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CLINICAL STUDY

Branchiogenic cyst – a rare finding in vascular surgery

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ABSTRACT
Branchiogenic cysts are benign lesions caused by anomalous development of the branchial cleft. They are typically detected in individuals aged between their twenties and forties. Ultrasonography is the first-line imaging method of choice. Surgical excision is the sole treatment modality *(Tab. 1, Fig. 6, Ref. 25)*. Text in PDF *www.elis.sk*
KEY WORDS: branchiogenic cyst, extirpation, ultrasonography, computed tomography.

Introduction

Anomalies in the given area are the result of altered development of the branchial apparatus during embryogenesis, specifically after the second week up to the sixth or seventh week of fetal life. The persistence of residual branches can lead to the development of cysts, cavities, fistulas or cartilage islands (1, 17). Anomalies of the 2nd branchial cleft are the most common cause of neck formations of this type: they account for approximately 90% of all cases (2, 16, 17). Although the masses are congenital, they are usually not identified until the second to fourth decade of life when they enlarge secondary to infection or rupture. They are observed with equal frequency in men and women (3, 16, 17). There are indications that the frequency of cyst formation is increased in mitochondrial disorders (MIDs). Cysts can be found in various organs of MID patients, but tongue root cysts have not been reported as a manifestation of a MID (8, 14). Malignant transformation is known. However, the differentiation from a neck metastasis of a squamous cell carcinoma of unknown primary is challenging (20). Even though there are strict criteria, the diagnosis of this entity remains controversial (10, 14). Also, there is a small percentage of malignancy of these malformations, but it is very important to check whether all the histological diagnostic criteria for a primary branchiogenic carcinoma are accomplished (11, 12, 13, 18). Histopathological findings suggested the diagnosis of lymph node infiltration by squamous cell carcinoma of an unknown primary site, but the differential diagnosis also included branchiogenic carcinoma arising in a branchial cleft cyst (9, 13, 15, 19). The preoperative diagnosis is based on clinical and radiological findings, which are also important for accurate determination of spatial characteristics of the lesion. Ultrasonography is the first-line imaging method of choice to define the benign, cystic nature of the lesion (1, 11, 12, 18).

Materials and methods

In the case report, we discuss a 28-year-old female patient who came for an examination 3 weeks after the appearance of a prominent lesion on the left side of the neck, which arose after physical strain. She underwent a physical examination, imaging examinations, namely ultrasonography, and computed tomography in conjunction with angiography. Based on the exclusion of vascular malformation and dilatation, she underwent all preoperative examinations and was operated on. The entity that we surgically removed was a histologically verified branchiogenic cyst of type II.

Results

The patient was an asymptomatic 28-year-old woman with a history of Crohn's disease (treatment with imuran, milurit). She had repeatedly undergone surgical revision of her small and large intestines. She reported regular menstruation and allergy to penicillin.

She came for her first examination three weeks after the lesion on the left side of the neck had appeared due to stress. Physical examination revealed a circumscribed mass that moved freely along the anterior border of the upper third of the sternocleidomastoid muscle.

Ultrasonography demonstrated a presence of a mass located on the lateral side, in the area of the middle part of the left common carotid artery (ACC l.sin.). The lesion had a homogeneous structure, well-pronounced wall, oval, without flow or vascularization. The lesion was seated on the vascular structures in the area the carotid artery bifurcation in the neck. A hypoechoic deposit of 17x17x19 mm was visible. The entire formation was unmalleable, over 5-cm long, and approximately 3-cm thick. The blood flow in

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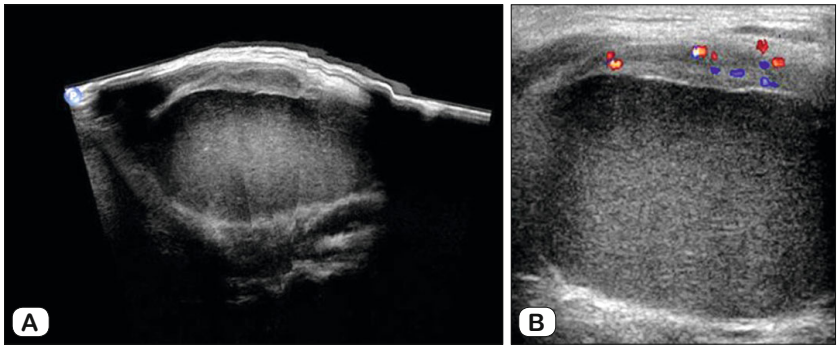

Fig. 1. Ultrasonographic finding of a brachiogenic cyst (A), Doppler (B)

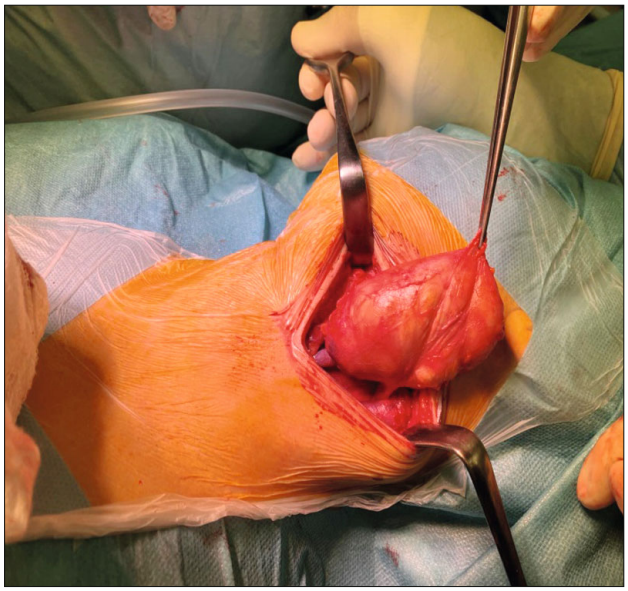

Fig. 2. Cyst preparation (source: author).

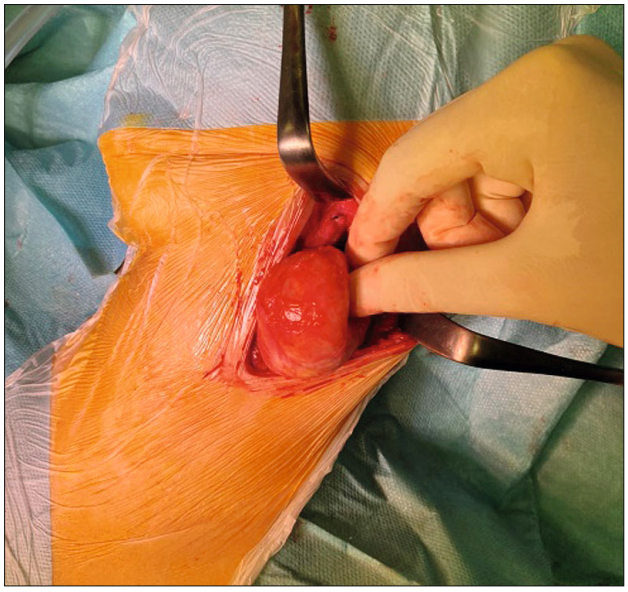

Fig. 3. Visualization of cyst compressibility (source: author).

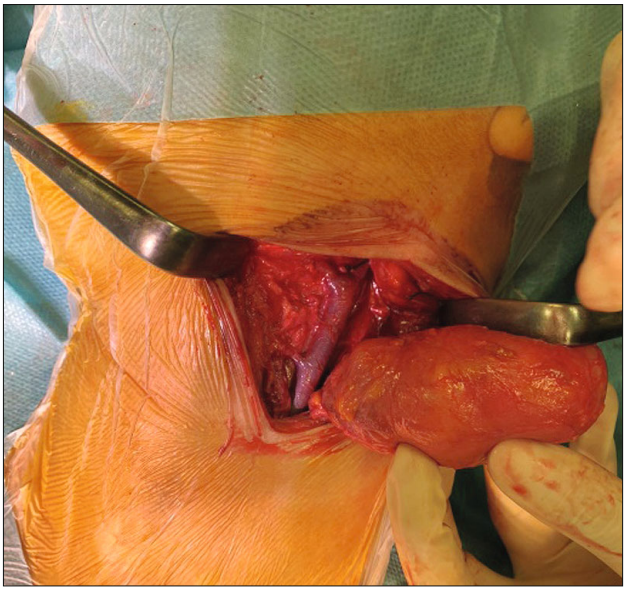

Fig. 4. Preparation of cyst from vascular structures (source: author).

the common carotid artery (ACC), internal carotid artery (ACI), external carotid artery (ACE), and left external jugular vein(VJI l.sin.) was present (Fig. 1).

Computed tomography examination (CTAG) confirmed a cystoid, thin-walled lesion, without pathological enhancement, with slight pressure on the VJI l.sin and contact with the terminal segment ACC l.sin and initial segments of ACI and ACE l.sin. In terms of differential diagnosis, it can also be a branchiogenic cyst. The lymph nodes were examined in the entire range without pathological findings. After standard preoperative examinations, the patient was operated on under general anesthesia.

We gradually dissected the tumorous mass that was pushing the VJI l.sin. medially (Fig. 2). From the medial side, the tumorous formation was pressing upon the ACC, and we gradually visualized the vagus nerve. From the lateral side, we separated the tumor from the sternocleidomastoid muscle (SCM) (Fig. 3, 4).

The extirpated formation was approximately 7x5 cm in size. It had a gelatinous consistency (Fig. 6). In the proximal part, we sutured the vena jugularis externa (VJE) (Fig. 5).

The histological findings confirmed a smooth, ovoid, yellow-brown, soft-elastic, tumorous mass, . approximately 70x35x35 mm in size. Cystic changes on the section were formed by a unilocular cyst, with a smooth lining, which was filled with a whitish pulpy substance. As confirmed by the pathologist, the mass was a cyst of the second branchial cleft, manifesting no malignity or other significant adverse characteristics.

After being educated on surgical wound care, antibiotic medication, and necessity of applying low molecular weight heparin

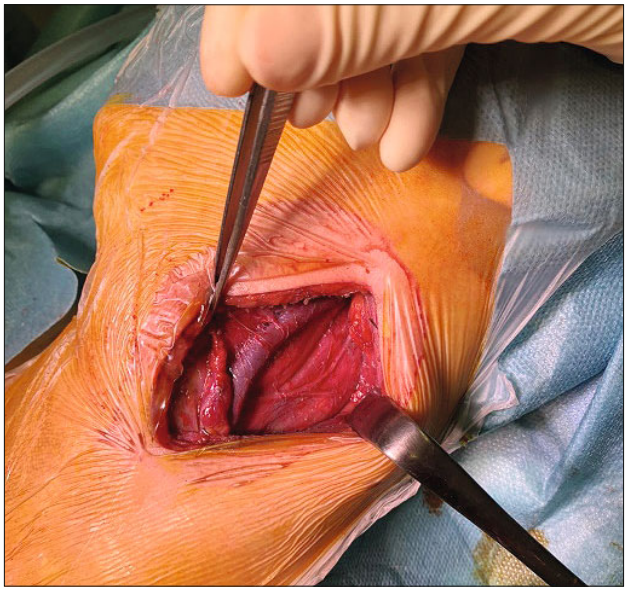

Fig. 5. Section after extirpated cyst (source: author).

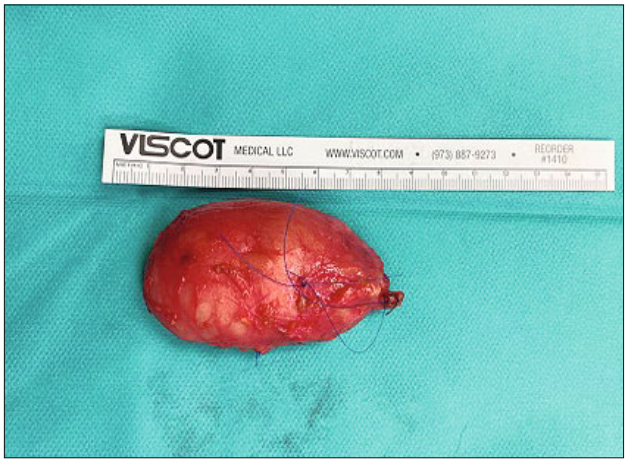

Fig. 6. Brachiogenic cyst (source: author).

for seven days, the patient was discharged from hospital on the 5th postoperative day to continue her treatment in a home care setting, . During the subsequent check-ups, the sutures were removed, and the wound was healing primarily, without any recurrence of the tumorous formation,

Discussion

The vast majority (90%) of branchiogenic cysts arise from the second fissure. Cysts arising from the second branchial cleft are divided into four classes according to Bailey (Tab. 1). They can occur bilaterally. They appear as soft, mobile, asymptomatic masses in the subcutaneous tissue, possibly deeper under the muscles. They are generally located along the front edge of the sternocleidomastoid muscle, although they may develop anywhere

Tab. 1. Bailey's classification of second cleft cysts.

Type I	lies on the front edge of sternocleidomastoid muscle, deep below the platysma muscle
Type II	develops along the anterior edge of the sternocleidomastoid, lateral to the carotid space and posterior to the submandibular gland (classic location of these cysts)
Type III	is located medially between the carotid bifurcation and the lateral wall of the pharynx
Type IV	lies in the space of the mucous membrane of the pharynx; lined by columnar epithelium

along the course of the second-branchial fissure fistula, from the skin on the lateral neck, between the internal and external carotid arteries, to the tonsils (3, 23, 24). They grow slowly for weeks to years. Depending on the size (which varies from 1 to 10 cm) and location, they can cause local symptoms such as dysphagia, dysphonia, dyspnea and stridor. Cysts may be painful or tender secondary to infection, with suppuration and fistula formation (7). They contain a viscous, cloudy, yellow-green liquid with cholesterol crystals in the sediment. The walls are thin and covered with stratified squamous non-keratinized epithelium that covers the lymphoid tissue. Differential diagnosis includes parapharyngeal formations, enlarged lymph nodes, parotid formations, paragangliomas of the vagus nerve (7, 24).

Because these are surface formations, ultrasonography is the first-line diagnostic imaging method of choice. It is a fast, non-invasive, low-cost examination without exposure to ionizing radiation. In addition, it can depict the cystic nature of the mass and complications that may have developed. Sonographically, the cysts of the second branchial cleft appear as round, oval, hypo- to anechoic formations with well-defined edges and thin walls that compress the surrounding soft tissues. The mass is compressible and shows a strengthening of the back wall. With infections or abscesses, the contents of the cyst may become inhomogeneous with a corpuscular appearance (4).

On computed tomography, these lesions usually appear well circumscribed and, in the absence of complications, are uniformly hypodense with thin walls. The thickness of the wall may increase after infection. The cyst generally causes posteromedial displacement of the sternocleidomastoid muscle and carotid space vessels, and anterior displacement of the submandibular gland (5, 21).

Magnetic resonance imaging provides better visualization of the deep extent of the cyst and more advanced preoperative assessment. Cyst content varies from hypo- to isointense (relative to muscle) on T1-weighted sequences; it is hyperintense on T2-weighted sequences. The presence of an inflammatory process is often manifested by thickening and enhanced signal intensity of the walls, which resemble characteristics associated with abscesses or lymphadenopathy (6).

Fine-needle aspiration cytology is useful (although invasive) to achieve a preoperative diagnosis (22, 25). Cytologic criteria are as follows: yellow pus-like fluid, keratinized anucleate cells, squamous epithelium, and a matrix of amorphous debris. Surgical excision is currently the treatment of choice (25).

Educational conclusions

The occurrence of branchiogenic cyst is rare in our clinical material. Tumors, aneurysmal dilatations of carotid arteries, pseudoaneurysms of arteries, vascular malformations, and pathologically enlarged lymph nodes must be excluded in the differential diagnosis. First-line ultrasonography is helpful for this. Computed tomography and magnetic resonance will accurately determine the position and pressure of the structures on the tumorous formation. Fine-needle aspiration cytology also facilitates the diagnosis. Surgical excision remains the unequivocal method of choice. It is necessary to bear in mind the differential diagnosis of branchiogenic cyst mainly in younger patients presenting with a sudden appearance of a neck lesion with characteristics described in our study.

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