MAGNETIC RESONANCE IMAGING OF SKIN-COVERED BACK MASSES IN CHILDREN

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ABSTRACT

Purpose: To evaluate role of magnetic resonance imaging (MRI) in children with skin-covered back masses.

Materials and methods: MR studies of fourteen children with skin-covered back masses were compared with surgical findings, histopathological reports, or clinical history. The greatest diameters of the palpable masses were compared with the greatest diameters of the masses on MR images. MRI findings important for treatment planning were noted.

Results: The masses in five children were histologically proven; they were sacrococcygeal mature teratoma,[2] sacrococcygeal endodermal sinus tumor,[2] and Ewing sarcoma.[1] Three children with lipomyelomeningocele, three with posterior meningocele, one with lipomyelocele, and one with anterior sacral meningocele had their masses surgically confirmed. The clinical history and MRI of the mass of one child were consistent with hemangioma. In the child with an anterior sacral meningocele, the greatest diameter of the mass on MR images was three times as big as that of the palpable mass. In three children (two with endodermal sinus tumor and one with Ewing sarcoma), the greatest diameters of the masses on MR images were twice as big as those of the palpable masses. Two children with endodermal sinus tumor and one with Ewing sarcoma had intraspinal invasion; one with a mature sacrococcygeal teratoma had a retrorectal extension; and one with an anterior sacral meningocele had a connection of the mass with the spinal canal. MRI findings of a child with hemangioma obviated biopsy.

Conclusion: MRI had an important role in diagnosing these children and their treatment planning.

Key Words: Lumbosacral Region, Sacrococcygeal Region, Magnetic Resonance Imaging, Meningocele, Teratoma.

INTRODUCTION

Masses without skin over the caudal spine in children are usually myelomeningoceles, which can be diagnosed clinically without difficulty.[1] Imaging studies are rarely performed in the newborn with a myelocele or myelomeningocele.[2] However, back masses with skin cover in

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children are difficult to diagnose clinically. In the past, correct diagnoses were made only at the time of operation.[1] Skin-covered back masses in children have included lumbosacral lipoma, teratoma, meningocele, hemangioma, and terminal myelocystocele.[1,3,4] The purpose of this study was to evaluate the role of magnetic resonance imaging (MRI) in children with skin -covered back masses.

MATERIALS AND METHODS

Between December 1998 and November 2001, fifteen children with skin-covered back masses were examined using MRI. One child was excluded from this study because she died before surgery. The children, ten girls and four boys, ranged in age from 2 days to 12 years (median, 7 months).

MR studies were performed with a 1.5-Tesla system (Signa Horizon, GE Medical Systems, Milwaukee, USA). All children underwent sagittal and axial T1-weighted imaging, and sagittal and axial fast spin-echo (FSE) T2-weighted imaging with fat suppression. Contrast-enhanced T1-weighted imaging was performed in four children (cases 3, 4, 13, and 14). The T1-weighted imaging (440-640/8-20/2-4 [TR/TE/excitations]) and FSET2-weighted imaging (2500-3200/60-150/2-4[TR/TE/excitations]) were obtained with sections 2-4 mm thick and 0-0.5 mm interslice spacing. A spine-phased array coil was used for eleven children and a head coil was used for three children.

The diagnoses from the MRI reports were compared to the surgical reports, histopathological reports, or clinical history. The greatest diameters of the palpable masses were compared with the greatest diameters of the masses on MR images. MRI findings important for treatment planning were also noted.

RESULTS

The MR diagnoses, final diagnoses, and important MRI findings are summarized in Table 1. The masses in five children were histologically proven; they were sacrococcygeal mature teratoma,[2] sacrococcygeal endodermal sinus tumor,[2] and Ewing sarcoma.[1] Three children with lipomyelomeningocele, three children with posterior meningocele, one child with lipomyelocele, and one child with anterior sacral meningocele had their masses surgically confirmed. One year and nine months after an MRI, the mass of one child was decreased in size; this child had a bluish discoloration of the skin. The clinical history and MRI of this child were consistent with hemangioma.

The greatest diameters of the palpable masses varied from 3-15 cm, average 7.8 cm. In case 2, leakage of fluid from the mass had occurred before the MRI examination. The masses of twelve children were at the midline, one mass was left of the midline (case 5), and one mass was right of the midline (case 14). In ten children the greatest diameters of the palpable masses were the same as those on MR images. In the child with an anterior sacral meningocele, the greatest diameter of the mass on MR images was three times as big as that of the palpable mass. In three children (two children with endodermal sinus tumor and one child with Ewing sarcoma), the greatest diameters of the masses on MR images were twice as big as those of the palpable masses. According to Altman's classification, two children with mature teratoma had type 1 tumors and two children with endodermal sinus tumor had type 2 tumors.[5]

The MRI diagnoses were correct in 13 patients (92.9%). In case 9, a posterior meningocele had been misdiagnosed as a lipomyelomeningocele. MRI provided information which was important in the treatment planning in five children (35.7%). Two children with endodermal sinus tumor and one child with Ewing sarcoma had intraspinal invasion (Figs. 1 and 2), one child with mature sacrococcygeal teratoma had a retrorectal extension, and one child with an anterior sacral meningocele had a connection of the mass with the spinal canal (Fig. 3). The MRI findings in case 13 obviated biopsy of the mass, which was finally diagnosed as a hemangioma (Fig. 4).

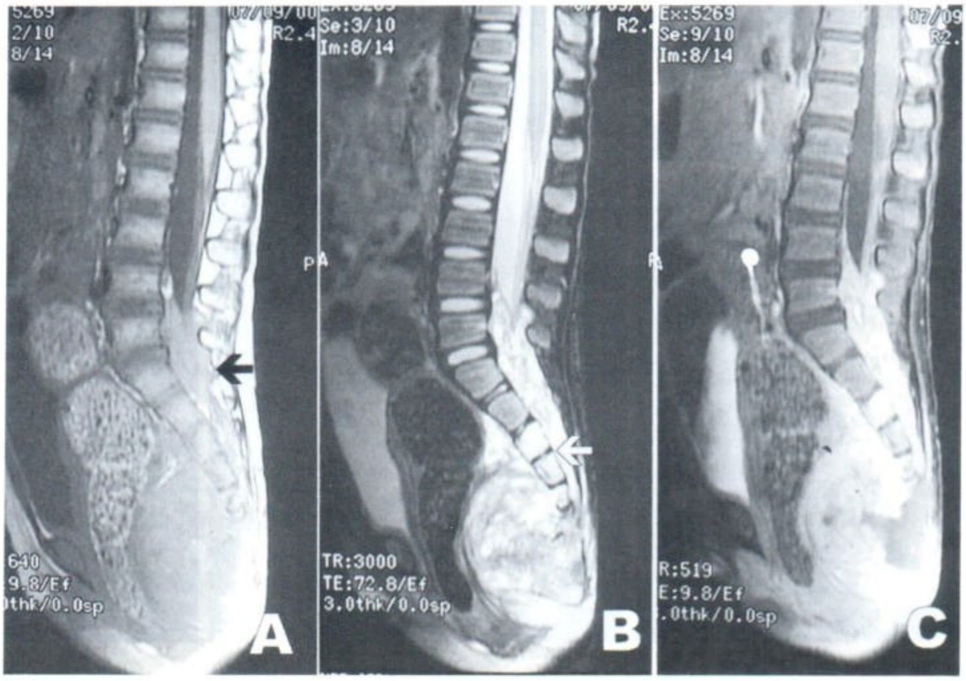

Fig. 1. Endodermal sinus tumor. Sagittal T1-weighted image (A) shows a slightly hyperintense mass compared to muscle in the retrorectal space with invasion of the spinal canal (black arrow). On sagittal FSET2-weighted image with fat suppression (B), the mass is mixed hyper- and hypointense. Abnormal hyperintensity of the S3-S5 (white arrow) and destruction of S5 and coccyx are seen. Postcontrast sagittal T1-weighted image with fat suppression (C) shows heterogeneous enhancement of the mass and abnormal enhancement of S3-5.

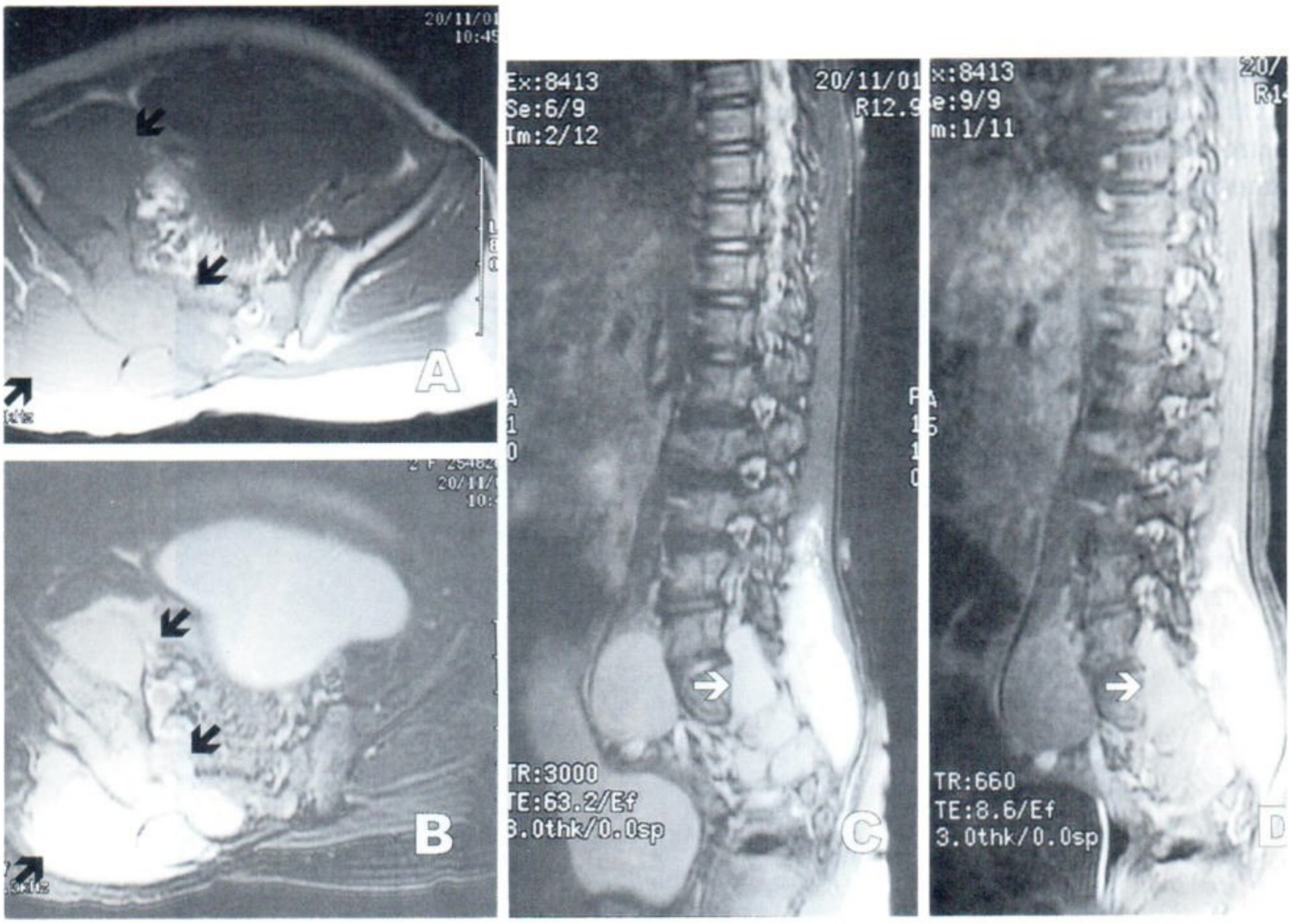

Fig. 2. Ewing sarcoma. Axial T1-weighted image (A) shows a slightly hyperintense mass (black arrows) compared to muscle surrounding the right ilium. On axial and sagittal FSET2-weighted image with fat suppression (B and C), the mass (black arrows) is hyperintense. Invasion of the right ilium, invasion of the right side of the sacrum, and invasion into the sacral foramina (white arrow) and spinal canal are seen. Postcontrast sagittal T1-weighted image with fat suppression (D) shows heterogeneous enhancement of the mass.

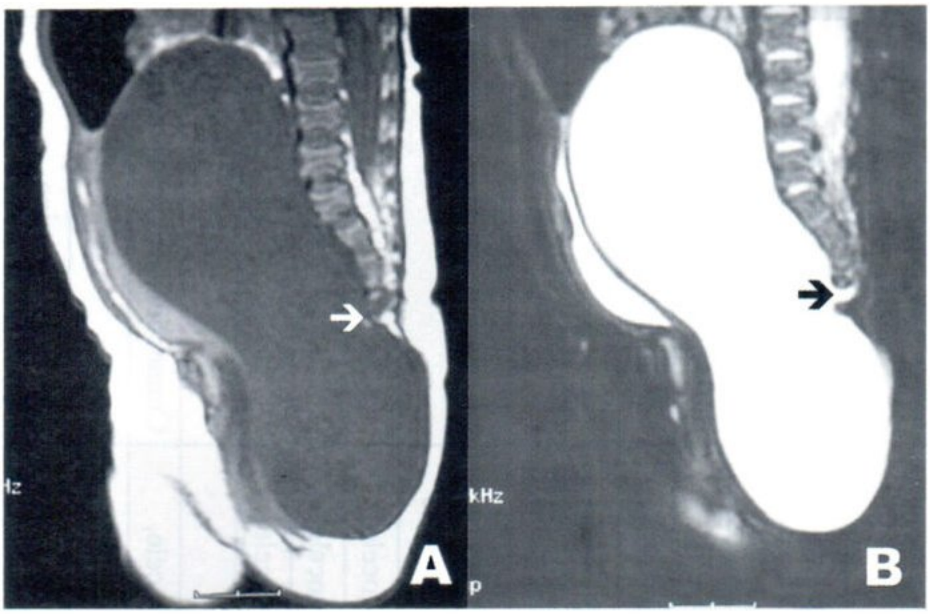

Fig. 3. Anterior sacral meningocele. Sagittal T1-weighted image (A) and sagittal FSET2-weighted image with fat suppression (B) show a large cyst in the pelvic cavity and lower abdomen. Note a small connection between the cyst and the spinal canal (arrows) and pressure erosion of the anterior aspect of the sacrum.

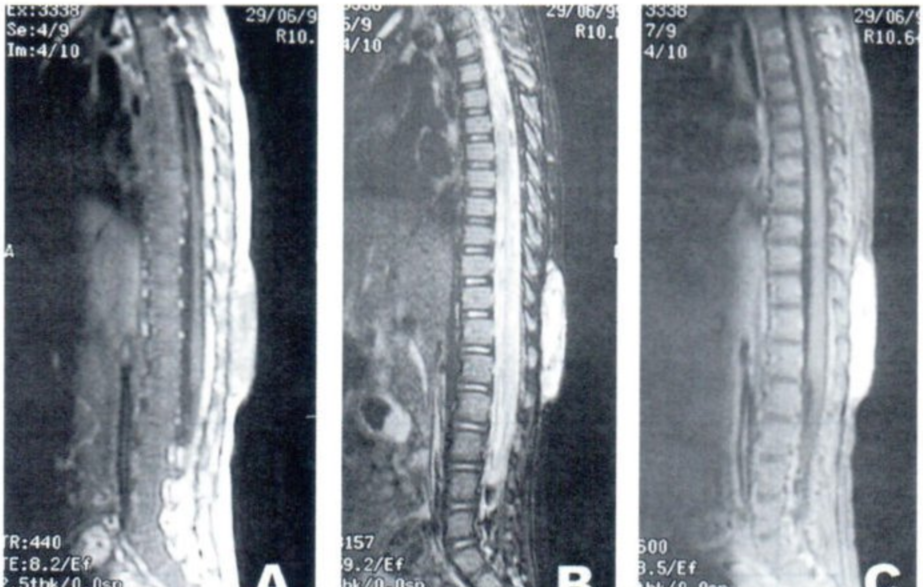

Fig. 4. Subcutaneous hemangioma. Sagittal T1-weighted image (A) shows a mass with heterogeneous intensity in the subcutaneous tissue of the back. On sagittal FSET2-weighted image with fat suppression (B), the mass is mixed hyper- and hypointense. On postcontrast sagittal T1-weighted image with fat suppression (C), the mass is markedly enhanced.

Table 1. MRI diagnoses, final diagnoses, and important MRI findings

Case No.	Sex	Age	MRI diagnosis	Final diagnosis	Important MRI findings
1	M	14 days	Benign germ cell tumor	Mature teratoma	Retrorectal extension
2	F	6 days	Benign germ cell tumor	Mature teratoma	Intraspinal invasion
3	F	3 years	Mailgnant germ cell tumor	Endodermal sinus tumor	Intraspinal invasion
4	M	2 years	Mailgnant germ cell tumor	Endodermal sinus tumor	
5	M	4 years	Lipomycelomeningocele	Lipomycelomeningocele	
6	F	2 months	Lipomycelomeningocele	Lipomycelomeningocele	
7	M	12 years	Lipomycelomeningocele	Lipomycelomeningocele	
8	F	4 days	Posterior meningocele	Posterior meningocele	
9	F	1 year	Lipomycelomeningocele	Posterior meningocele	
10	F	2 days	Posterior meningocele	Posterior meningocele	
11	M	2days	Lipomyelocele	Lipomyelocele	
12	F	1 month	Anterior meningocele	Anterior meningocele	Connection with spinal canal
13	F	1 year	Hemangioma	Hemangioma	
14	F	2years	Sarcoma	Ewing sarcoma	Intraspinal invasion

DISCUSSION

In this study the three most common skin-covered back masses in children were teratoma, lipoma (lipomyelomeningocele or lipomyelocele), and meningocele, which differs slightly from the study of Lemire et al.[1] They found that the three most common ones were teratoma, lipoma, and mixed neural lesions.

The sacrococcygeal region is the most common location for teratoma in children. CT or MRI is an excellent method for determining the extent of the sacrococcygeal teratomas;[6,7] however MRI is better for the detection of spinal canal invasion. In general, benign teratomas are more likely to be predominantly cystic and malignant teratomas are more likely to be solid.[6] Sacral destruction, invasion of surrounding structures, and metastatic disease are sign of malignancy. Extension of sacrococcygeal teratoma into the spinal canal is rare; it has been described as occurring in association with malignant or recurrent tumor.[8] The two endodermal sinus tumors in this study were solid masses and had invaded the spinal canal. Abnormal signal intensity of the bone marrow of the sacrum and destruction of sacrum were also seen in one child with endodermal sinus tumor. However, a few cases of benign sacrococcygeal teratomas with intradural extension have been reported.[8,9] It has been reported that the MRI finding in a neonate who had a benign sacrococcygeal teratoma with intradural extension was a huge heterogeneous mass with solid and fluid-filled components extending into the spinal canal.[8] This MRI finding differs from our cases.

MRI is the method of choice for imaging the pediatric spine, particularly in patients with myelopathy or suspicion of developmental malformations.[2] Two of the three most common skin-covered back masses in children in our study were developmental malformations, lipoma and meningocele. In these cases, CT can be used to study the mass, but it requires the injection of an intrathecal contrast medium. Spinal ultrasonography has been recommended as the primary imaging method in infants with suspected congenital spinal anomalies of the lower spine.[10,11] However, in case of any pathologic finding, especially if surgical intervention is considered, MR imaging should be done. This gives more anatomic details of the pathology.[10]

MRI is superior to ultrasonography in demonstrating the entire spinal canal, the extent of the lesions, and their anatomic relationship to surrounding structures.[10] In this study MRI provided information which was important in the treatment planning in five children. MRI also made diagnosis possible, which obviated biopsy of the mass in one child with hemangioma.

The limitation of this study is that it is retrospective. The MRI diagnoses were made by single reader before surgery. However, this study confirms the role of MRI in the evaluation of children with skin-covered back masses.

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