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Spinal schwannomas: a review of 42 cases.

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Abstract

In this study, 42 cases of spinal schwannomas are reviewed. We analyzed the therapeutic results of patients with spinal schwannomas in order to investigate the factors which affect the clinical outcomes. Early diagnosis and treatment could help procure a good result for the patient. The delay in diagnosis and the subsequent duration of symptoms was significantly longer in cases of lumbar lesions compared to cervical and thoracic lesions. Tumor recurrence was rare, but in some cases where complete resection was not possible, close follow-up of the patients postoperatively with MRI was indicated.

KEYWORDS: schwannoma, spinal tumor

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Spinal Schwannomas: A Review of 42 Cases

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In this study, 42 cases of spinal schwannomas are reviewed. We analyzed the therapeutic results of patients with spinal schwannomas in order to investigate the factors which affect the clinical outcomes. Early diagnosis and treatment could help procure a good result for the patient. The delay in diagnosis and the subsequent duration of symptoms was significantly longer in cases of lumbar lesions compared to cervical and thoracic lesions. Tumor recurrence was rare, but in some cases where complete resection was not possible, close follow-up of the patients postoperatively with MRI was indicated.

Key words: schwannoma, spinal tumor

Schwannomas are relatively common soft tissue tumors, and they are the most common tumors found in the spinal canal. Early diagnosis and treatment can help procure a good result for the patient, but those tumors found in the spinal canal are frequently diagnosed late and cannot always be treated with total extirpation for various reasons. There are very few reports regarding the clinical features of spinal schwannomas (1). In this study, we analyzed the therapeutic results of patients with spinal schwannomas in order to investigate the factors which affect the clinical outcomes.

Patients and Methods

During the period from 1965 to 1993, 42 patients with spinal schwannomas were treated at our Department. There were 25 men and 17 women. The average age of the patients at the time of admission was 45.1 years ranging from 12 to 79 years old. In all cases, histologic examinations of the surgical specimens showed the typical findings of spinal schwannomas. Each case was reviewed with respect to the nature of the preoperative symptoms, symptom duration, location of the tumor, radiographic findings and therapeutic results.

Results

Tumor location. Twelve schwannomas were located in the cervical (C) region, 18 in the thoracic (T) region, 11 in the lumbar (L) region, and 1 in the sacral (S) region. In two patients, multiple tumors were located at different levels within the spinal cord; one involved the T10-12 and the L1-S1 regions, and the other involved the C3-5 and the T12-L1 regions. In these two cases, the location of the tumor was classified by the region with the larger mass: the lumbar region for the first case and the thoracic region for the second. Twenty-six tumors had a purely intradural-extramedullary location, 13 tumors were extradural, 2 tumors were intramedullary, and one tumor intra-extradural location (dumbbell-shape). In the extradural cases, nine cases were located in the paravertebral area, existing through the foramen in a dumb-bell shape. In two cases, the tumors were found in the spinal cord as well as at a distant location (one case with chest and neck tumors and the other with auditory nerve involvement). In four cases, there were multiple tumors in the same spinal region (Table 1).

Symptoms. The first symptom was pain in 26 cases (61.9 %), sensory change in 8 (19.1 %), and motor deficit in 7 (16.7 %). One case was incidentally found on a CT examination. The relationship between the presenting symptoms and location of the corresponding tumors is shown in Table 2. When the tumor was in the lumbar area, almost all of the patients presented with pain, but when it was in the thoracic area, a significant number of patients presented with motor deficits. The duration of symptoms varied greatly (Table 3). In the lumbar area, the average period of time from the patient's first symp-

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Table 1 Schwannomas

Case	Age	Sex	Level
1.	27	M	T10-12, L1-S1
2.	52	M	C3-5, T12-L1
3.	12	F	C4-5, bilateral acoustic tumors
4.	39	M	T9-10, lt chest, neck
5.	60	F	S1-3, multiple daughter nodules
6.	60	M	T12-L4, multiple daughter nodules
7.	14	F	L1-5, two nodules
8.	45	F	T12-L3, two nodules

T: thoracic; C: cervical; S: sacral; and L: lumbar

tom to the time of surgery was 42.5 months which was almost twice of that of cervical lesions (18.8 months) and thoracic lesions (22.9 months). Twenty-three patients (54.7 %) were given various diagnoses (lumbago, disc herniation *etc.*). In the cervical lesions, 6 out of 12 (50 %) cases were miss-diagnosed. Likewise 7 out of 18 (38.9 %) lesions in thoracic area and 10 out of 12 (83.3 %) lumbar/sacral lesions were miss-diagnosed initially.

Radiographic, myelographic, CT and MRI findings. We observed radiographic abnormalities such as scalloping of the vertebral bodies, erosion of the vertebral arches, thinning of the pedicles, and enlargement of the intervertebral foramina in 4 of 12 (33.3 %) cervical lesions, 3 of 18 (16.7 %) thoracic lesions, and 6 of 12 (50 %) lumbar/sacral lesions at the time of admission. Bony changes described above are better evaluated with CT in all recent 28 cases. Myelography was also carried out in all cases, and a total block was found in 29 cases and a partial block in 13 cases. MRI films were obtained in the most recent 14 cases, and in all of these cases, MRI was sufficient for preoperative evaluation and surgical planning. Myelography followed by CT was as sensitive as MRI (12 cases).

Operation. The tumor could be completely resected in 33 cases but only partial resection was performed in 9 cases because of difficulties associated with the anatomical site or adhesion to the nerve rootlet without nerve damage. There were 19 cases in which adhesion to the nerve rootlets could not be released, but the nerves were sacrificed after confirming that they were sensory nerves (not motor nerves).

Outcomes. The follow-up period was from 2 to 31 years (mean 9.7 years). In case in which complete resection was not possible due to the dumbbell shape of a C2, 3 lesion, the tumor recurred 18 years following the initial operation. Repeat resection was performed with a good result. There were no other cases of recurrence or regrowth of the lesions either clinically or as demonstrated on follow up MRI examination (11 cases). Postoperatively, pain resolved in 30 of 30 (100 %) patients, sensory disturbance resolved in 29 of 33 (87.9 %) patients, and motor disturbance resolved in 29 of 33 (87.9 %) patients (Table 4). In analyzing the clinical outcomes with respect to location of the lesions, most of the poor results were associated with lumbar lesions. Out of all 42 cases, four patients demonstrated no change following surgery, and three became worse. Of these three cases, two cases involved large lesions in the cauda equina; one complained of postoperative gait disturbance and the other

Table 2 The relationship between the intial symptom and the location of the corresponding tumor

Sympom	Number of cases
Pain	
Cervical area	6
Thoracic area	9
Lumbar/sacral areas	11
Total	26
Sensory change	
Cervical area	4
Thoracic area	4
Lumbar/sacral areas	0
Total	8
Motor disturbance	
Cervical area	2
Thoracic area	5
Lumbar/sacral areas	0
Total	7

Table 3 The relationship between symptom duration and the location of the corresponding tumor

Location	Duration (month)
Cervical	18.8 (3-36)
Thoracic	22.9 (2-156)
Lumbar	42.5 (0-240)
Sacral	36.0 (36-36)
Total	27.9

Table 4 Therapeutic results following surgical treatment

Sympom	Complete recovery	Partial recovery	No change	Progress
Pain				
Cervical area	7	2	0	0
Thoracic area	9	2	0	0
Lumbar/sacral areas	6	4	0	0
Total	22	8	0	0
Sensory change				
Cervical area	5	5	0	0
Thoracic area	6	7	2	0
Lumbar/sacral areas	2	4	0	2
Total	13	16	2	2
Motor disturbance				
Cervical area	5	5	0	1
Thoracic area	11	4	1	0
Lumbar/sacral areas	2	2	0	2
Total	18	11	1	3

case with an intramedullary tumor in the cervical region, demonstrated a slight motor deficit postoperatively.

Discussion

Schwannomas usually present as a solitary tumor. In reality, most of the reported cases of multiple schwannomas were probably considered to be neurofibromatosis type 2 (NF2), a subclass of von Recklinghausen's disease (2). von Recklinghausen's disease is typically defined as having multiple neurofibromas, but it is occasionally difficult to distinguish a schwannoma from a neurofibroma, even by histologic examination (2). All cases included in this report had histologic findings consistent with schwannoma, but case 3 might be considered as a case of NF2 because of bilateral acoustic nerve involvement. Case 4 also had some clinical features consistent with von Recklinghausen's disease with a small café-au-lait spot and spinal deformity (NF1). Previous reports have stated that 3-4 % of all spinal cord tumors are multiple in nature (1, 5). Of the 47 cases of schwannomas classified by Seddon, there were 7 cases of multiple lesions including 2 cases of multiple spinal lesions (3). In this report, 8 out of 42 cases (19.0 %) presented with multiple spinal cord schwannomas. Even if the cases with clinical features consistent with von Recklinghausen's disease are excluded, the percentage of multiple tumors in the present series (16.6 %) is significantly greater than that reported previously. In von Recklinghausen's disease, 10-20 % of all cases demonstrate malignant degeneration. In cases without von Recklinghausen's disease, malignant change is very rare (2). At the present time, all of the patients are doing well, including the patient in whom the tumor recurred.

Although spinal schwannomas are best treated with early diagnosis and surgery, lesions in the lumbar region are frequently diagnosed late, and are treated similarly to other painful diseases (1). These patients frequently present with back pain without other neurological signs, making definitive diagnosis difficult. However, on review of our data, plain radiographs demonstrated specific roentgenologic signs such as scalloping of the vertebral bodies, erosion of the vertebral arches *etc.* in 50 % of the cases at the time of admission. A more careful review of the radiographs may allow the diagnosis to be made earlier. With the advent of the routine use of MRI in the investigation of the spinal cord, it has become easier to diagnose spinal schwannomas (6-11). Nowadays, MRI is the procedure of choice for the diagnosis of most spinal cord tumors and in many cases is sufficient for preoperative evaluation and surgical planning (10). Furthermore, some reports have dealt with the differentiation of spinal schwannomas and meningiomas (6, 8, 9): it is reported that spinal schwannomas and meningiomas can be differentiated by careful observation of MRI films (9). In conclusion, MRI can be used to carefully follow patients for the uncommon presentation of recurrence or regrowth following surgical treatment of schwannomas.

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