

Prevalence of Spinal Meningeal Cyst in the Sacrum

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Abstract

Spinal meningeal cysts in the sacrum (SMC) are known to be occasionally symptomatic with low back pain as well as leg pain, but no distinct prevalence of this pathological entity including asymptomatic lesions has been described. This prospective study investigated the prevalence of SMCs based on magnetic resonance (MR) myelography in 102 consecutive Japanese women with gynecological problems, who underwent pelvic conventional MR imaging. Ten of 102 patients were suspected of being positive for SMC (9.8%), but pseudo-positive findings were possible. A high probability of positive SMC was found in 7/102 (6.9%). MR myelography was better to detect SMCs than conventional MR imaging. Multiplicity and female preponderance may be other features of SMC. The speculated prevalence of SMCs in Japanese females ranged from 6.9% to 9.8%.

Key words: meningeal cyst, magnetic resonance myelography, sacral nerve root cyst, spinal meningeal cyst, Tarlov cyst

Introduction

Spinal meningeal cyst in the sacrum (SMC), first described as perineurial cyst of the spinal nerve roots in 1938,¹⁶⁾ has been the cause of some confusion in nomenclature such as “perineurial cyst,” “meningeal diverticula,” and “occult intrasacral meningocele.” The clinical differences between perineurial cyst and meningeal cyst involve the cerebrospinal fluid circulation, relationship to the dorsal root ganglions, and clinical manifestations.¹⁷⁾ These confused conditions were later summarized as a single category of spinal meningeal cyst Type II based on the apparent cerebrospinal fluid communication between the normal subarachnoid space and perineurial cysts, and lower clinical significance in relation to the dorsal root ganglions.¹¹⁾ This Type II classification indicates extradural cysts with spinal nerve root fibers. Therefore, the diagnosis of Type II cyst can be established independent of several criteria; communication with the subarachnoid space or anatomical relationship with dorsal root ganglion, or clinical manifestation. If magnetic resonance (MR) imaging delineates a fluid-containing cystic le-

sion next to the sacral nerve roots or terminal dural sac, the cyst can be regarded as SMC, although some rare complications such as cystic neurinoma in the sacral foramen cannot be excluded. SMCs are known to be occasionally symptomatic with low back pain as well as leg pain, but no distinct prevalence of this pathological entity including asymptomatic lesions has been described. This brief study investigated the prevalence of this disease in Japanese females based on MR myelography.

Patients and Methods

This prospective study included 102 consecutive women aged from 22 to 77 years (mean 41.4 years) with gynecological problems who underwent pelvic MR imaging. All patients agreed to undergo an additional sacral MR imaging examination extending the time required by only one minute. MR imaging examinations were performed using a 1.5-T MR unit (Magnetom Vision; Siemens, Erlangen, Germany). The MR myelogram was based on a coronal single-shot T₂-weighted image (repetition time [TR] 8000 msec, echo time [TE] 820 msec, flip angle [FA] 90°, 50 mm thickness) (Fig. 1).

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Fig. 1 Sacral magnetic resonance myelogram based on coronal single-shot T₂-weighted imaging (repetition time 8000 msec, echo time 820 msec, flip angle 90°) showing no abnormalities.

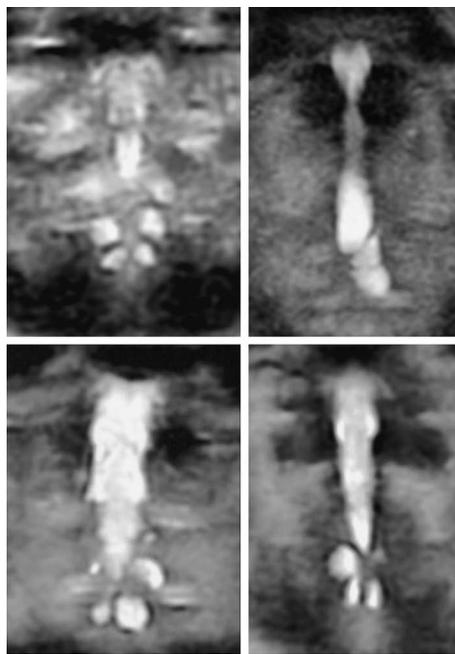


Fig. 3 Sacral magnetic resonance myelograms of 4 cases in Group 2 showing apparent lesions next to the terminal dural sac.

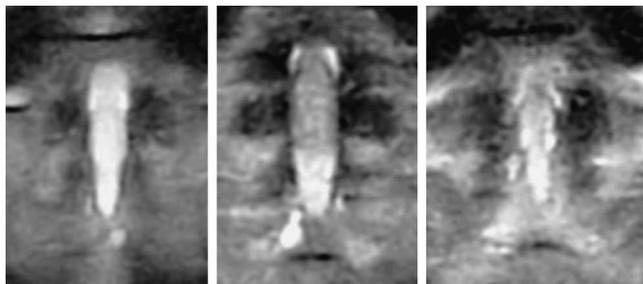


Fig. 2 Sacral magnetic resonance myelograms of 3 cases in Group 1 showing lesions slightly larger than dorsal root ganglia or separate from the terminal dural sac.

Results

Ten of the 102 patients aged from 26 to 48 years (mean 39.2 years) were suspected of being positive for SMC (9.8%). The positive suspected lesions were classified into three groups based on the extent and/or location of the cysts. Group 1 of 3 patients: Lesions slightly larger than dorsal root ganglia or separate from the terminal dural sac (Fig. 2). Group 2 of 4 patients: Apparent lesions next to the terminal dural sac (Fig. 3). Group 3 of 3 patients: Large and multiple lesions as large as the dural sac (Fig. 4). The exact relationship to the sacral spine level has not been clarified, but most lesions were located around the S2 and S3 levels. Five patients (2 in Group 2 and 3 in Group 3) were suspected of having multiple cysts. No clinical information about related neurological symptoms was obtained in this study.

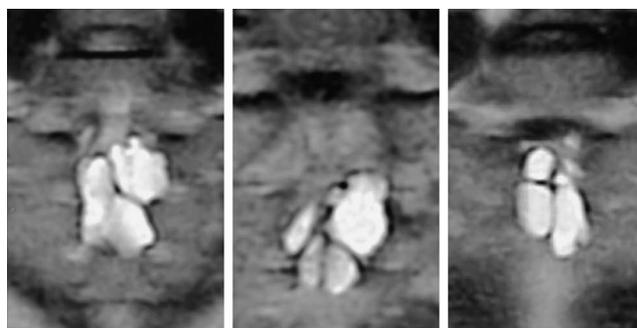


Fig. 4 Sacral magnetic resonance myelograms of 3 cases in Group 3 showing large lesions.

Discussion

The MR myelography sequence in this study, compatible with the so-called heavy T₂-weighted sequence (TR 8000 msec, TE 820 msec, FA 90°), is nearly same as the rapid acquisition with relaxation enhancement (RARE) method, and extended the whole MR study by only one minute. The RARE method is a basic two-dimensional (2D) single-shot fast spin-echo sequence providing an MR myelogram highlighting signals from the cerebrospinal fluid.¹⁸⁾ This sequence seemed to be appropriate for a prospective single-shot screening study for SMC

because of the short 2D data acquisition time and better spatial resolution to show SMC than conventional MR imaging.⁵⁾

The first description of the prevalence of SMC as 5/30 (16.7%) was based on an anatomical study,¹⁶⁾ whereas subsequent reports have been based on MR imaging. The prevalence of SMC was found to be 23/500 (4.6%) among patients with symptoms such as low back pain,¹³⁾ and 44/3535 (1.2%) in patients with low back pain, sciatica, or spinal stenosis.¹⁰⁾ Recently, the prevalence of SMC was reported as 46/2669 (1.6%) in Korean adults with low back pain and/or sciatica.⁸⁾ Although the exact sequences were not described, conventional sagittal T₁- and/or T₂-weighted MR imaging was employed.

The total number of patients with suspected positive SMC was 10 of 102 (9.8%) in our study. However, Group 1 may have had pseudo-positive lesions such as dorsal root ganglions, or normal variant enlarged terminal dural sac, because of the slightly high signal effect from the surrounding fatty tissue in this sequence. High probability of positive SMC is expected in Groups 2 and 3, so the prevalence of SMC in this study was certainly 7/102 (6.9%). Therefore, the prevalence of SMC in Japanese females ranges from 6.9% to 9.8%. This speculated prevalence seemed to be higher than those previously reported based on conventional MR imaging, but was closer to the 16.7% found in the original anatomical study.¹⁶⁾ Furthermore, MR myelography is superior to conventional MR imaging with a few sagittal images to detect SMC,¹⁸⁾ so that the incidence of SMC may increase with screen-

ing by MR myelography.

Our observations using a single-shot 2D image acquisition lack the multiple projection angles that may result in decreased sensitivity to detect SMC. Recent advances in MR imaging such as three-dimensional (3D) true-fast imaging with steady-state precession and 3D half-Fourier acquisition single-shot turbo spin-echo are expected to increase the detection rate of SMC, but these sequences do need longer scanning time. Furthermore, a constructive interference in steady state sequence could show the nerve root fibers contained in the cysts, which is essential for the differentiation of Type I and II cysts.⁹⁾ MR imaging appeared to be better than computed tomography (CT) myelography for demonstrating SMCs,¹⁹⁾ because CT myelography occasionally fails to show non-communicating SMCs. Flow-sensitive MR imaging is also reported useful to determine the communication between the cyst and the subarachnoid space.³⁾

Multiplicity and sex may cause differences in the incidence of SMCs.^{13,15)} Therefore, we reviewed MR-based series of case reports dealing with five or more SMCs (Table 1).^{1-4,6-11,13,15,18-20)} Our study identified at least 5 cases of multiple SMCs out of 10 cases. Amazingly, not only multiple but also large cysts in Group 3 were found in this study. The rate of multiple SMCs widely ranges from 7.7% to 80% (Table 1). Multiplicity may pose a problem in deciding which lesion is responsible for the clinical symptoms. Sex-related differences in incidence had not previously been documented, but most case reports involved mainly females (66–100%) (Table

Table 1 Summary of reported case series of spinal meningeal cyst

Author (Year)	Age (yrs)		Total No. of cases	Female		Multiple	
	Range	Mean		No. of cases	%	No. of cases	%
Van de Kelft and Van Vyve (1991) ²⁰⁾	37-71	45.5	13	5	38.5	1	7.7
Davis et al. (1993) ³⁾	25-79	50.3	19	16	84.2	8	42.1
Paulsen et al. (1994) ¹³⁾	nc	nc	23	nc	nc	nc	nc
Itoh et al. (1997) ⁷⁾	33-69	50	5	5	100.0	4	80.0
Tsuchiya et al. (1999) ¹⁹⁾	16-77	nc	10	7	70.0	8	80.0
Mummaneni et al. (2000) ¹¹⁾	34-74	nc	8	6	75.0	6	75.0
Cattaneo et al. (2001) ²⁾	40-66	53.2	5	2	40.0	3	60.0
Voyadzis et al. (2001) ²¹⁾	34-63	48.1	10	8	80.0	3	30.0
Caspar et al. (2003) ¹⁾	18-62	45	15	10	66.7	1	6.7
Kitis et al. (2004) ⁹⁾	4-71	nc	14	10	71.4	5	35.7
Langdown et al. (2005) ¹⁰⁾	27-83	54.5	54	38	70.4	nc	nc
Tanaka et al. (2006) ¹⁵⁾	21-72	50.6	12	5	41.7	10	83.3
Guo et al. (2007) ⁴⁾	28-44	36.7	11	5	45.5	6	54.5
Joo et al. (2010) ⁸⁾	nc	nc	46	nc	nc	nc	nc
Hung and Chang (2010) ⁶⁾	36-66	51.8	5	4	80.0	nc	nc

nc: not contributory.

1).^{3,6,7,9-11,18,20)} Only a few reports showed an incidence as low as 40%.^{2,19)} Our study was prospectively conducted in females, which may result in a higher incidence of SMCs, so a further prospective screening study in males is expected to establish the overall incidence of SMC.

SMC seems to be a common finding, so that the surgical intervention for patients with sensory disturbance in the legs and/or perineal area should be carefully considered.

Conflicts of Interest Disclosure

The authors have no personal financial or institutional interest in any of the drugs, materials, or devices in the article. All authors who are members of The Japan Neurosurgical Society (JNS) have registered online Self-reported COI Disclosure Statement Forms through the website for JNS members.

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