

Spinal Schwannoma: scrutinizing the armamentarium of a single institute.

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ABSTRACT

Objectives: To investigate the clinical characteristics, epidemiological features of spinal schwannomas diagnosed at a single institution.

Methods: A retrospective study carried out of all consecutives 67-patients presented with spinal schwannoma treated at the neurosurgery department in King Hussein Medical Center. Clinical information, imaging studies, and biopsy results were compiled from all consecutive patients (all cases were included) treated in our setup over a period of 10-years from January 2006 to January 2016.

Results: Study cohort consisted of 38-females (56.71%) and 29-males (43.28%), with ages ranging from 17 to 75 years (mean: 41.45 ± 13.74 yr). The most common initial symptom was radicular pain (46 patients, 68.65%). The most common regions of involvement were the lumbar spine (37 patients, 55.22%), followed by cervical (16 patients, 23.88%), thoracic segments (12 patients, 17.91%) and sacral region (2 patients, 2.98%). In the total population of 67- cases, the schwannomas were intradural extramedullary in 65-cases (97.01%) and in 2-cases it was extradural (2.98%). Three cases (4.47%) recurred locally.

Conclusion: Spinal schwannomas are benign tumors that can cause significant neurological deficits. Lumbar spine is the most common site of spinal schwannomas according to this study. Surgery for spinal schwannomas usually results in excellent postoperative clinical outcomes. Schwannoma is generally separable from the underlying nerve. In cases of subtotal removal, there could be a recurrence.

Keywords: Extramedullary spinal tumor, Nerve sheet lesion, Primary spinal lesion, Spinal tumors.

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Introduction

Primary spinal cord tumors are rare neoplasms that occur within or adjacent to the spinal cord, can potentially lead to severe neurologic deterioration⁽¹⁾. Schwannoma is the most common nerve sheath tumor. They can be found anywhere along the spinal canal. Orthodox spinal schwannomas are generally solitary, firm, oval, or lobulated encapsulated benign tumors arising from the sensory (dorsal) nerve root⁽²⁻⁵⁾. They commonly occur in the lumbar and cervical

regions and originate from Schwann cell progenitors^(5, 6). The incidence of spinal schwannoma is 0.3–0.5/100,000 individuals annually^(7, 8). Studies showed no gender preponderance and it is usually diagnosed during the fourth and fifth decades of life⁽⁹⁾. Among schwannoma patients, 3–4% has multiple tumors (schwannomatosis)^(10, 11). Conventional classification of schwannomas includes: intradural, extramedullary schwannomas are the most common (49-83%), extradural (7-27%) and a "transdural"

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tumor that extends through the dural root sleeve, having both intradural and extradural components. (1-19%), i.e. intramedullary schwannomas are quite rare, representing less than 1% of cases^(4, 12-15). Spinal tumors and their spectrum have not been studied extensively at our center. We evaluated retrospectively the cases of spinal tumors treated in our setup over a period of 10 years. This review addressing the spinal schwannoma, aims to investigate the clinical characteristics, histopathology and long-term outcomes in patients that were managed at our center with baseline comparison of our findings with those reported in literature.

Methods

This study was conducted by reviewing retrospectively the clinical data, radiological findings, surgical treatment and clinical outcomes of the patients, histopathology reports and clinical outcome documents. We analyzed data from 67-adult patients who underwent surgery for a single conventional spinal schwannoma confirmed by histopathological examination. Patient data were extracted from the KHMC Primary Spinal Tumors electronic Database, which includes approximately 414-patients treated between 2006 and 2016 with spinal lesions. Collected data included demographic features; sex, age, size of the tumor, resection extent, histological alterations, local recurrence, perioperative morbidity, and complications were documented. Preoperative radiology reports were used to confirm tumor location and size based on largest single dimension. The extent of resection was based upon surgical operative notes and post-operative imaging.

Surgical details

All of the tumors were tackled surgically via partial or total laminectomy through a posterior approach, and maximum effort was made to prevent postoperative instability. Total en bloc removal was achieved in 56-cases (83.58%) without recurrence, and intralésional resection subtotal removal to avoid nerve damage and bleeding were done in 11-cases (16.41%). Among these cases, three recurrences occurred with the development of symptoms.

Results

Our cohort consisted of 38-females (56.71%) and 29-males (43.28%), with ages ranging from 17 to 75 years (mean: 41.45). The most common initial symptom was radicular pain (46-patients, 68.65%), 21-patients (31.34%) had signs and symptoms of myelopathy and sphincteric dysfunction at presentation. The average duration of symptoms before surgery was 1.53 years and ranged from 3-months to 6.10 years. The schwannoma was most often adjacent to one (31-patients, 46.27%) or two (36-patients, 53.73%) vertebral bodies (mean: 1.85 ± 0.86 ; median: 2 vertebral bodies). The most common regions of involvement were the lumbar spine (37-patients, 55.22%), followed by thoracic (16-patients, 23.88%), cervical segments (12 patients, 17.91%) and sacral region (2 patients, 2.98%). In 67-cases, the schwannomas were intradural extramedullary in 65-cases (97.01%) and in 2-cases it was extradural (2.98%). The median follow-up time for all cases was 15.9 months. Postoperative histological findings were schwannoma in all cases. At the time of discharge, 59-patients improved in terms of radicular pain and neurological deficits in comparison with their preoperative neurological status according to follow-up data records. Among 11-cases who underwent subtotal removal to avoid the nerve roots injury, we experienced 3-cases (4.47%) of local recurrence. All of them were located in the lumbar spine and had the previous history of subtotal removal. The preoperative symptoms were also segmental radiculopathy with sphincteric difficulty but no motor weakness. After second operation, two cases recovered but one showed persistent symptom

Discussion

Orthodox spinal schwannomas are benign tumors that can cause pain and significant neurological deficits due to displacement/compression of the parent peripheral spinal nerve and/or neighbor neural elements located within or in the vicinity of the spinal canal. Spinal schwannomas account for about 25% of primary intradural spinal cord tumors in

adults. The annual incidence of spinal schwannoma is 0.3–0.5/100,000 individuals. Literature revealed no significant prevalence difference between males and females (7.8.16-18). In our series, we noticed a somewhat higher prevalence in females, 38-cases (56.71%) with respect to males, 29-cases (43.28%). Reports showed a divergent incidence of the schwannoma regarding affected patients age who are between the 4th and the 5th decade (5.19.20). In this review, age span extending from 17 to 75 years (mean: 41.45 ± 13.74 years). Schwannoma show a pervasive development in the spine, though, the most commonly reported segment of the spinal cord is the cervical and lumbar regions to be affected (7.18.20.21). In our study, the higher incidence of the regions involved was: the lumbar spine 37-patients, (55.22%), followed by cervical 16-patients, (23.88%), thoracic segments 12-patients,(17.91%) and sacral 2-patients, (2.98%) (Figure1). Topographically, intradural location reported in 70-80% of spinal schwannomas, (Figure.1,2) while those extending through the dural aperture as a dumbbell mass with both intradural and extradural components(Figure 3),account for another 15%, Intramedullary schwannomas are extremely rare (13.22,23). In 67- cases reviewed in this study, 65-cases were intradural extramedullary (97.01%) and in 2-cases it was extradural (2.98%). Clinically, the initial symptoms are varied in accordance with the level of the tumor. The pain is localized, sharp in nature and mostly temporarily, due to the direct or indirect compression of the nerve root by the tumor. Later on, when compression increases to the spinal cord, spinal tracts get damaged and myelopathy develops [18.23-25]. Results revealed that the most common initial symptom in the majority of patients was a radicular pain (46 patients,

68.65%), followed by motor weakness, 21 patients (31.34%) had signs and symptoms of myelopathy and sphincteric dysfunction at presentation. Surgery is the mainstay of the spinal schwannomas, though total resection of spinal nerve sheath tumors has been considered to be feasible, some cases have resected incompletely [13.14.26]. In our study, due to anatomical difficulties total resection was not achieved in 7-cases. However, a righteous understanding of the surrounding structures anatomy and meticulous surgical techniques could overcome these hindrances. In case of residual tumor, a long-term observation is mandatory. Surgery for spinal schwannomas usually results in excellent postoperative functional outcomes, which correlates to the preoperative neurological condition of patient (figure 4). Total removal of schwannomas is generally feasible and curative. However, sub totally resected tumors with extensive Para spinal involvement, have a definite propensity to recur. Deficits resulting from the sacrifice of the involved nerve roots are usually minor and well tolerated (7.13.16.24.25). This analysis of 15.9-months median follow-up time of all cases showed that at the time of discharge, most of the patients appeared to be significantly improved in comparison with their preoperative neurological status. Among 7-cases underwent subtotal removal to avoid the nerve roots injury, 3-cases (4.47%) developed local recurrence. All of them were lumbar lesions. The preoperative symptoms were also segmental radiculopathy with sphincteric difficulty without motor weakness. Two cases recovered but one showed persistent symptom after the second operation.

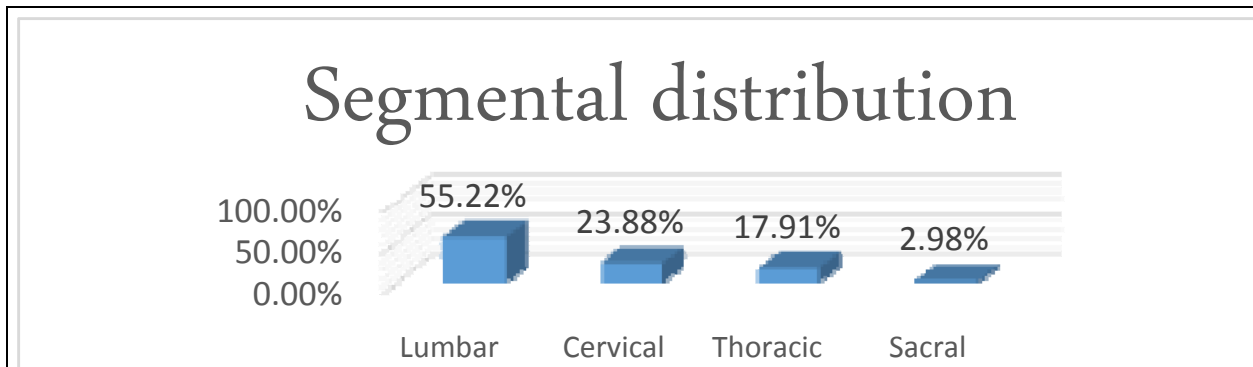


Fig 1: The percentage distribution of spinal schwannomas at various spinal segments.

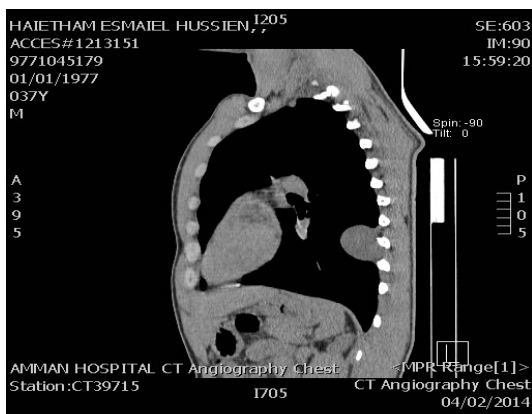


Fig 2a

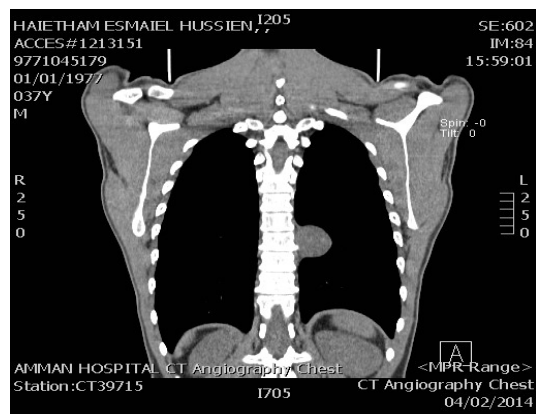


Fig 2b

Fig 2 A&B: Thoracic spine CT scan, sagittal and coronal cuts, showing an extensive schwannoma.

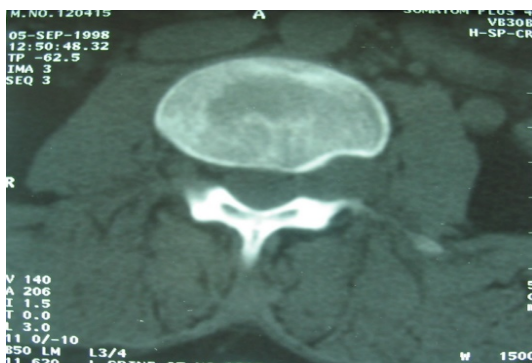


Fig 3a

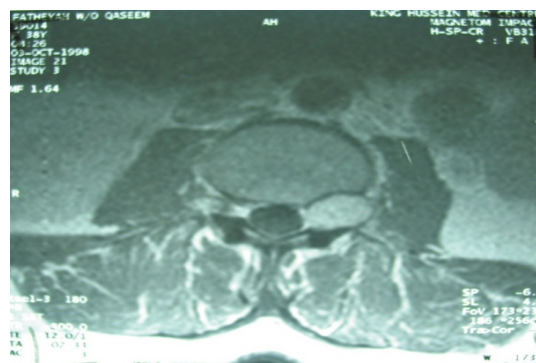


Fig 3b

Fig 3 A&B: a: axial CT scan cut, b: axial T1 contrasted MRI, both images showing Dumbbell shape schwannoma.



Fig 4a



Fig 4b

Fig 4 A&B: axial contrasted T1 MRI, thoracic Spine showing extensive schwannoma ,pre and post-operative

Conclusion

Conventional spinal schwannomas are benign tumors that can cause pain and significant neurological deficits. Most conventional spinal schwannomas occurred in the lumbar spine. Surgery for spinal schwannomas usually result in excellent postoperative functional outcomes. Schwannoma is generally separable from the underlying nerve, so marginal excision spares the parent nerve. Although there could be recurrence in cases of previous subtotal removal, these also show good or stable prognosis.

Limitations and Future Directions

This is a retrospective study of data without a standardized treatment protocol for spinal schwannomas. This study identified several knowledge gaps and opportunities for further research related to spinal conventional schwannomas. First, patients' NF status should be assessed and NF patients should be analyzed as a distinct subset. Second, it is critical to adopt a standardized classification system for conventional spinal schwannoma based on radiological imaging, such as the classification system proposed by Sridhar et al.

Ethics Statement

This study was carried out in accordance with the recommendations of Royal medical Services Ethical Committee for Medical Research, ethical approval (47/1/2018).

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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