CHAPTER 64

SURGERY IN SUPERIOR SULCUS TUMORS

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INTRODUCTION

Superior sulcus tumors account for 5–8% of non-small cell lung carcinomas (NSCLC). They were first described by radiologist Henry Pancoast in 1924 [1]. Pancoast called these lesions "apical chest tumors" arising from residual embryonic cells in the fifth brachial cleft. In 1932, however, Tobias identified the same clinical entity as bronchogenic carcinoma. In 2003, Detterbeck used the term "superior sulcus tumor" to describe Pancoast-Tobias tumors. Detterbeck described superior sulcus tumor as "lung cancer arising in the apex of the lung that involves structures of the apical chest wall", regardless of related symptoms [2]. Due to their location, these tumors are diagnosed late and were traditionally considered inoperable. However, recent advances in multimodality therapy have improved outcomes.

CLINICAL PRESENTATION

The most common presenting symptom is pain. Shoulder and elbow pain is especially common due to invasion of the first rib and involvement of the lower branches of the brachial plexus. Pain occurs as a result of malignant invasion of the T1 and C8 nerve roots, parietal pleura, and first rib. Pain along the course of the ulnar nerve suggests T1 nerve invasion, while weakness in the intrinsic muscles of the hand suggests nerve root involvement at the level of C8 or lower. Pain can occur not only in the arm, but also the head and neck. Pain in these areas arises from C8–T1. Involvement of the stellate ganglion, located in the C7–C8 region, manifests with Horner's syndrome (anhydrosis, ptosis, myosis) [3].

Rarely, phrenic nerve and recurrent nerve paralyses can cause aphonia and diaphragmatic eventration. Swelling in the face and distention of veins in the neck indicate mass effect obstructing the superior vena cava.

DIAGNOSTIC METHODS

Radiologic detection of the apical mass in posterioranterior chest x-ray is one of the simplest diagnostic methods. Thoracic computed tomography (CT) enables evaluation of the relationship between the mass and adjacent tissues. CT is particularly important when assessing costal, vascular, and vertebral invasion (**Figure 1**). Magnetic resonance imaging (MRI) is useful in the evaluation of soft tissue structures in the thoracic inlet, brachial plexus, subclavian vessels, spine, and neural foramina. Respiratory dynamic MRI is not commonly used, despite having 100% sensitivity and 83% specificity. Positron emission tomography is an important modality for evaluating locoregional and distant metastases.

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possible in patients with vertebral invasion and can result in better overall prognosis. Dartavelle et al.[12] reported a 5-year survival rate of 30% in their series of 12 patients with vascular invasion who were surgically treated via an anterior transcervical transthoracic approach. In another study including 34 patients with invasion of the subclavian artery, Fadel et al.[33] reported a 4-year survival rate of 34%. Although local tumor regression can be induced with neoadjuvant therapy protocols and complete resection is possible with current surgical techniques, sufficient local control cannot be achieved in patients with vertebral invasion; complete resection rates decrease to 37.5% and major complications occur more frequently, at a rate of 41.2%.

RECURRENCE

Disease-free survival is as important as long-term survival in superior sulcus tumors. Marra et al. [19] identified T and N status and complete resection as significant prognostic factors for recurrence. Ginsberg et al.[6] detected local recurrence in 75% of patients who underwent surgical resection after induction radiotherapy. However, lower local recurrence rates were reported in patients under multimodality treatment.

Radiation Therapy Oncology Group 0214 in a Phase III study compared the efficacy of prophylactic cranial radiotherapy (PCRT) in patients with Stage IIIA and IIIB NSCLC. There were no statistically significant differences in survival ($p = 0.86$) and disease-free survival ($p = 0.11$) between the groups with or without PCRT. However, brain metastases were more common in patients without PCRT ($p = 0.004$)[34].

CONCLUSION

Resection of superior sulcus tumors is a major procedure due to the many vital adjacent structures and should be performed at experienced centers. The optimal diagnostic and treatment method for each patient must be determined using a multidisciplinary approach. Survival rates are rising steadily with evolving surgical techniques and multimodal therapies. Further research on postoperative recurrence is needed.

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