26.2 Reconstructive Procedures in Tumor Surgery

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CONTENTS

A. Pathomorphology ........................................... 678
  I. Extravasal Tumors (Benign Tumors, Carcinoma, Sarcoma) ........ 678
  II. Vascular Tumors ........................................ 679
B. Operative Indications ........................................ 679
C. Techniques of Reconstruction ................................ 679
  I. Neck .................................................................. 679
  II. Thorax ............................................................ 681
  III. Abdomen and Retroperitoneum ............................. 681
  IV. Extremities ..................................................... 684
References ............................................................. 684

A. Pathomorphology

I. Extravasal Tumors (Benign Tumors, Carcinoma, Sarcoma)

Larger arteries and veins are usually resistant to tumor growth over a long period of time. Even malignant tumors exhibiting rapid expansive and infiltrating growth do not infiltrate the vessel wall in the majority of cases.

It is primarily the veins that are affected by enveloping or invasive tumors, e.g., the superior vena cava in cases of mediastinal tumors, or the inferior vena cava or its branches in cases of renal or genital tumors (see below).

Even in vessels completely surrounded by a tumor, invasion of the vascular lumen with the risk of life-threatening bleeding or tumor embolism is relatively rare. More often, adjacent veins are completely compressed by the tumor.

By contrast, an arterial wall usually undergoes only a more or less pronounced stenosis, thanks to the higher internal pressure. The stenosis may often be removed by annular dissection of the tumor. Frequently, vascular lesions may be encountered. Radical resection is only seldom achieved [2].

Operative therapy in cases of carotid body tumor is of special surgical significance [17, 30, 31]. Embryologically, the normal carotid body, located in the adventitia of the carotid bifurcation, is a chemoreceptor (stimulation by pH, pCO₂, and pO₂), having the form of a 2 x 3 mm lentiform nodule. Enlargement of this nodule up to a diameter of 1 cm is often found in people living at altitudes greater than 4000 m above sea level (Andes, Tibet); the condition is also referred to as chemodectoma. A benignly or malignantly growing carotid body contains proven neurotransmitters in up to 10% of cases, but is not endocrine active itself. Therefore, the condition is more correctly referred to as a paraganglioma of the carotid body, or, to use the clinical term, a carotid body tumor [16, 26, 31]. The vascular supply of the normal carotid body arises from the vasa vasorum in the immediate region of the carotid bifurcation. In cases where the carotid body has undergone tumorous enlargement, branches from the external carotid artery are usually found.

1. Classification

Based on clinical observations, three types of tumors are distinguished (Fig. 26.2.1). This classification is especially helpful with respect to the operative approach. Since the tumor is benign in about 90% of cases, the maintenance of continuity following resection is also justified with types II and III. Microscopic examination of tumor tissues reveals the predominant tendency of the tumor to imitate the normal structures of the carotid body, producing both chief cells and sustentacular cells [1]. They may vary from a type that is rich in vessels and similar to an angioma, to an adenoma-like type. According to the predominant feature three major types are distinguished: paraganglion-
Fig. 26.2.1. Clinical classification of carotid body tumors (according to F. LINDER) [17]

Type I Type II Type III

ic, angiomatous, and adenomatous. This morphological classification, however, is only of minor clinical significance as no conclusions concerning the malignancy may be drawn from it. With respect to carcinomatosis, one must distinguish between locally infiltrating growth and the certain proof of actual carcinomatosis with metastases in local lymph nodes or, in rare cases, with distant metastases (in the lung and the bones).

2. Diagnosis

The differential diagnosis of lateral neck tumors deserves special mention, owing to the fact that 80% of carotid body tumors are only partially resected, that is to say, the preoperative diagnosis is correct in only a few cases. Usually the diagnosis is either lateral cervical cyst or lymphoma.

Carotid body tumors are mostly asymptomatic until the tumor diameter reaches 3 cm. After several years, a hard, indolent mass develops, recognizable by a lateral protrusion on the neck. Larger tumors may cause symptoms in adjacent structures with lesions of the hypoglossus nerve and also of the vagus or recurrent nerve. Irritations of the adjacent sinus nerve with bradycardia and syncope are also observed.

In case of clinical suspicion (signs of mobility, pulsation, localization; [31]), arteriography is indicated, which usually reveals a typical separation of the carotid body and also of the tumor itself in the late phase. Computed tomography may be of help in judging the operability of larger tumors [10].

II. Vascular Tumors

Benign or malignant tumors originating from the vessel wall itself are extremely rare. These may include leiomyomas, leiomyosarcomas, fibrosarcomas, hemangioendotheliomas, and hemangiopericytomas of the vena cava and its branches, the portal vein, the aorta, and also the iliac and leg arteries [3, 4, 7, 8, 14, 15, 18, 19, 22, 24, 25].

Occasionally, in cases of untreated primary tumors, intra-arterial tumor emboli may require surgical intervention.

B. Operative Indications

In malignant tumors (carcinomas and sarcomas), the indication for an extended tumor operation with resection of larger arteries in continuity is relatively rare: the tumor already involving adjacent vessels are mostly inoperable for other reasons (distant metastases, invasion of other adjacent structures). Therefore, the indication for vascular resection in tumor surgery is subject to strict criteria [23].

Also for malignant vascular tumors (leiomyosarcoma, fibrosarcoma) vascular resection with graft interposition is usually too late.

An operative indication, however, is given in cases of:

1. Benign and semimalignant tumors – elective, curative surgery
2. Malignant tumors in cases of vascular complications (bleeding, tumor embolism) – emergency, palliative procedure

C. Techniques of Reconstruction

I. Neck

1. Combined Resection of the Carotid Artery in Neoplastic or Inflammatory Disease

Sometimes, radical surgery for tuberculous lymphomas of the neck and for pharyngeal and laryngeal carcinomas is impossible without a carotid artery resection, with preservation of continuity [5, 20].

Operative Technique. While the external carotid artery may usually be ligated without sequelae, re-