Spinal Schwannomas; Classification, Management And Outcomes

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Abstract

Schwannomas are benign tumours of the peripheral nerve sheath. When they occur in spine, they are most commonly found in intradural-extramedullary location. Surgery is the mainstay of treatment. Radiation has a limited role in the management of residual or recurrent lesions not suitable for surgery. Here we discuss the existing literature on the outcomes of spinal schwannoma after surgery.

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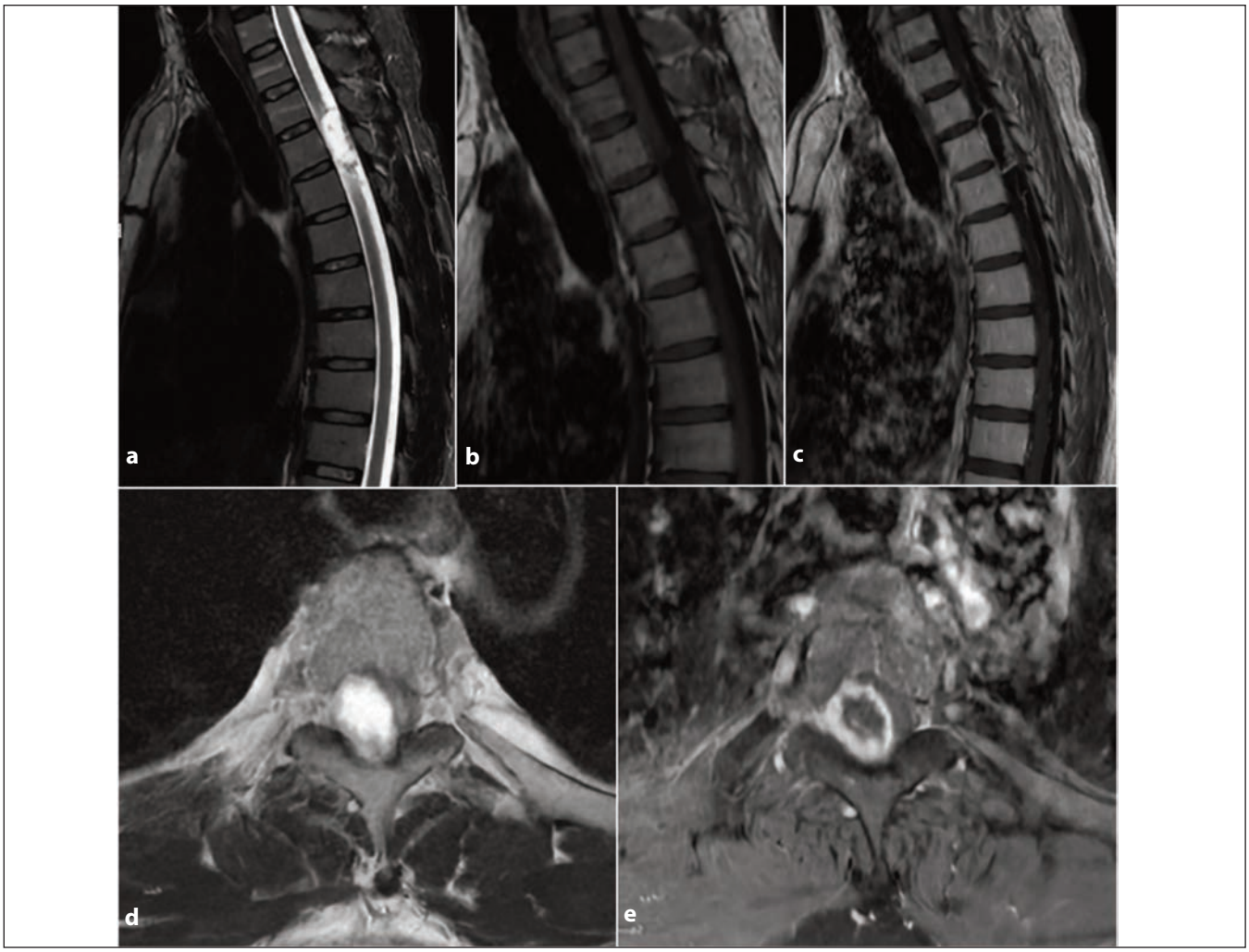

Figure: Biopsy proven spinal schwannoma. The lesion is well defined, hyperintense on T2(a), hypointense on T1(b), patchy peripheral contrast enhancement and central hypoitense area. The lesion is not extending into the neural foramen.

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Introduction

Spinal schwannomas (SS) are slow growing, encapsulated tumours with an annual incidence of 0.3–0.7 per 100,000.[1] They originate from a myelinated nerve sheath around the dorsal root.[2] The majority of lesions are intradural, but they

can also grow extradurally (10%) or combined intra-extradurally (10–15%). Although rare, intramedullary schwannomas are also identified.[3] These benign (WHO grade-1) tumours are most commonly intradural extramedullary spinal tumours and are often associated with neurofibromatosis type 2.[4] These tumours tend to develop an hourglass shape due to bony anatomy of the neural foramen during their growth, and are then called dumbbell tumours. The surgical approach is based on the classification of these tumours, with nine types of dumbbell tumours described in the literature.[5] Surgery is the treatment of choice for most symptomatic spinal schwannomas[2,6] Preoperative functional status and anatomical location have been found to be the most accurate indicators of surgical outcomes in extramedullary malignancies.[5,6] In this review, we have summarized the existing literature on surgical management of spinal schwannomas.

Review of Evidence

Ando et al.,[7] published a retrospective review of clinical presentation, management and outcomes of spinal schwannomas, and identified risk factors for postoperative motor and sensory deficits. A total of 244 patients (126 males and 118 females) over a period of 21 years were included. Gross total resection was achieved in 86.1% of the cases. Postoperative motor deficits were seen in 13.1% and sensory deficits in 20.5% of cases.[7] Preoperative motor weakness, gait disturbance, dumbbell Eden type II, subtotal resection, and operative time were significantly associated with postoperative motor deficits. Preoperative gait disturbance and subtotal resection were linked to postoperative sensory deficits.[7]

Cofano et al.,[8] published a retrospective review of 12 years data for spinal intradural extramedullary lesions (IDEM) in two different hospitals. Forty-three percent of the study population (n=108) had spinal schwannoma. Gross total resection was achieved in 84.3% (210/249) of all IDEM, which was most common in spinal schwannomas; 45.2% (n=95/108). Subtotal resection was achieved in 39(15.6%), out of which 13 cases were schwannomas, and only 3 of them progressed. Postoperative neurological deficit on McCormick grades was found directly linked to preoperative deficits.[8] Patients who underwent resection with intraoperative neuromonitoring (IONM) had significantly less neurological worsening at follow-up compared to the non-IONM group (p=0.01). However, the extent of resection was not related to the use of IONM.[8]

A prospective cohort by Newman at el.,[9] analyzed patients reported outcomes after surgical resection of IDEM spinal tumours over a period of 4 years. A total of 57 patients were included, and (61%) of patients had spinal schwannoma. Postoperative brief pain inventory showed a significant decrease in pain severity, pain interference with daily life and overall pain experience for all patients. (p<0.0001). A statistically significant improvement in mean score in general activity, walking ability, mood, ability to participate in normal work, quality of relations, quality of sleep, and enjoyment of life was also observed (p<0.001).[9] Analysis of MD Anderson symptom inventory also showed significant improvement in sleep, pain, fatigue, drowsiness, sadness, numbness, spine pain and limb weakness after surgical resection (p<0.05).[9] However bladder and bowel control, bowel patterns and sexual function did not significantly improve with surgery (p>0.05).[9]

Hohenberger et al.,[10] published a retrospective review of their institutional database over a period of 20 years. Ninety consecutive patients were identified with SS who underwent surgical resection and were followed for 12 months. Gross total resection was achieved in 93.3 % versus subtotal resection in 6.7% of patients.[10] Postoperative complications were observed in 7.7% of patients out of which 2.2 % required revision surgery. After surgery, 59.7% of the patients fully recovered from local back pain, and 69.5% recovered from radiating pain ($p < 0.001$). Preoperative sensory (78.1%) and motor (80%) deficits were also seen to improve. New postoperative neurological deficit was observed in 25 (27.7%) patients (motor=3, senosory=23, both=1), although all motor and 69.5 % of sensory deficits improved at 12 months follow-up.[10] A significantly higher proportion of new deficits were observed in patients where the nerve root was infiltrated by the tumour and surgery was performed without IONM (p<0.05).[10]

Conclusion

Spinal schwannomas are the most common intradural extramedullary spinal tumours. Surgery is the mainstay of treatment with excellent patient reported and neurological outcomes. The use of intra-operative neuromonitoring has the potential to decrease post-operative deficits however requires further investigation to establish its effectiveness.

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