Localized sympathetic overactivity: an uncommon complication of lung cancer

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SYNOPSIS Direct nerve infiltration by tumour tissue usually produces pain, and loss of motor, sensory, and autonomic function. Two patients are reported in whom a major symptom of nerve infiltration was sympathetic overactivity manifested by excessive spontaneous sweating.

FIG. 1 *Case 1. Posterior thoracic area illustrating spontaneous piloerection on the left side.*

Lung cancer is a common malignant disease which may present with unusual clinical symptoms and signs (Joseph, 1965). The most frequent neurological complications are metastasis to the brain or spinal column, and direct invasion of the brachial plexus or of nerves within the thorax.

Direct neural invasion commonly produces pain, and impairment of sensory and motor function; impairment of autonomic function is not obvious either to the patient or to the examiner, with the exception of those patients with apical lung tumours who may develop Horner's syndrome (Pancoast, 1932). Localized autonomic overactivity has been reported occasionally in association with apical lung cancer (Hepper *et al.*, 1966) but it is rarely the major symptom of presentation; for this reason the following two cases are reported.

CASE 1

This 40 year old Frenchman was referred from New Caledonia with a two month history of pain radiating from below the left shoulder-blade around the trunk on the left to just above the umbilicus. There had been no rash or other symptoms; the pain was relieved slightly by lying with the legs up and by exercise. Over the past few months his weight had decreased by 10 kg.

On examination, there was an area on the left side of the trunk which extended from the T8 spine to the L1 spine in the mid-line posteriorly, and to the xiphoid and umbilicus anteriorly (Fig. 1), within which the skin was pale and cold, and piloerection was present. Beads of sweat exuded from the skin. Pain appreciation was mildly impaired in this region, but apart from a mild thoracic scoliosis convex to the right there was no other abnormality. On admission to hospital, the intensity of the pallor, piloerection, and sweating varied from time to time but could be increased by rubbing the affected area, a procedure which also produced a burning pain in the mid-line anteriorly.

Plain radiography of the thoracic and lumbar spine was normal; the blood haemoglobin, white cell count, biochemistry screen, and spinal fluid were normal, and the blood WR and Mantoux test were negative. There was a minimal opacity in the left costophrenic angle on the chest radiograph. The ESR was 27 mm/hour (Westergren). A myelogram was normal. Intradermal histamine was injected bilaterally, and there was no response in the abnormal area, suggesting that the lesion was distal to the dorsal root ganglia. Considerable pain relief was

obtained by xylocaine infiltration of the left dorsal sympathetic trunk at the T7 and T8 levels and for this reason a surgical sympathectomy was planned.

A left thoracotomy was performed and the pleura in the paravertebral region was found to be thick and indurated, and several firm lumps were palpated. The autonomic trunk could not be identified in this tissue which was found to be anaplastic large cell carcinoma of pulmonary origin. After radiotherapy the patient was free from pain, and there was no abnormal autonomic activity. Ten months later there was a recurrence of mild pain in the same area which responded to a second course of radiotherapy.

CASE 2

This 61 year old butcher presented with a history of dull but constant pain in the right shoulder for 15

FIG. 2 Case 2. Spontaneous sweating over the right hand, right side of face, and right cubital fossa. The areas are stained with Alizarin Red.

months. There was no weakness, wasting, or sensory deficit, and the reflexes were symmetrical. Marked spontaneous sweating was present over the right side of the face and neck, right hand, and right cubital fossa (Fig. 2). The pupils were equal and reactive. The external jugular vein was distended on the right side, and the presence of an apical lung lesion was demonstrated by x-ray examination.

Electromyography was performed on the right deltoid, triceps, forearm extensors, abductor pollicis brevis, and abductor digiti minimi muscles and no significant abnormality was demonstrated. Both motor conduction velocity and sensory action potentials were normal in the median and ulnar nerves.

He was treated with radiotherapy but the pain did not remit. An exploratory operation was performed, and an apical lung tumour was found to be invading the proximal ends of ribs 2 and 3, and the sympathetic trunk at this level. The involved structures, and the upper lobe were removed, and the patient remained symptom-free until his sudden death seven months later.

DISCUSSION

The direct invasion of nerves by malignant tissue is a common occurrence, and both patients in the present report had the constant pain which may occur with these lesions. In addition, both cases were found to have profuse, spontaneous sweating in the territory of nerves directly infiltrated by lung cancer. The distribution of autonomic overactivity in case 1 is consistent with involvement of several intercostal nerves, sympathetic fibres associated with intercostal vessels or one ventral root (Pool, 1956), but these individual structures could not be identified at surgery. The distribution of sympathetic overactivity in case 2 suggested involvement of the sympathetic trunk and this was confirmed at operation.

It was noted in case 1 that increased sweat

secretion and a dull, painful sensation were produced by rubbing the skin in the affected area, suggesting that cross-reaction between sensory afferent and sympathetic efferent fibres was occurring. There is some evidence that direct fibre-fibre interaction can occur at the site of nerve injury (Granit *et al.*, 1944) and this type of interaction could explain the phenomenon, although convergence of sensory afferent fibres with sympathetic efferent fibres at the cord level is also possible. Finally, direct irritation of sympathetic efferent fibres at the site of invasion has to be considered as a possible factor in the production of sympathetic overactivity, analogous to the production of pain by irritation of sensory afferent fibres.

Localized sympathetic overactivity has been observed in association with sympathetic fibre irritation by cervical rib (Telford, 1942), ventral root compression by a spinal osteoma (Pool, 1956), and by apical lung cancer (Hepper *et al.*, 1966). These two cases are reported because they represent examples of a very uncommon presenting feature of underlying lung cancer.

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