frequently seen on routine magnetic resonance imaging of the lumbosacral spine, with a prevalence of 1-5%. Al-Omari et al. study prevalence was 3.2%.¹⁴ We had

one case of lipoma of filum terminale (0.1%); it is not clear why our results do not match theirs. The difference may be due to lack of T1 axial images and fat saturation sequences in our lumbosacral spine MRI protocol. There was a significant relation of the prevalence of incidental findings in the older age group in which incidental findings were higher in older age group, and this could be due to increasing incidence of diseases with increasing age as noticed by Jooriet al⁶ and Sobhan M.⁹



Figure 1: Axial T2 weighted image demonstrates the fusion of the kidneys at the midline, consistent with a horseshoe kidney.



Figure 2: Axial T2 weighted image demonstrates dilated right renal pelvis, consistent with Pelviureteric junction obstruction.

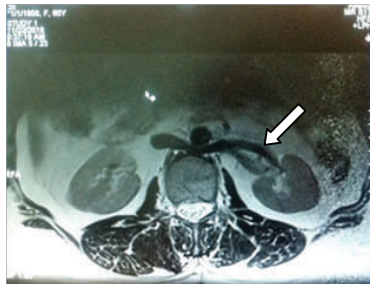


Figure 3: Axial T2 shows left renal vein coursing posterior to the aorta, consistent



Figure 4: Sagittal T1 shows hyperintense lesion within the filum terminale, consistent with the typical appearance of lipoma of filum terminale.

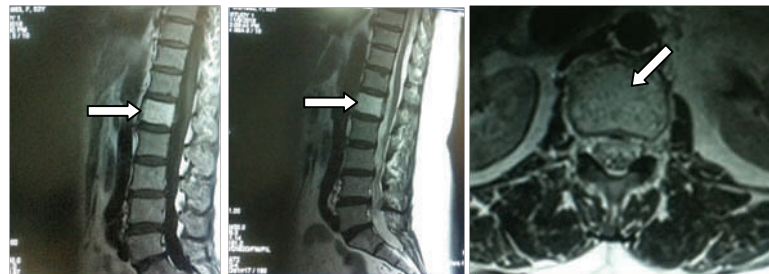


Figure 5: A.T1 and B.T2-weighted sagittal images, with C. axial T2 show a typical appearance of hemangioma of increased signal intensity replacing the entire L1 vertebral body. Coarse vertically oriented trabeculae are present.

Conclusion

Incidental findings were common in MRI examination of the lumbar spine, and most were clinically insignificant; however, some of these findings may be more significant than the spinal problems being evaluated and can have a significant impact on patient management. Therefore, they should be included in the reports since they will give additional and valuable information.

Competing interests

The authors declare that they have no competing interests.

References

- Dilli A, Ayaz UY, Turanl S, Saltas H, Karabacak OR, Damar C, et al. Incidental extraspinal findings on magnetic resonance imaging of intervertebral discs. *Arch Med Sci* 2014; 10:757–63.
- Golding SJ. Radiation Exposure in CT: What Is the Professionally Responsible Approach? *Radiology* 2010; 255(3):683–6.
- Park HJ, Jeon YH, Rho MH, Lee EJ, Park NH, Park SI, et al. Incidental findings of the lumbar spine at MRI during herniated intervertebral disk disease evaluation. *Am J Roentgenol* 2011; 196(5):1151–5.
- Quattrocchi CC, Giona A, Di Martino AC, Errante Y, Scarciolla L, Mallio CA, et al. Extra-spinal incidental findings at lumbar spine MRI in the general population: a large cohort study. *Insights Imaging* 2013; 4(3):301–8.
- Gebara NV, Meltzer DE. Extraspinal findings on lumbar spine MR imaging. *J Radiol Case Rep* 2009; 3(8):5–13.
- Joori SM, Albeer MR, Baldawi DS. Extraspinal incidental findings of spinal MRI. *J Fac Med Baghdad* 2013; 55(3):219–23.
- Fu CJ, Chen HW, Wu CT, Chen LH, Wong YC, Wang LJ, et al. Extraspinal Malignancies Found Incidentally on Lumbar Spine MRI: Prevalence and Etiologies. *J Radiol Sci* 2013; 38(3):85–91.
- Tuncel SA, Çağlı B, Tekataş A, Kırıcı MY, Ünlü E, Gençhellaç H. Extraspinal Incidental Findings on Routine MRI of Lumbar Spine: Prevalence and Reporting Rates in 1278 Patients. *Korean J Radiol* 2015; 16(4):866–73.
- Sobhan M, Samiee M, Asgari Y, Ahmadi M. Incidental Findings of the Lumbar Spine at MRI in Patients Diagnosed with Discopathy. *Int J Med Imaging* 2016; 4(5):44–7.
- Tucker J. The Psoas and Iliacus: Functional Testing; 2009. (Accessed December 14, 2016, at: drjeffreytucker.com/2009/09/the-psoas-and-iliacus-functional-testing).
- Nam JK, Park SW, Lee SD, Chung MK. The clinical significance of a retroaortic left renal vein. *Korean J Urol* 2010; 51(4):276–80.
- Hsieh CL, Tiao WM, Chou YH, Tiu CM. Retroaortic left renal vein: Three case reports. *J Med Ultrasound* 2012; 20(2):115–8.
- Maher CO, Piatt JH, Ragheb J, Aldana PR, Gruber DP, Jea AH, et al. Incidental findings on brain and spine imaging in children. *Pediatrics* 2015; 135(4):1084–96.
- Al-Omari MM, Eloqayli HM, Qudseih HM, Al-Shinag MK. Isolated lipoma of filum terminale in adults: MRI findings and clinical correlation. *J Med Imaging Radiat Oncol* 2011; 55(3):286–90.