Peripheral nerve sheath tumors – case series in tertiary health care center in the central India

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INTRODUCTION

Peripheral nerve sheath tumors (PNST) encompass a spectrum of well-defined clinicopathologic entities, ranging from benign neural tumors to high-grade malignant PNST (MPNST), which are often resistant to conventional treatments. A subset of peripheral nerve tumors is difficult to classify, demonstrating hybrid morphologic features overlapping with previously discrete diagnostic categories, such as schwannoma and perineurioma. Neurofibromas are benign tumors, they are mixture of non-neoplastic peripheral nerve components perineurial cells, axons, fibroblasts, and variable inflammation, grossly neurofibromas are tan white, glistening on cut section and growth pattern is either well defined intraneural or diffuse infiltration of soft tissue at extraneural site.

Neurilemmomas are benign neoplasm of schwann cell origin, grossly it is well circumscribed masses with degenerative changes and variable admixture of compact spindled Antoni A areas and hypocellular myxoid. Schwannoma variants include cellular schwannoma and plexiform schwannoma.

MPNST arising from a peripheral nerve or in extraneural soft tissue and showing nerve sheath differentiation.

CASE PRESENTATION

We identified 26 cases of PNST including a rare site of parapharyngeal region and as a mesenteric mass. The age ranged from 12 to 65 years with most patients being in the 4th and 5th decade. M: F ratio is 1.3:1.
Case 1–10
Out of total 26 cases, 18 were found to be of Schwannoma, among 18 cases of schwannoma, 10 case were of classical type schwannoma, showing typical antoni A and antoni B type cells and alternate hypo and hypercellular areas.

Case 11–13
Out of 18 schwannoma cases, three being morphologically found as ancient schwannoma, because cells exhibiting marked pleomorphism, myxoid degeneration, hemorrhage, and cystic changes (Figure 1a–c).

Case 14–16
Out of 18 schwannoma cases, three being morphologically found as cystic schwannoma, the tumors grossly presented as cystic mass with thin septations, filled with serous fluid inside, cyst wall showing changes of neural tumor of schwannomatous origin, two cases were involving extremities (Figure 2a–c).

We found one of the cystic schwannomas at very rare site, presented as mesenteric mass, of aged 43 years female, present in out patient department with palpable lump lower abdomen (left side), on guided aspiration only mucinous fluid mixed with blood was aspirated, then she was advised for histopathological examination (HPE) for confirmation and typing of lesion. Post-operative specimen received in our histopathology section. Grossly, an encapsulated mass received measuring 10.5×8.5×6 cm, which on cut section cystic-solid to variegated in appearance, multiple sections taken and processed. On microscopic examination, there were many large cystic areas filled with mucinous fluid and at places hemorrhagic areas seen. Cyst wall showing a sheet of spindle shaped tumor cells with wavy nuclei, arranged in herring-bone pattern showing alternate hypocellular and hypercellular (antoni A and B) areas with myxoid stroma and presence of verocay bodies at places (Figure 3a–e).

Case 17
Among all schwannoma cases, one was diagnosed as cellular schwannoma, present at unusual location of parapharyngeal region, showing high cellularity but having minimal pleomorphism.

Case 18
Among all schwannoma cases, one was of plexiform type schwannoma, located at popliteal fossa of young child,
mimicking plexiform neurofibroma, but showing nodular configurations with alternate hypo and hypercellular areas (antoni A and B areas) (Figure 4a-c).

**Distribution of tumors (schwannoma)**
Tumor was distributed all over the body involving central nervous system (CNS) to the nerves located at the periphery. Among these, three were presented as intradural-extradural space occupying lesions (SOL), two were presented extradurally located at L3-L4 region, one located at CP angle, one case located at parapharyngeal region, which is highly uncommon site for this tumor (Table 1).

On HPE, it was diagnosed as cellular type schwannoma which was again a rare variant (Figure 5a-f).

Remaining cases include one at supraclavicular region, one-one cases at right vestibule and acoustic region also, remaining cases were from the upper and lower extremities. The case of plexiform schwannoma is also an uncommon variant which was located at popliteal fossa of a young child.

**Case 19–23**
The second most common type was of neurofibroma, out of seven cases of NF, five cases were being of classical type.

**Case 24–25**
Remaining two cases were identified as plexiform type neurofibroma. Two cases of plexiform neurofibroma were involving peripheral region (Figure 6a and b).

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**Figure 3:** (a-e) Cystic schwannoma-mesenteric mass. (a) Gross-encapsulated intact mass. (b) Cut section-cystic-solid to variegated in appearance, cyst filled with mucinous fluid and blood clots. (c) Microscopic examination showing cystic and hemorrhagic areas (H and E stain, ×400). (d) Cystic spaces filled with mucinous material and cyst wall formed by solid sheet of tumor cells (H and E stain, ×400). (e) Tumor cells forming verocay bodies with palisaded nuclei (H and E stain, ×1000)

**Figure 4:** (a-c) Plexiform schwannoma. (a) Plexiform pattern H and E stain (×100). (b) Biphasic areas H and E stain (×100). (c) Spindled cells with indistinct cytoplasm and elongated nuclei H and E stain (×400)
This tumor was also distributed from CNS to the nerves located at the periphery. Among these, three were presented as intradural-extramedullary SOL, one was intradural in location, one case of neurofibroma presented as axillary mass, which was incidentally diagnosed in case of infiltrating ductal carcinoma of breast in female of age only 31 years. (Table 2)

Case 26
We found only one case of malignancy, which was diagnosed as MPNST, the case was presented as retroperitoneal mass located near appendix, which was uncommon site for neural tumors (Table 3).

The tumor exhibits high pleomorphism and mitosis as well necrosis but morphologically neural origin was maintained focally (Figure 7a-e).

### DISCUSSION

The PNST is characterized by neoplastic proliferations with Schwann cell differentiation, represents the primary neoplastic cell component of neurofibroma,

Schwannomas occur at all ages but most common found in between the ages of 20 and 50 years with equal distribution. Schwannomas are usually solitary sporadic lesions found in head, neck, and flexor surfaces of the upper and lower extremities. Consequently, the spinal roots and the cervical, sympathetic, vagus, peroneal, and ulnar nerves are most commonly affected. In a population-based study of schwannomas, about 90% were sporadic, 3% occurred in patients with neurofibromatosis type (NF)2, 2% in those with schwannomatosis, and 5% in...
Table 2: Demographic distribution of cases of neurofibroma (n=7)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Age</th>
<th>Sex</th>
<th>Site</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>32</td>
<td>M</td>
<td>Intradural tumor</td>
<td>Neurofibroma</td>
</tr>
<tr>
<td>20</td>
<td>27</td>
<td>M</td>
<td>Intradural-extradural SOL</td>
<td>Neurofibroma</td>
</tr>
<tr>
<td>21</td>
<td>38</td>
<td>M</td>
<td>Intradural-extradural SOL</td>
<td>Neurofibroma</td>
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<tr>
<td>22</td>
<td>31</td>
<td>F</td>
<td>Axillary mass</td>
<td>Neurofibroma</td>
</tr>
<tr>
<td>23</td>
<td>50</td>
<td>M</td>
<td>Intradural-extradural SOL</td>
<td>Neurofibroma</td>
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<tr>
<td>24</td>
<td>65</td>
<td>F</td>
<td>Left hand</td>
<td>Plexiform neurofibroma</td>
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<tr>
<td>25</td>
<td>12</td>
<td>M</td>
<td>Painful swelling right wrist</td>
<td>Plexiform neurofibroma</td>
</tr>
</tbody>
</table>

M: Male, F: Female, SOL: Space occupying lesions

Table 3: Demographic distribution of cases of MPNST (n=1)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Age</th>
<th>Sex</th>
<th>Site</th>
<th>Diagnosis</th>
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<tbody>
<tr>
<td>26</td>
<td>51</td>
<td>F</td>
<td>Retroperitoneal mass, appendix</td>
<td>MPNST</td>
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</table>

F: Female, MPNST: Malignant peripheral nerve sheath tumors

There is a rare variant called cystic schwannoma first described in 2008. It is a rare site for cystic schwannoma. On microscopy, tumor showed cyst formation and classical biphasic pattern. It was treated with local excision and there was no history of recurrence.

The growth pattern of neurofibromas is localized, diffuse, or plexiform, localized form is seen most commonly as a superficial and solitary tumor. Diffuse and plexiform neurofibromas are associated with NF1, sporadic neurofibromas occurring in NF1. In the series by Geschickter, about 90% of neurofibromas were of the solitary or sporadic type, and the remainder was found in the setting of NF1. In our study, seven cases of neurofibroma, five being localized variants, sporadic in origin and two being plexiform variant associated with NF1 were found. An unusual case of 31-year-old female presented in surgical outpatient department with a right breast lump in the lower outer quadrant measuring 9×7×3 cm and palpable axillary mass measuring 6×3.5×3 cm for the past 8 months. On microscopy, the breast lump was diagnosed as invasive duct carcinoma (mucinous type) and the axillary mass turned out to be localized variant of neurofibroma. On gross examination of axillary mass was a solid grey-white nodule with glistening tan white cut surface. HPE showed presence of Schwann cells with wavy serpentine nuclei intermixed with collagen. This is a very rare presentation of neurofibroma with invasive duct carcinoma of breast.

MPNST is mostly found in patients 20–50 years of age. The most common locations are the trunk and extremities, followed by the head-and-neck area. Most frequently affect the sciatic nerve. The presenting symptoms are an enlarging painful or painless mass. In our study, the incidence being in 4th decade appearing as rapidly growing retroperitoneal mass with metastasis to lung, liver, and bone. The patient presented with abdominal pain, lower back pain, and loss of appetite. On microscopy, a striking herringbone pattern of spindle cells with brisk mitotic activity, necrosis, and focal myxoid areas were seen. Fibrosarcoma was considered a differential diagnosis. Tumor cells showed positivity for S-100 and was diagnosed as MPNST.
CONCLUSION

Cellular schwannoma of parapharyngeal space is very rare and is associated with overall excellent prognosis. Neurofibroma can rarely present with invasive duct carcinoma of breast. Surgical excision and histopathological examination is mandatory for all the cystic, solid-cystic, or solid masses whether they are involving extremities, retroperitoneal, or presented as intra-abdominally. Another important site is CNS presenting as SOL. This emphasizes the importance of thorough examination of specimen for any incidental neural tumors. Excision followed by adjuvant radiotherapy is the mainstay of treatment in cases of malignant peripheral nerve sheath tumors. Difficulty in accessibility of cranial MPNST explains the subtotal resection and hence poor prognosis in such cases, metastasis to the spinal cord is the most often site followed by lung and bone. A close post-operative follow-up is highly recommended to prevent further recurrence and complication.

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REFERENCES


11. Weiss SW, Langloss JM and Enzinger FM. Value of S-100protein


Authors Contribution:
SM- Concept and design of the study, interpreted the results, reviewed the literature, and manuscript preparation; MS- Concept and design of the study, interpreted the results, reviewed the literature, and manuscript preparation and revision of the manuscript; RKC- Interpreted the results, reviewed the literature, statistically analyzed and interpreted, and preparation of manuscript; and SS- Interpreted the results, concept, coordination, review of literature, and manuscript preparation.

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