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RESEARCH ARTICLE

Incidental Lumbar Spinal Magnetic Resonance Imaging Findings of Patients with a Prediagnosis of Degenerative Spinal Disease

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ABSTRACT

Objective: Spinal incidental lesions include incidentally detected findings from spinal imaging which is related to the vertebral column or spinal components but are not related to the disease that is being investigated. In this study, we report the incidental findings detected in lumbar spinal. Magnetic resonance imaging (MRI) examinations performed on patients with a prediagnosis of degenerative spinal disease. In addition, the frequency and clinical importance of these incidental findings are discussed.

Materials and Methods: The lumbar spinal MRI results for 293 cases were retrospectively examined. The age, gender, clinical findings, symptoms, radiological images, and presence/absence of neurosurgical pathology that required surgery, and incidentally, detected findings were examined.

Results: About 65.20% (n=191) of 293 cases were female and 34.80% (n=102) were male. The median age was 57 years (minimum=2 years: maximum=88 years). It was determined that the median age level was higher for patients with incidental findings (p=0.011). A positive correlation was found between the age of the patient and the number of incidental findings (rs=0.17; p=0.005).

Conclusion: Incidental spinal findings are frequently detected with radiological imagings that are widely used today.

Keywords: Disk herniation, imaging, incidental, lumbar, pathology, spinal

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INTRODUCTION

Lesions that are detected incidentally during radiological examinations without the presence of clinical signs or symptoms are known as incidental lesions. Incidental lesions can be temporary, permanent, or sometimes pathological. Spinal incidental lesions include incidentally detected findings in spinal imaging results which are related to the vertebral column or spinal components but are not related to the disease that is being investigated. Magnetic resonance imaging (MRI) of the spine can be performed for the cervical, thoracic, or lumbar spinal regions according to the complaints and neurological findings of the patients, and many incidental findings, such as hemangiomas, fibrolipomas, Tarlov cysts, arachnoid cysts, or synovial cysts, can be detected in these spinal images.[1–3]

With the widespread use of PACSs (picture archiving and communication systems), soft-copy images, viewed on a computer, are now frequently used instead of the traditional hard-copy images.[2] In traditional hard copies, the image is usually cropped so that the relevant region is left on the examination area. With the advent of PACS, however, more incidental findings are now diagnosed due to the use of a larger number of images and uncropped images.[2,4]

In this study, the incidental findings detected in lumbar spinal MRI examinations performed on patients with a prediagnosis

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of degenerative spinal disease are examined. In addition, the frequency and clinical importance of these incidental findings are discussed.

MATERIALS and METHODS

In this study, 293 patients admitted to the Neurosurgery Outpatient Clinic between April 1, 2022, and October 1, 2022, that underwent lumbar spinal MRI with a preliminary diagnosis of spinal degenerative disease were retrospectively examined. Patients with pathologies such as tumors or trauma were excluded from the study.

The MRI device used for the images had a 1.5 Tesla scanner and 4-channel spinal matrix coils (Signa 1.5T MRI Scanner/ Ge Healthcare). Considering the scanning parameters, axial T2-weighted, sagittal T1-weighted, and sagittal T2-weighted images were taken with a cross-sectional interval of 5 mm.

The age, gender, clinical findings, symptoms, radiological images, need for surgery, and the incidental findings detected in MRI were examined. The MRI examinations were evaluated by all the radiologists and neurosurgeons conducting the study.

Approval for this study was received from the Ethics Committee of Kanuni Sultan Süleyman Training and Research Hospital.

Statistical Analysis

The conformity of the age variable to normal distribution was determined by Shapiro-Wilk test. Since age did not correspond to normal distribution, it was reported with the number of incidental findings and the median (minimum: maximum) values. The Mann–Whitney U-Test was used for the comparison of the number of incidental findings between two groups, and the Kruskal–Wallis Test was used in the comparisons made according to the radicular pain that was observed. The Chi-square test was used for the comparisons, in which the rates of incidental findings were compared between groups. The relationship between age and incidental findings was examined by correlation analysis, and Spearman's correlation coefficient was calculated. The analysis was performed using SPSS software (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.), and the significance level was taken as α=0.05 in the analysis.

RESULTS

Of the 293 cases included in the study 65.20% (n=191) were female and 34.80% (n=102) were male. The rate of patients with incidental findings was 57.60% (n=110) among the female patients and 42.40% (n=81) among the male patients and the prevalence of incidental findings between genders was not significantly different (p=0.445). The median number of incidental findings was 1 (minimum=0: maximum=3) in both females and males. The number of incidental findings did not differ according to gender (p=0.251).

The median age of the cases included in the study was 57 years (minimum=2 years: maximum=88 years). The median age was found to be higher in patients with incidental findings (p=0.011): in the group with incidental findings, the median age was 60 years (minimum=15 years; maximum=88 years), while in the group without incidental findings, the median age was 54 years (minimum=2 years; maximum=83 years). A significant positive correlation was found between the age of the patient and the number of incidental findings (rs=0.17; p=0.005). It was observed that the number of incidental findings increased with increasing age. The relationships between the demographic characteristics, incidence of incidental findings, and the number of incidental findings are shown in Table 1.

The complaints of the patients were grouped into mechanical complaints such as low back pain, radicular pain spreading to the legs, and neuropathic complaints. Extruded/sequestered disc hernia, lumbar stenosis, or spondylolisthesis that may require surgery and incidental findings, such as hemangiomas, Tarlov cysts, perineural cysts, synovial cysts, Modic changes, sclerotic bone lesions, and Schmorl's nodes were detected in the lumbar spinal MRIs of the patients (Fig. 1 and Table 2).

According to MRI findings, 51.50% (n=151) of the cases included a pathology that may require surgery, and 48.50% (n=142) of the patients had no surgical pathologies. The rate of patients with incidental findings in the group of patients with pathologies that may require surgery was 58.90% (n=89). The rate of patients with incidental findings in the group that had no surgical pathologies was 41.10% (n=62). The rate of incidental findings was not significantly different between the two groups (p=0.291). The median number of incidental findings was 1 (minimum=0; maximum=3) in both groups. The number of incidental findings did not differ between the two groups (p=0.557) (Table 3).

Neurological deficits were present in 9.60% (n=28) of the cases included in the study, and 90.40% (n=265) of the cases showed no neurological deficits. The rate of patients with incidental findings in the group of patients with neurological deficits was 75% (n=21), while the rate of patients with incidental findings was 54% (n=143) in the group without neurological deficits. The rate of incidental findings was found to be higher among patients with neurological deficits than those without (p=0.033). The median number of incidental findings was 1 (minimum=0; maximum=2) in patients with neurological deficits and 1 (minimum=0; maximum=3) in patients without neu-

Table 1. Incidence of incidental findings and the relationship between the number of incidental findings and demographical properties

	Total (n=293)		Incidental finding				The number of incidental findings
			Present (n=164)		None (n=129)		
	n	%	n	%	n	%	
Gender							
Female	191	65.20	110	67.07	81	62.79	1 (0:3)
Male	102	34.80	54	32.93	48	37.21	1 (0:3)
p				0.445[a]			0.251[b]
Age (year)	57 (2:88)		60 (15:88)		54 (2:83)		r^s=0.17
p				**0.011[b]**			**0.005**

Date is reported as n % and median (minimum: maximum). [a]: Chi-square test; [b]: Mann–Whitney U Test; r^s: Spearman correlation coefficient

rological deficits. The number of incidental findings did not differ between the two groups p=0.141) (Table 3).

Radicular pain was present in 65.50% (n=192) of the cases included in the study, mechanical complaints were present in 28.30% (n=83) of cases, and neuropathic complaints were present in 6.10% (n=18) of cases. Incidental findings were observed in 60.40% (n=116) of patients with radicular pain, 51.80% (n=43) of patients with mechanical complaints, and 33.30% (n=6) of patients with neuropathic complaints. The prevalence of incidental findings did not differ between patient groups (p=0.063). The median number of incidental findings was 1 (minimum=0; maximum=3) in patients with radicular pain, 1 (minimum=0; maximum=2) in patients with mechanical complaints, and 0 (minimum=0; maximum=2) in patients with neuropathic complaints. There was no difference between the groups in terms of the number of incidental findings (p=0.050) (Table 3).

Table 2. The incidental findings detected in 293 cases and the number of the incidental findings

Incidental finding	n	%
Hemangioma	126	68.10
Modic Type 1 Changes	4	2.16
Modic Type 2 Changes	12	6.48
Modic Type 3 Changes	2	1.08
Schmorl's Node	21	11.35
Tarlov Cyst	11	5.94
Fibrolipoma	2	1.08
Sclerotic lesion	2	1.08
Syrinx	1	0.54
Perineural cyst	2	1.08
Synovial cyst	2	1.08
Total	185	100

DISCUSSION

Incidental lesions are incidentally diagnosed lesions that are not related to the main pathology detected in the radiological examinations of the patient and are sometimes more important than the main pathology.[2] Malignancies may also be diagnosed incidentally, although the most common incidental findings are benign lesions, such as vertebral hemangiomas, Tarlov cysts, perineural cysts, or fibrolipomas.[1]

Vertebral hemangiomas are common incidental MRI findings. According to the study by Huvos,[5] the incidence of vertebral hemangiomas is 11%. Vertebral hemangiomas can be classified as typical, atypical, or aggressive.[6] Typical vertebral hemangiomas with trabeculae in tomography sections have a hyperintense appearance on T1- and T2-weighted MRI images.[6,7] Vertebral hemangiomas are rarely symptomatic, but pain is the most common symptom of vertebral hemangiomas.[6,8] Atypical vertebral hemangiomas with more vascular content tend to be hypointense on T1-weighted images, hyperintense on T2-weighted images, and contrasted with enhancement. Aggressive vertebral hemangiomas can cause spinal canal compression with extraosseous enlargement and may be confused with malignancy.[6,8] In this study, vertebral hemangiomas were the most commonly seen incidental findings, constituting 68.10% of all incidental findings.

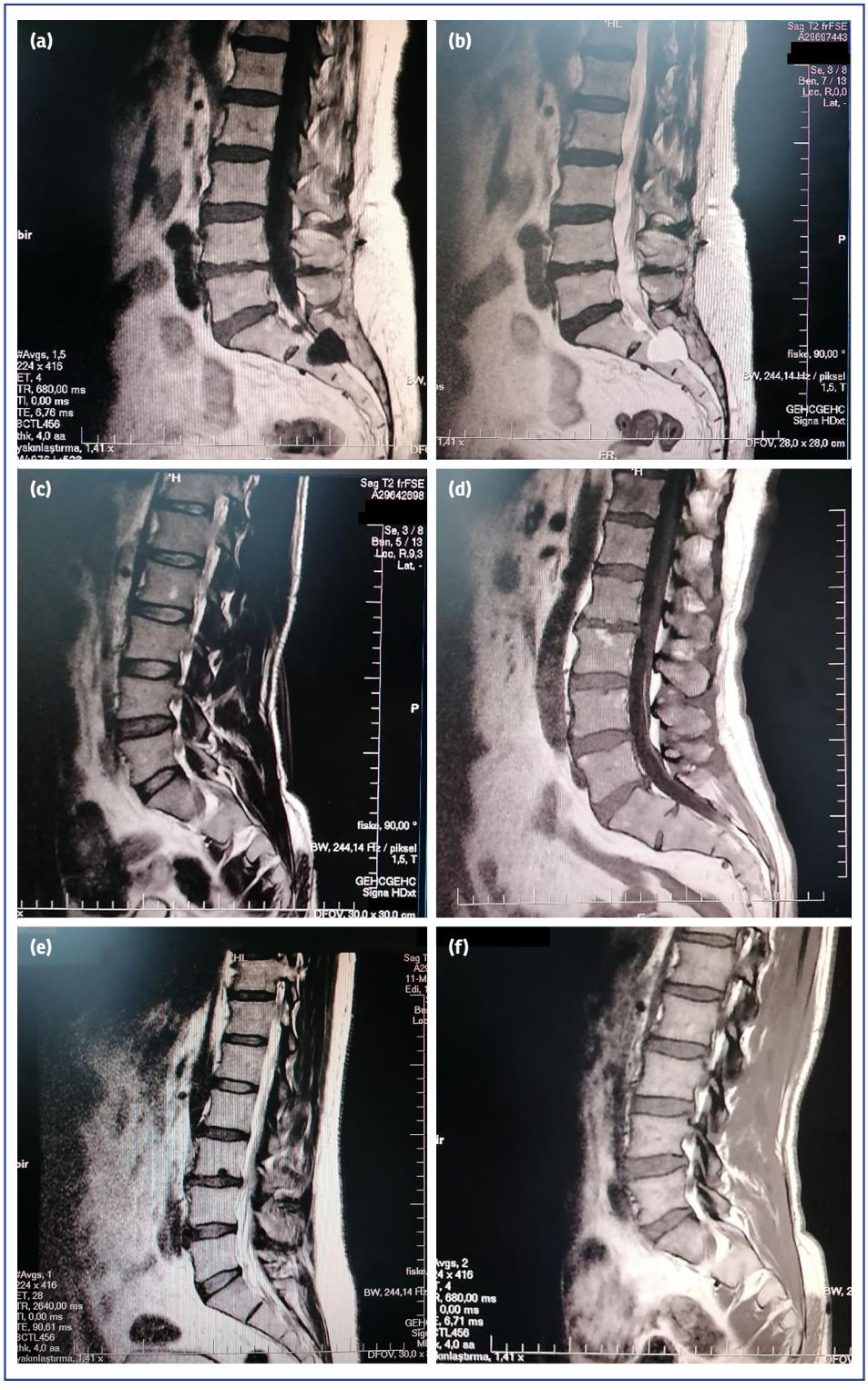

Figure 1. Examples of incidental findings detected in lumbar spinal MRI. **(a, b)** T1-weighted sagittal images. A Tarlov cyst can be seen at the S2 level (hypointense on T1-weighted image and hyperintense on T2-weighted image). **(c, d)** T1- and T2-weighted sagittal images, respectively. A hemangioma can be seen at level L2. **(e)** A Schmorl's node at the lower endplate of L3. **(f)** A filum terminale fibrolipoma can be seen

Table 3. The relationship between the incidence of incidental findings and the number of incidental findings with the presence of surgical pathology, presence of neurological deficits, and symptoms

	Total (n=293)		Incidental finding				The number of incidental findings
			Present (n=164)		None (n=129)		
	n	%	n	%	n	%	
Surgical pathology							
Present	151	51.50	89	54.26	62	48.06	1 (0:3)
None	142	48.50	75	45.74	67	51.94	1 (0:3)
p				0.291[a]			0.557[b]
Neurological deficit							
Present	28	9.60	21	12.80	7	5.42	1 (0:2)
None	265	90.40	143	87.20	122	94.58	1 (0:3)
p				0.033[a]			0.141[b]
Symptoms							
Radicular pain	192	65.50	116	70.73	76	58.91	1 (0:3)
Mechanical pain	83	28.30	43	26.21	40	31.79	1 (0:2)
Neuropathic pain	18	6.10	6	3.06	12	9.30	0 (0:2)
p				0.053[a]			0.050[c]

Date are reported as n % and median (minimum: maximum). [a]: Chi-square test; [b]: Mann–Whitney U-Test; [c]: Kruskal–Wallis Test

Synovial cysts, which are a frequent complication of degenerative spinal diseases, were first described by Baker in 1877. Synovial cysts are typically associated with facet joint arthropathies and may cause clinical signs and symptoms due to stenosis and nerve root compression.[9–11] Back pain and radicular pain are the most common complaints in symptomatic patients.[10] Synovial cysts can occur anywhere in the body where joints are present and can also occur in the cervical, thoracic, and lumbar spinal regions. They occur most commonly in the level L4–5, followed by L5–S1 and L3–4, respectively.[10,12] They are often isointense on T1-weighted images and hyperintense on T2-weighted images. In this study, synovial cysts were detected in two cases (1.08% of all incidental findings), and both cases were patients who had not undergone a previous spinal surgery but had extensive degenerative spinal MRI changes.

Tarlov cysts, first described by Tarlov in 1938, and sacral perineural cysts are multiple cystic lesions that are extradural and occur with cerebral spinal fluid accumulation between the endoneurium and perineurium of the posterior nerve root sheath.[13–15] These types of cyst are rare and mostly asymptomatic.[15] For example, the incidence of Tarlov cysts is 1%–5%.[14] These cysts are mostly asymptomatic, but become symptomatic in 1% of cases and may present with signs such as neurological deficits or bladder and bowel dysfunction.[14] In this study, Tarlov cysts were detected in 11 cases and all cases were asymptomatic.

The conus medullaris is attached to the dural sac by the intradural filum terminale.[16] Fibrolipomas of the filum terminale are also known as fatty fila.[1] They are always associated with tethered cords, and asymptomatic fibrolipomas are frequently seen. If the filum is thicker than 2 mm, an intraspinal lipoma should be suspected.[1] Sometimes, sacrococcygeal lipomas may accompany filum terminale fibrolipomas.[17] In this study, fibrolipomas were detected in two cases.

Schmorl's nodes were first described by Christian Georg Schmorl in 1927.[18] Schmorl's nodes are mostly located in the thoracolumbar region.[19] A Schmorl's node is a vertical disc herniation rather than a horizontal disk herniation that is formed as a result of a herniated nucleus pulposus adjacent to the vertebral endplate.[19] In this study, the number of Schmorl's nodes detected was 21, constituting 11.35% of all incidental findings (Table 2).

Modic changes are related to subchondral bone marrow lesions that are visible in MRI sections. They can be classified in

three groups according to the signal changes on T1-weighted and T2-weighted images.[20] Type 1 Modic changes reflect inflammatory processes in the vertebral endplate and are hypointense on T1-weighted images and hyperintense on T2-weighted images. Type 2 Modic changes reflect fatty marrow and are hypointense on T1-weighted images and iso-or hyperintense on T2-weighted images. Type 3 Modic changes represent sclerotic changes and are hypointense on both T1- and T2-weighted images.[20] In this study, type 1 Modic changes made up 2.16% of all incidental findings, while type 2 Modic changes made up 6.48% and type 3 Modic changes made up 1.08% of all incidental findings.

Aging is an inevitable process, in which natural, physiological, and sometimes pathological changes occur. The incidence of osteoporotic fractures, spinal stenosis, cervical myelopathy, and degenerative spinal deformities increases with age.[21] In our study, it was found that the incidence of incidental findings and the number of incidental findings in the same case increased significantly with age. In addition, it was found that incidental findings were more common in patients with neurological deficits than in patients without neurological deficits. However, in these patients, the main pathology (e.g., disk herniation, stenosis, or spondylolisthesis) was the cause of the neurological deficit, not the incidental finding.

CONCLUSION

Incidental spinal findings are frequently encountered due to the widespread use of radiological imaging methods with high imaging quality. These findings can sometimes be more important than the main pathology. The incidental findings, which may require surgery when detected if they are symptomatic, are mostly asymptomatic, but it is important to provide detailed information to patients regarding the incidental finding to reduce patient anxiety.

Disclosures

Ethics Committee Approval: The study was approved by the Kanuni Sultan Süleyman Training and Research Hospital Ethics Committee (No: KAEK 2023.01.1, Date: 11/01/2023).

Informed Consent: Written informed consent was obtained from all patients.

Peer-review: Externally peer reviewed.

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