The Journal of Laryngology and Otology
November 1985. Vol. **99**. pp. 1151–1159

Solitary neurogenic sarcoma of the nose

by

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Introduction

Neurogenic sarcoma is a rare tumour which has many synonyms, including neurofibrosarcoma, malignant Schwannoma, and malignant neurilemmoma. This diversity reflects the uncertainty regarding the cell of origin. Whilst in seems that the majority of neurogenic neoplasms, benign and malignant, are of Schwann cell origin (Batsakis, 1974), the possibility has been raised that they may be neurofibromatous, i.e. derived from perineural fibroblasts (Abell *et al.*, 1970). An uncommitted attitude to the histogenesis of this group of tumours is adopted here by referring to them as neurogenic, either benign or sarcomatous.

Approximately 25 per cent of all reported benign Schwannomas are found in the head and neck (Katz *et al.*, 1971). Incidence rates for neurogenic sarcoma are unreliable owing to their paucity but Kragh *et al.* (1960) from the Mayo Clinic reported four cases in comparison to 148 benign lesions in the period 1910–1957: the latter included tumours of the brachial plexus and lower cervical regions where they commonly arise. Oberman and Sullenger (1967) described three malignant compared to 38 benign tumours, but made no mention of true incidence. The reported incidences of malignant change in the benign neurogenic tumours of von Recklinghausen's disease vary widely from an 'enlightened guess' of 5 per cent by Stout (1949) to 16.4 per cent by Preston *et al.* (1952).

We report here a case of neurogenic sarcoma of the nose in a patient who showed no evidence of von Recklinghausen's disease. Reference to only one previous report (Conley, 1955) has been found in a patient who had received over-zealous radiotherapy for severe eczema of her face. She developed a superficial malignant Schwannoma of the tip of nose and a fibrosarcoma of the upper lip: both tumours developed seven years after approximately 150 exposures to X-rays of unknown dosage.

Case Report

A retired male motor mechanic aged 71 years was referred by his general medical practitioner with a tentative diagnosis of rhinophyma. His only symptom was a diffuse swelling on the right side of his nose (Fig. 1), which had enlarged over four to five months.

Clinical examination revealed a firm subcutaneous, circumscribed lump in the right ala nasi fixed to the skin externally and mucosa internally at the region of the junction of the upper and lower lateral cartilages. Radiology confirmed that the maxilla was not involved. An initial biopsy was taken through an intercartilaginous incision under local anaesthesia. The lesion felt granular on cutting. Pieces were examined with both light and electron microscopes. These both revealed a malignant connective tissue tumour.

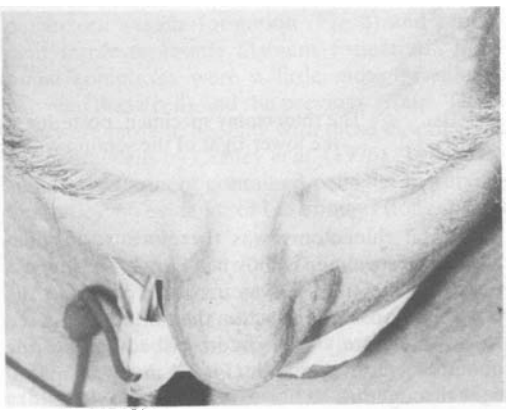

FIG. 1

The swelling and deformity of the right side of the nose.

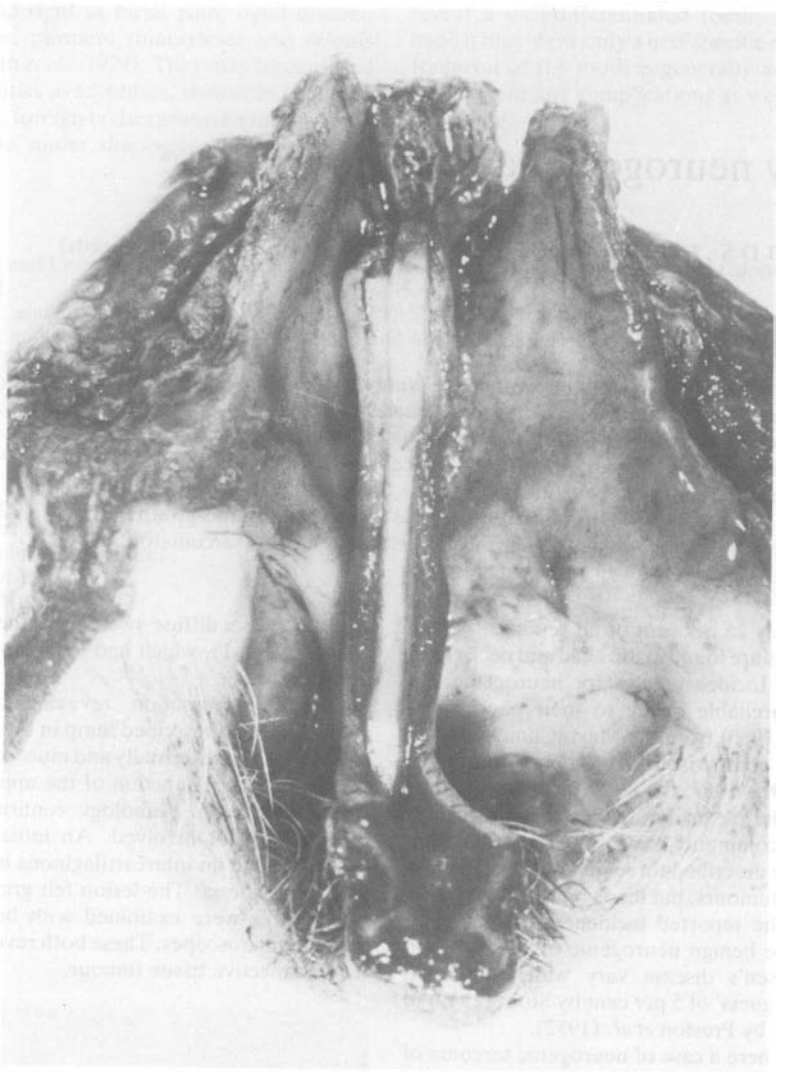

FIG. 2

The rhinectomy specimen, posterior aspect. The tumour is seen as a white area to the lower right of the septum with the biopsy incisions at the upper margin.

A total rhinectomy was therefore performed. The major specimen is shown in Fig. 2. The mucosa overlying the tumour was irregular owing to the previous biopsies. On section the tumour appeared to be moderately well-circumscribed, measuring about 1.5 cm. in diameter (Fig. 3) and was opalescent throughout.

Histological examination revealed a densely cellular lesion (Fig. 4), with cells ranging from 10–20 μm. in diameter with a high nucleo-cytoplasmic ratio. The nuclei were round or elongated, often somewhat irregular or cleaved, with clumped chromatin.

Many areas showed a tendency to 'streaming' and a 'tandem' arrangement of nuclei was common. Mitotic activity was seen but was not marked, with approximately one mitotic figure per high power field (×400). Widespread 'microcyst' formation was seen in many areas: these contained no mucin or hyaluronic acid. Taken together, the above fea-

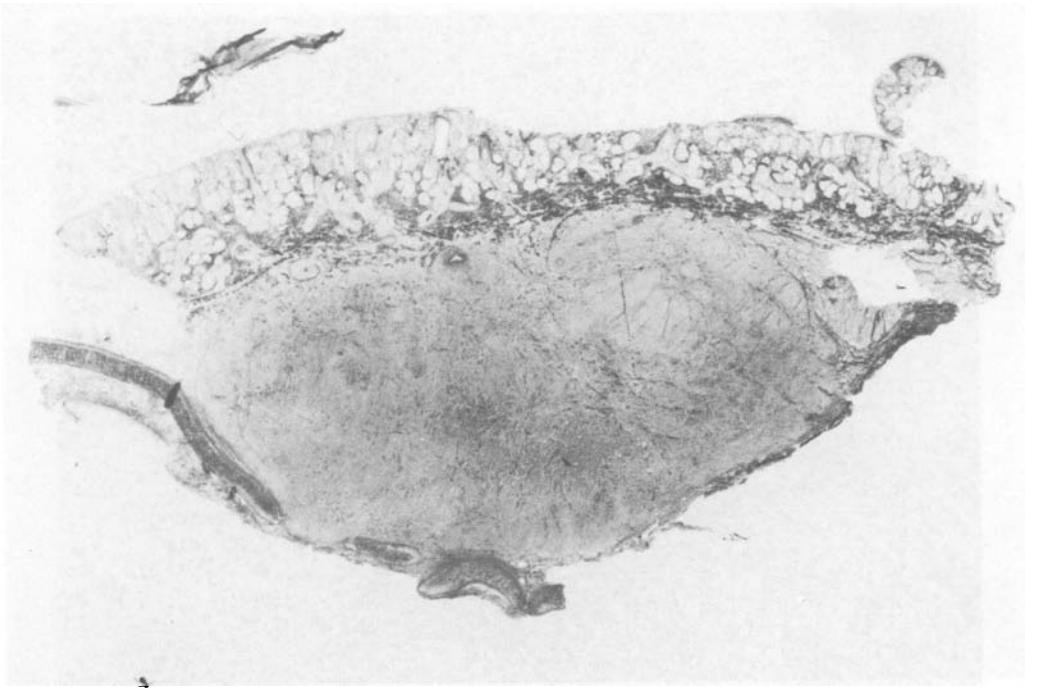

FIG. 3

The well-defined tumour mass at the centre, overlaid by the skin of the nose with prominent adnexae. The lower margin reveals fragments of cartilage covered by nasal mucosa. (Magnification ×5.)

tures were suggestive of a Schwannoma showing Antoni Type B appearances. However, no convincing 'Verocay bodies' were identified.

Examination of the margins of this tumour revealed undoubted invasion. Tumour was seen invading cartilage (Fig. 5), muscle (Fig. 6) and skin adnexae. The tumour therefore appeared to exhibit the morphological appearances of a Schwannoma, but was behaving in a malignant fashion. Electron microscopy was therefore undertaken to try and identify the stem cell.

Electron microscopy of two discrete areas from the centre of the lesion revealed similar features. These were a mixture of cells showing a biphasic pattern, lying in prominent extracellular material containing occasional fibroblastic cells.

One group of cells showed a complex interdigitating pattern of cellular processes with predominantly complete basal lamina (Fig. 7), and areas of excessive intercellular basement membrane material. They exhibited prominent ergastoplasm, Golgi membranes, centrioles, occasional myelin whorls (Fig. 8), intracytoplasmic filaments and occasional junctional complexes.

Occasional lysosomal dense bodies were also seen. These features were all suggestive of Schwann cells, and accord well with those reported in the nitrosourea-induced neurinomas described by Conley *et al.* (1976). The other group of cells showed a discontinuous basement membrane, with pinocytotic vesicle formation (Fig. 8) and prominent intracytoplasmic filament formation. Junctional complexes were a little more prominent between these cells and the previous group. These cells were more in keeping with those described as perineural cells by Conley *et al.* (1976). The extracellular component contained collagen in varying quantities: no evidence of Luse bodies (long spaced collagen) was seen.

Discussion

The tumour consisted of cells with features of both Schwann cells and perineural cells and exhibited undoubted invasion of muscle, cartilage and skin adnexae; however, it does not satisfy every criterion outlined by D'Agostino *et al.* (1963), for the diagnosis of primary malignant neoplasia of

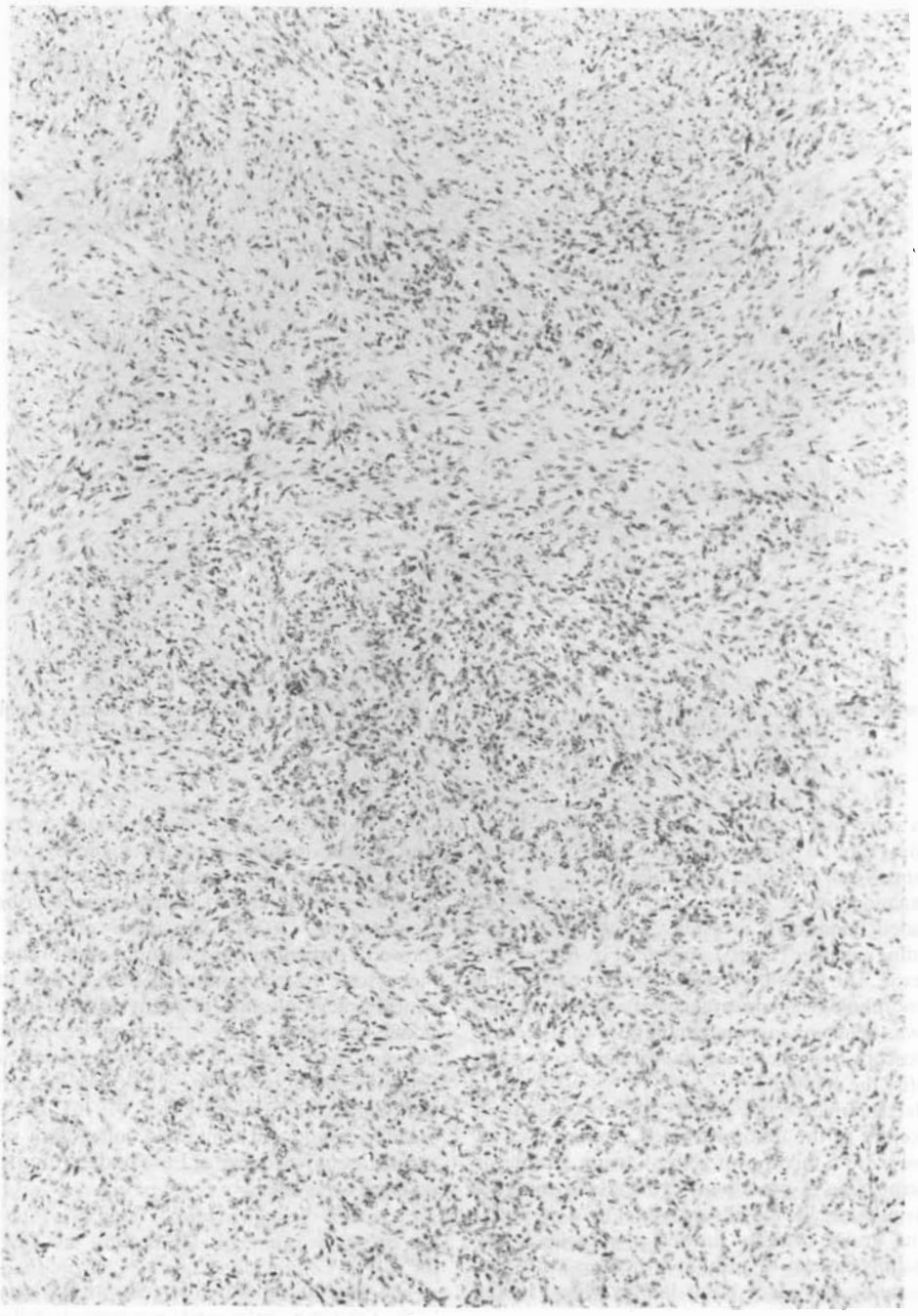

FIG. 4

A low power view showing a densely cellular tumour showing some features of Schwannomas. (Magnification ×80.)

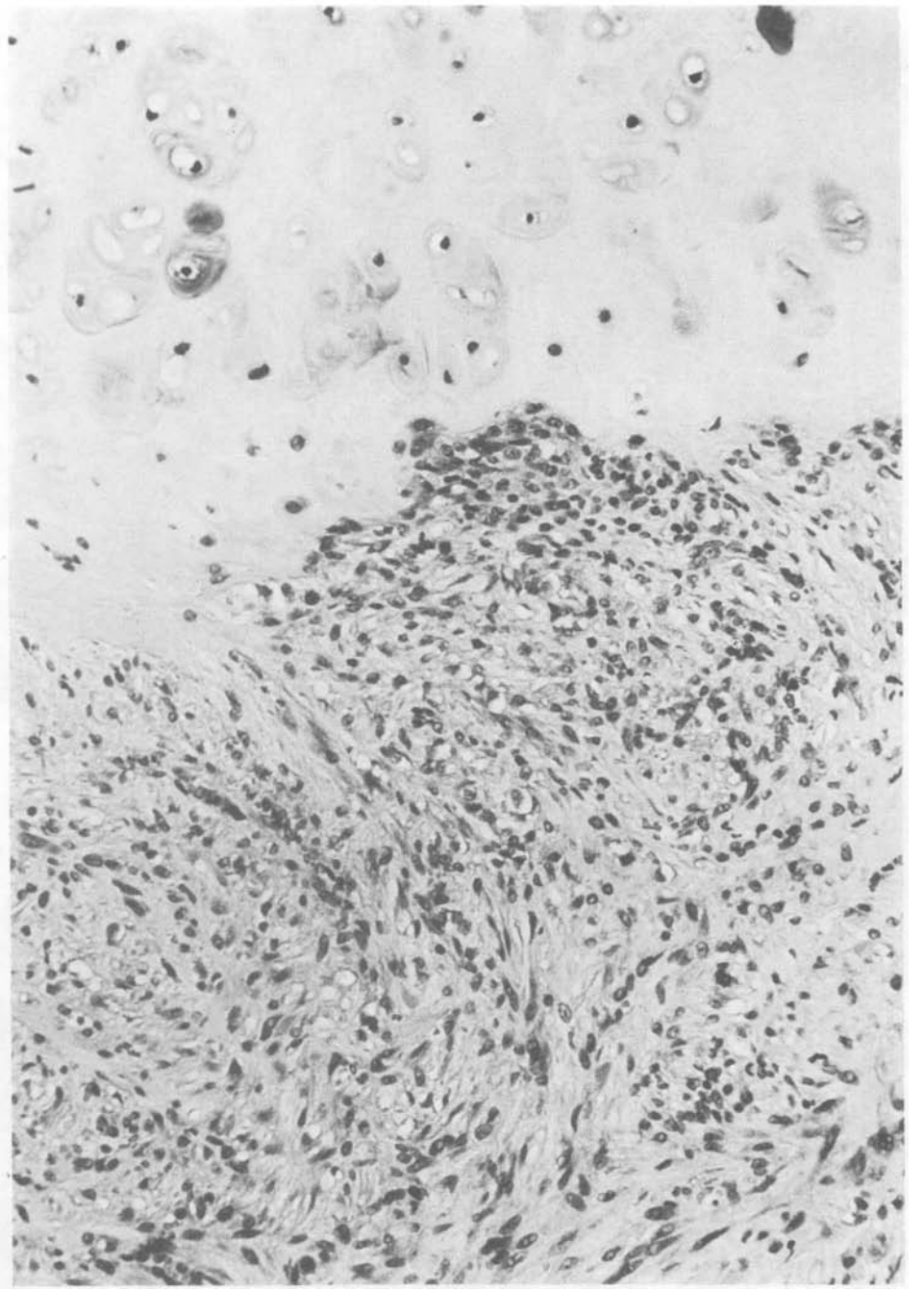

FIG. 5

This shows the tumour invading nasal cartilage. Also well demonstrated are the 'streaming' of cells, and early 'microcyst' formation reminiscent of Antoni 'B' areas of benign Schwannomas. (Magnification ×80.)

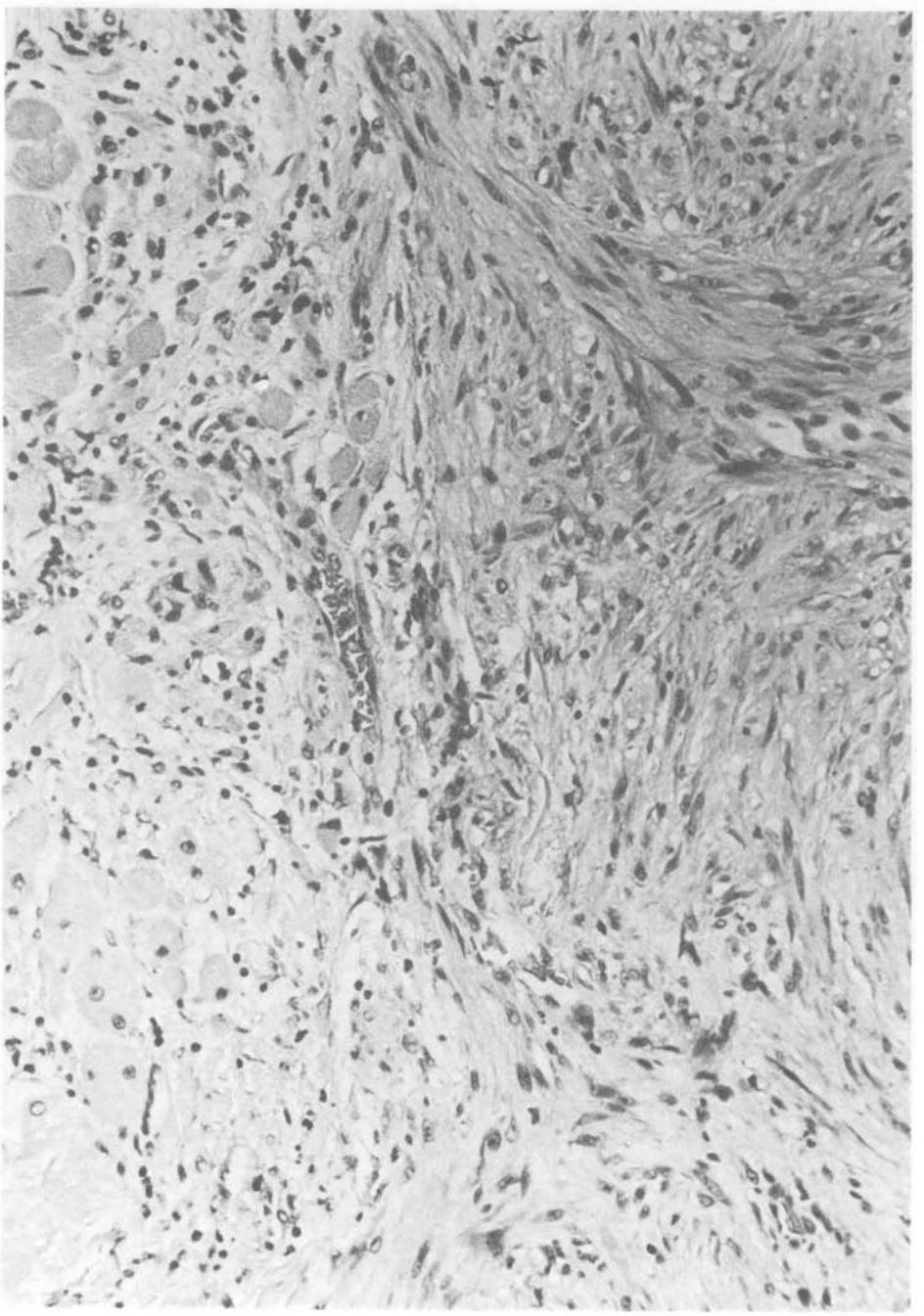

FIG. 6

Diffuse invasion of muscle at the left of the picture is seen. (Magnification ×80.)

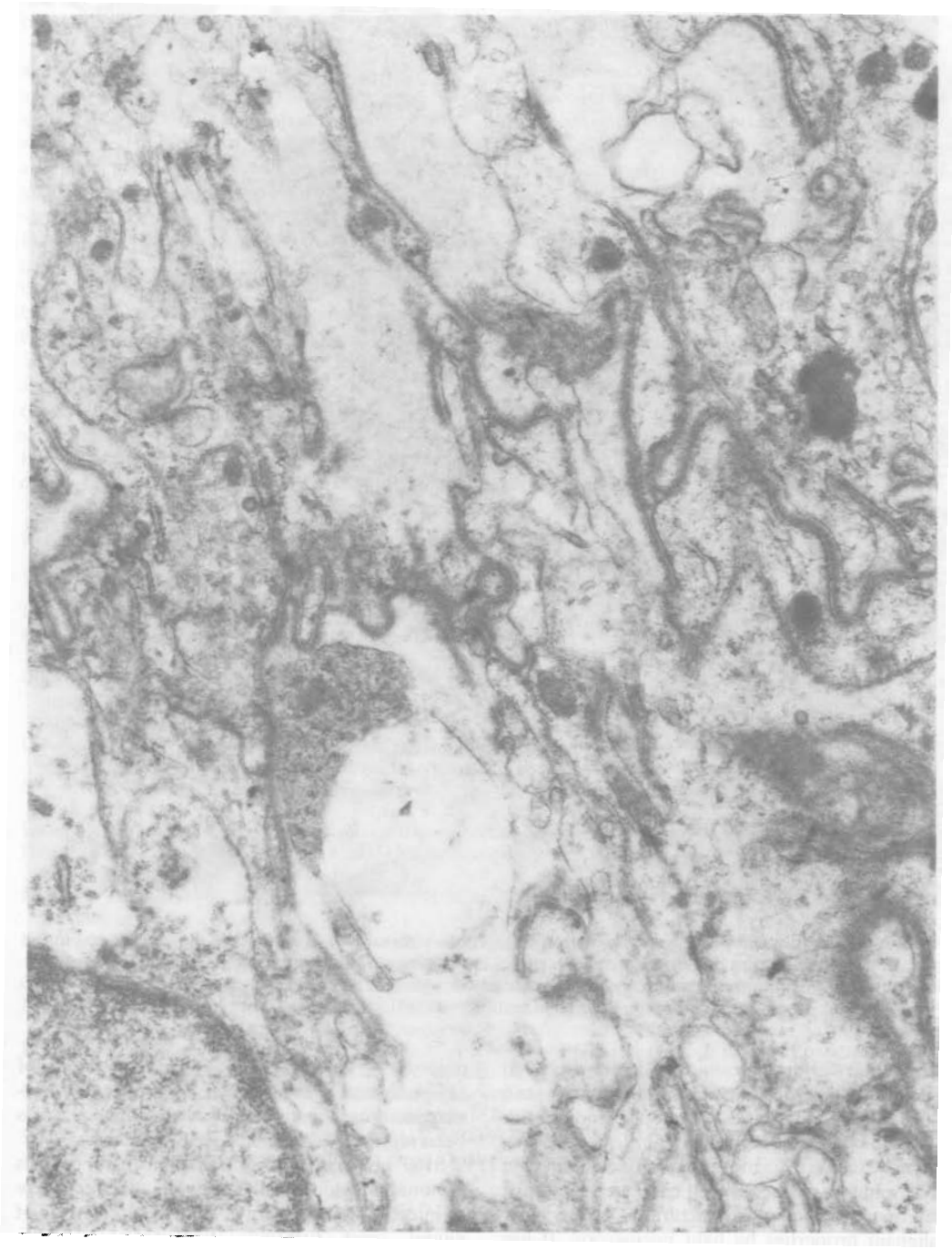

FIG. 7

Elongated cells with a lamellar pattern of closely packed parallel or interdigitating cell processes separated by abundant intercellular basement membrane material. Also seen are a few lysosomal dense bodies. (Magnification ×45,000.)

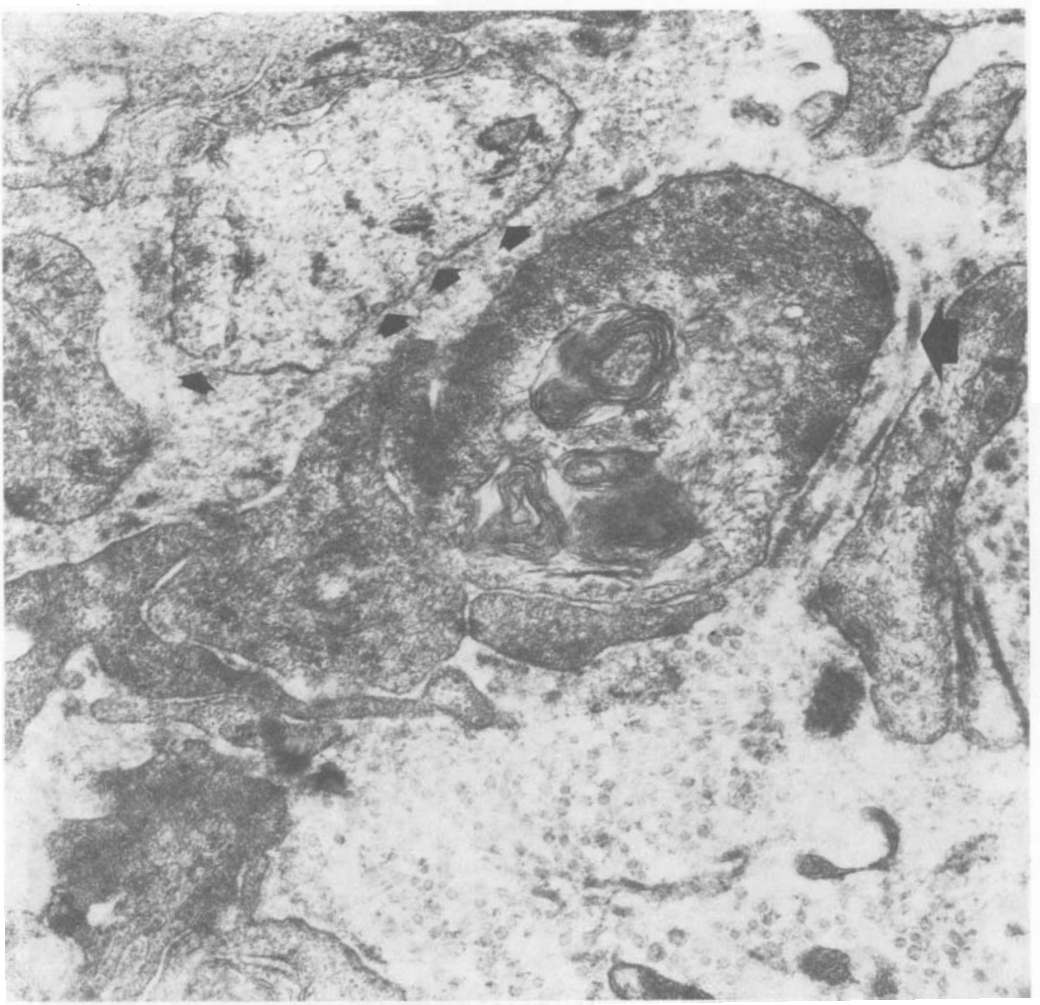

FIG. 8

This shows numerous cell processes lying within collagenous stroma. The cytoplasm of the cell process in the centre of the field contains membrane-bound vacuoles enveloping poorly-formed myelin 'whorls'. The smaller arrows indicate micropinocytic vacuoles. The larger arrow indicates a collagen fibril in longitudinal section. (Magnification ×45,000.)

nerve in that the tumour cannot be demonstrated to originate from a nerve trunk. Nerves were seen proximal to the tumour, but tumour blending with epineurium was not identified. This, in our view, does not exclude a diagnosis of neurogenic sarcoma as Schwann or perineural cell characteristics have been demonstrated ultrastructurally, and its clear malignant properties by light microscopy. It has been pointed out by Robitaille *et al.* (1975) that it is extremely difficult to identify continuity with a nerve in Schwannomas of the nose or sinuses.

The mitotic activity accords well with that reported by Ghosh *et al.* (1973) in their review of 115 malignant Schwannomas. No evidence of cartilagenous or osseous metaplasia was found, as has been reported occasionally in these tumours.

S100 protein staining was performed on this tumour and whilst results were negative they were of interest. S100 protein is highly characteristic of neural crest tumours (but not exclusively restricted) and was applied by Weiss *et al.* (1983) to 36 malignant Schwannomas, obtaining negative results in 18 of these; he suggested that its presence is related to degree of differentiation in these

tumours, and on that basis this tumour appears poorly-differentiated.

Malignant neurogenic sarcomas other than those arising in von Recklinghausen's disease are rare and this appears to be the first spontaneous case reported to arise in the nose since the only other was ascribed to radiation (Conley, 1955). The radiation was given to treat severe eczema but seven years later resulted in the development of a fibrosarcoma of lip and a neurofibrosarcoma of the nose. In that case no electron microscopic studies were performed to confirm the diagnosis which, according to Henderson and Papadimitriou (1982), may be the only definitive means of morphological identification of the predominant cell type.

The solitary nature of the lesion described here and the absence of stigmata of multiple neurofibromata appear to have important consequences in terms of prognosis. According to Hajdu (1979) those patients with a neurogenic sarcoma complicating von Recklinghausen's disease did significantly worse than those with a solitary neurogenic sarcoma.

Conclusion

This case describes an exceedingly rare tumour, which can only be diagnosed as a malignant 'spindle cell' tumour on light microscopy and which required electron microscopic examination to identify the cells of origin. However, on the basis of this case, it is not possible to advance the controversy related to the cell of origin of nerve sheath tumours which will require further work on the role and behaviour of the Schwann cell and perineural cell for confident assessment.

Acknowledgements

Our thanks are due to Mr. David Hanson for his kind permission to report on his patient. Also we would like to thank Dr. C. Gray and Dr. S. Aparicio for advice and assistance with the interpretation of the electron micrographs.

References

ABELL, M. R., HART, W. R., and OLSON, J. R. (1970) Tumours of the peripheral nervous system. *Human Pathology*, **1**: 503.

BATSAKIS, J. G. (1974) *Tumours of the Head and Neck*. Williams and Wilkins Company, Baltimore, p. 235.

CONLEY, J. J. (1955) Malignant Schwannoma of tip of nose. *American Medical Association Archives of Otolaryngology*, **62**: 638–640.

CONLEY, F. K., RUBINSTEIN, L. J., and SPENCE, A. M. (1976) Studies on experimental malignant nerve sheath tumours maintained in tissue and organ culture systems. II. Electron Microscopy observations. *Acta Neuropathologica*, **34**: 293–310.

D'AGOSTINO, A. N., SOULE, E. H., and MILLER, R. H. (1963) Primary malignant neoplasms of nerves in patients without manifestations of multiple neurofibromatosis. *Cancer*, **16(2)**: 1003–1014.

GHOSH, B. C., GHOSH, L., HUVOS, A. G., and FORTNER, J. G. (1973) Malignant Schwannoma: a clinicopathologic study. *Cancer*, **31**: 184–190.

HAJDU, S. I. (1979) *Pathology of Soft Tissue Tumours*. Lea and Febiger, Philadelphia. p. 457.

HENDERSON, D. W., PAPADIMITRIOU, J. M. (1982) Ultrastructural Appearances of Tumours. *A Diagnostic Atlas*, Churchill Livingstone, Edinburgh. p. 200.

KATZ, A. D., PASSY, V., and KAPLAN, L. (1971) Neurogenous neoplasms of major nerves of face and neck. *Archives of Surgery*, **103**: 51.

KRAGH, L. V., SOULE, E. H., and MASSON, J. K. (1960) Benign and malignant neurilemmomas of the head and neck. *Surgery, Gynaecology and Obstetrics*, **111**: 211–218.

OBERMAN, H. A., SULLENGER, G. (1967) Neurogenous tumours of the head and neck. *Cancer*, **20**: 1992–2001.

PRESTON, F. W., WALSH, W. S., and CLARKE, T. H. (1952) Cutaneous neurofibromatosis (von Recklinghausen's disease) clinical manifestations and incidence of sarcoma in 61 male patients. *Archives of Surgery*, **64**: 813.

ROBITAILLE, Y., SEEMAYER, T. A., and EL DEIRY, A. (1975) Peripheral nerve tumours involving paranasal sinuses: a case report and review of the literature. *Cancer*, **35**: 1254–1258.

STOUT, A. P. (1949) Tumours of the peripheral nervous system. *Atlas of Tumour Pathology*, Section 2, Fascile 6, Armed Forces Institute of Pathology, Washington D.C.

WEISS, S. W., LANGLOSS, J. M., and ENZINGER, F. M. (1983) Value of S100 protein in the diagnosis of soft tissue tumours with particular reference to benign and malignant Schwann cell tumours. *Laboratory Investigation*, **49**: 299–308.

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