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Surgical removal of a giant branchial cleft cyst: A case report

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ABSTRACT

A lateral neck cyst is a congenital abnormality most commonly occurs in children and young adults. The development of this pathology caused by disturbances during the embryogenesis process, during which there is improper closing of the branchial apertures and incomplete fusion of the branchial arches. This cyst is typically benign- however, in cases of frequent and recurrent infections various complications may arise. A lateral neck cyst can be diagnosed incidentally, for example: during imaging studies to diagnose infection complications. Treatment first involves curing the infections and potential complications, followed by surgical treatment to prevent infection recurrence. Here we describe a case of a patient who presented to the Maxillofacial Surgery Clinic with a sizeable unilateral neck mass measuring approximately 10 cm in diameter, which had been growing asymptotically for almost four years.

Keywords: Branchial cleft cyst, benign neck tumor, giant neck cyst, congenital abnormality

1. INTRODUCTION

The main purpose of this work is to clarify the origin of the lateral neck cyst and the conditions for distinguishing it from malignant lesions of the neck region. The key to a successful treatment plan is precise imaging diagnosis and complete surgical resection of the lesion. We present here a case of a large side neck cyst in a middle-aged male patient, which was asymptomatic and managed surgically in Military Medical Institute in Warsaw (MMI), one of the most significant accredited multi-profile healthcare institutions with the highest referral level in Poland, with a good outcome.

2. CASE REPORT

A 47-year-old patient was referred on a scheduled basis to the Maxillofacial Surgery Outpatient Clinic due to a massive neck tumor on the right side, which

had been gradually enlarging for almost four years. The tumor was initially asymptomatic, but in recent months, pain and a rapid increase in size prompted the patient to seek medical help. The patient denied any trauma to the area in the past and there was no family history of cancer. He had been chronically treated for hypertension and left ventricular hypertrophy with captopril, ramipril, doxazosin, and amlodipine. During the physical examination, a large mass was observed on the right side of the neck, extending from the angle of the mandible to the clavicle. On physical examination, the tumor was round shaped, soft, non-tender and non-movable. Additionally, the laryngological examination revealed a shift of the larynx to the left side.

The patient's reported pain and discomfort due to the dimensions of the tumor led to the decision to perform an imaging scan. The CT scan revealed a sizeable focal lesion with the morphology of a well-demarcated cyst with a solid component measuring 76x102x110 mm (Figure 1). Solid elements up to 18 mm thick were visible at the anterior part of the lesion. The lesion significantly displaced the anatomical structures of the neck. It shifted laterally and flattened the sternocleidomastoid muscle; displaced medially the carotid vessels moreover, compressed the internal jugular vein significantly. Other neck structures, including the pharynx and larynx, were typical without signs of a neoplastic process. Due to the pressure on the carotid vessels, a carotid artery CT was performed. CT scan excluded any narrowing. A targeted fine-needle aspiration biopsy was performed under ultrasound guidance and revealed keratinized squamous epithelial cells and foamy macrophages in smears on histopathology.

No atypical cells found. The findings supported the diagnosis of a branchial cleft cyst. The patient referred to the Clinical Department of Maxillofacial Surgery for surgical removal of the tumor. Patient condition on admission to the hospital ward, including both his medical condition and the size of the cyst, was unchanged from the earlier outpatient examination. The patient has been qualified to undergo the procedure. However, upon arrival at the operating room and initial sedation, the patient's blood pressure increased to 240/180 mmHg, leading to disqualification from the procedure until blood pressure stabilization. A month after the first hospitalization, the individual readmitted to the hospital. After necessary additional preoperative assessments, the procedure for the removal of the right neck tumor was performed under general anesthesia. Following sterile surgical preparation, an arched incision approximately 10 cm long was made in the right submandibular area, about 2 cm below the lower edge of the mandible.

Sharp and blunt dissection revealed the neck tumor, which was cystic, and it was subsequently removed in its entirety. Surgeons identified the cyst duct, cut and solidified it and then ligated. The obtained material was sent for histopathological examination (Figure 2). During dissection, the marginal branch of the facial nerve and the facial vessels on the right side were identified and preserved. Surgeons placed drain connected to a Redon bottle in the neck wound. They achieved hemostasis, sutured the wound in layers with local plastic reconstruction, placed staples and a pressure dressing. The procedure went without complications. The patient tolerated the surgery well and, upon awakening, was hemodynamically and respiratory stable and was transferred to the monitored ward of the Clinic. The postoperative period went without complications; during hospitalization, the patient received fluid therapy and antibiotic therapy.

On the second day post-surgery, the patient, in good general condition and with properly healing wounds, was discharged from the maxillofacial surgery department with instructions for a follow-up visit at the Clinic to receive the histopathological results. The final microscopic diagnosis of the primary specimen was a branchial cleft cyst. Approximately three weeks after the surgery, the patient presented with the result mentioned above for a follow-up visit at the Clinic (Figure 3). He denied any complaints related to the surgery and reported resolution of the pain. After the final diagnosis of branchial cleft cyst, the patient referred for further periodic follow-up examinations on an outpatient basis.

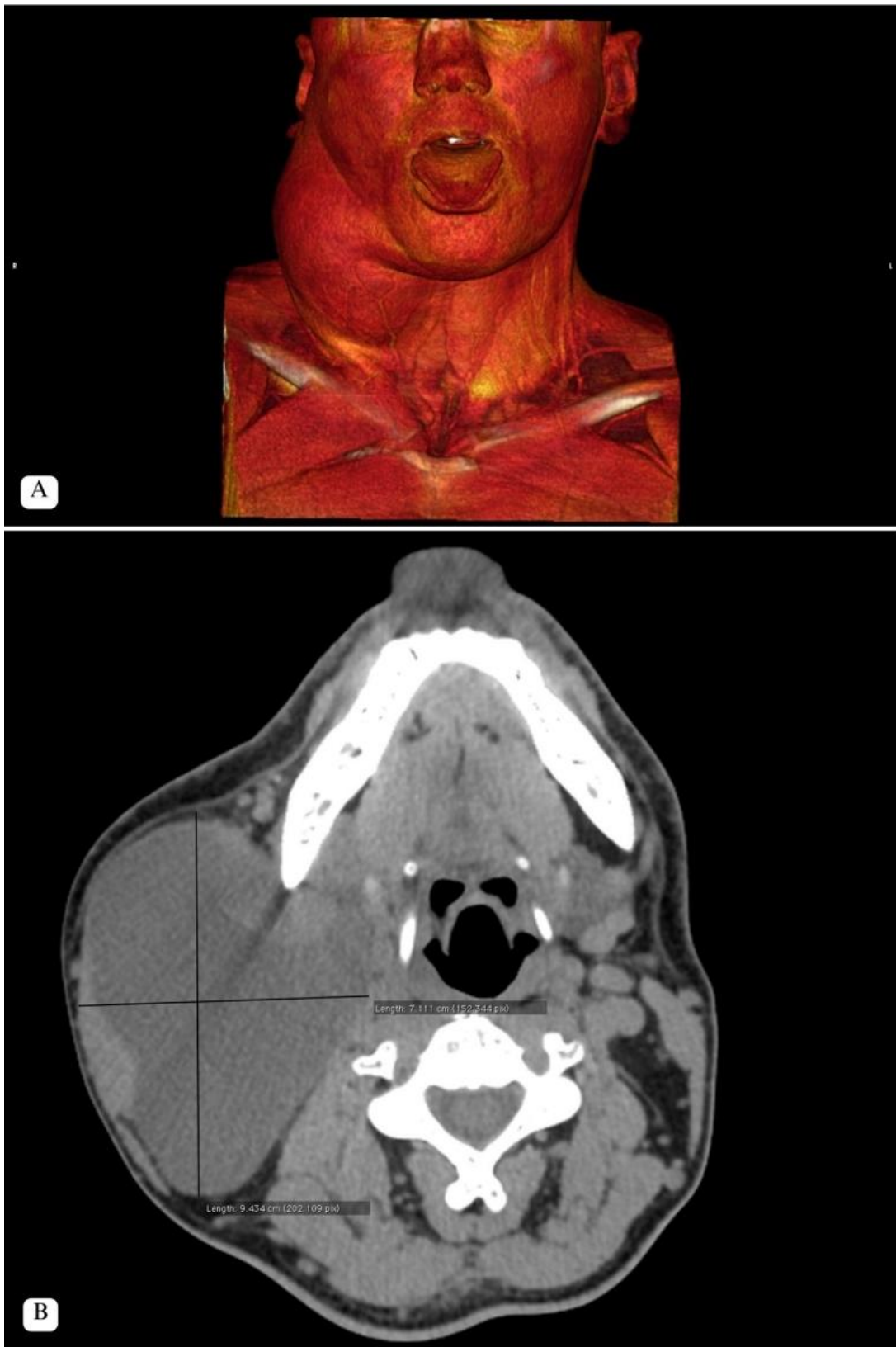


Figure 1 Computed tomography reconstruction image (A). On axial view, the preoperative computed tomography (CT) imaging the branchial cleft cyst showing a cystic mass measuring greater than 9 centimeters in longest dimension with peripheral enhancement, located behind the mandibular angle (B).

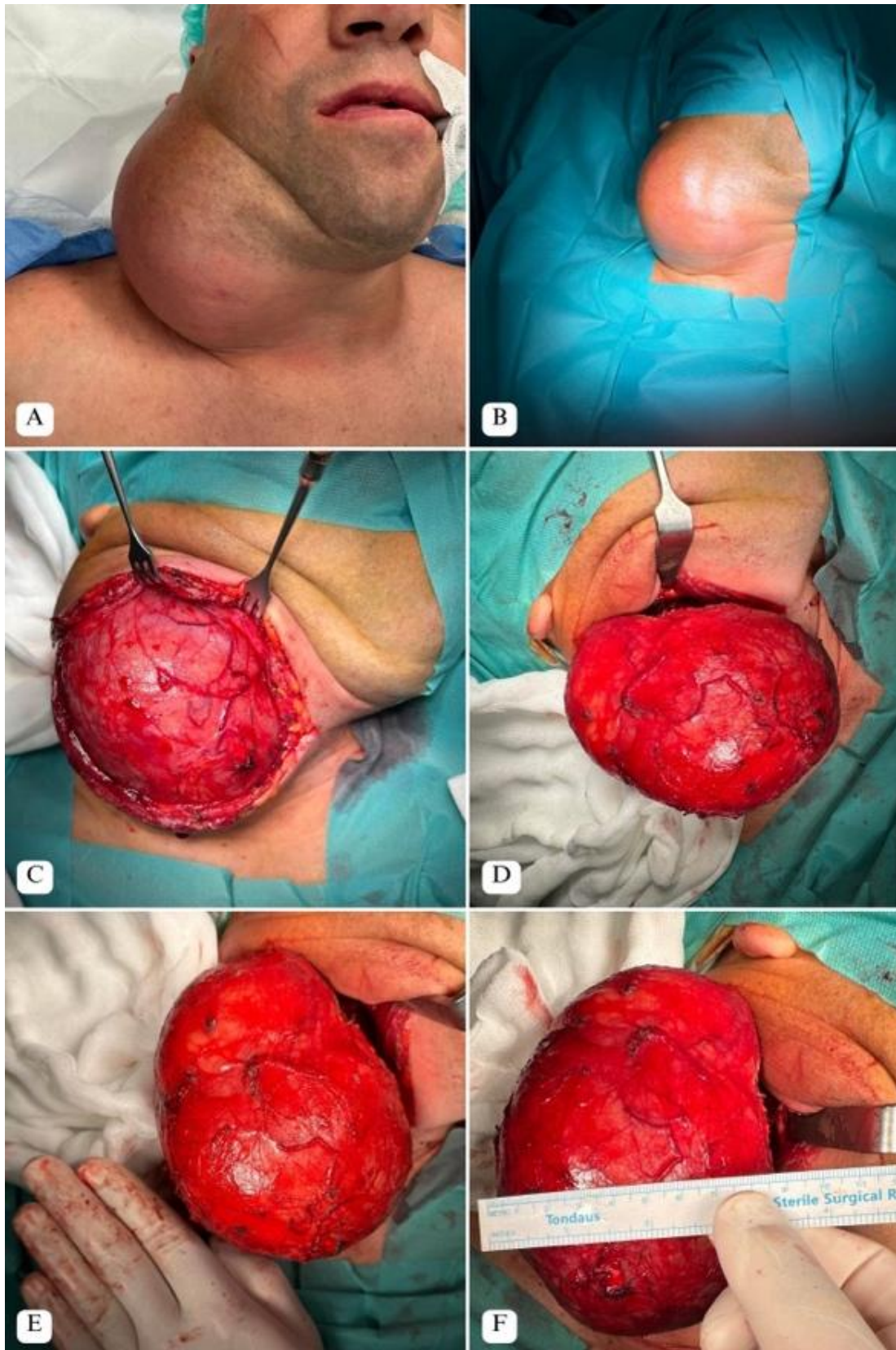


Figure 2 Preoperative photo showing cyst of the right-side submandibular region (A, B); Intraoperative photo of cyst while separating it from underlying great vessels (C, D, E); Surgical specimen (F).



Figure 3 The two weeks after surgery follow-up visit. The examination showed a subsidence of the swelling in the neck on the right side and a slightly raised scar in lateral view.

3. DISCUSSION

Branchial cleft cyst is one of the most common congenital and benign anomalies of the neck region. Are classified in the group of anomalies of the gill apparatus. They comprise 20% of all congenital head and neck lesions (Waldhausen, 2006). They occur bilaterally in approximately 1% of cases and do not show a preference for developing on either side (Doshi and Anari, 2007). Between the 21st and 24th weeks of embryonic life, four gill pockets are formed. Their absence or incomplete involution of one of them results in the formation of cysts, sinuses or fistulas. Cysts are distinguished from the other two types of lesions by their noncommunicative nature. Diagnosis of this condition is possible at any age from the neonatal period to adulthood (Mammadov et al., 2010).

In a study by Franzen et al., (2019) 133 patients with lateral neck cysts were analyzed to determine their etiology. The lesions were 70% benign, and their etiology was about 85% indicative of pharyngeal arch cysts. The second most common pathology was cysts that were deformed lymph nodes, and the rarest were tuberculous foci. In about 30% of patients, the lesions were metastases of squamous cell carcinoma from the head and neck region. Lateral neck cysts are most often asymptomatic. Patients' attention is drawn to their rapid growth or rare nonspecific symptoms, such as chronic cough, dysphagia, recurrent cyst infections, located in the middle and, or upper neck. It can be confused with lymph node abscess, thyroid cyst and second branchial cleft cyst.

The reason for the increase in the size of the cyst may be the inflammatory processes of the neck and upper respiratory tract. An occasional tendency to inherit this type of lesion has been reported (Thomaidis et al., 2006). Baseline ultrasound confirms the cystic nature of the lesion. Other modalities, computed tomography (CT) and magnetic resonance imaging (MRI), can provide essential data on the location of the cyst, allowing for sparing, optimal preoperative planning and treatment as an adjunct. CT reveals a well-circumscribed, thin-walled mass with fluid density (-20 ± 20 HU) and mucus content in 50% of cases. MRI shows a low-intensity T1 signal and a high-intensity T2 signal (Ozel et al., 2005). Fistulography can be helpful in assessing the length, course and orifices of the fistula, as well as the size, and location of the associated cyst.

A fine-needle biopsy, on the other hand, helps distinguish a cyst from a neoplastic lesion, an enlarged, inflamed lymph node, or other lesion. Cysts are filled with watery fluid, mucous or gelatinous contents with exfoliated epithelial elements, or if the lesion is infected, with thick purulent contents (Allen et al., 2023). The differential diagnosis considers inflammatory lymphadenopathy, including tuberculous lymphadenitis, primary or secondary neoplastic lesion of the lymph nodes of the neck, lymphoma, thyroid nodules, parotid tumor, parotid gland tumor, cervical glomus paraganglioma, lymphatic or hemangioma, neurofibroma, lipoma, dermoid cyst, median neck cyst, smooth cell sarcoma, sublingual salivary gland cyst (lat. ranula), mainly located under the mandibular-glandular muscle (Zatoński et al., 2012).

Histopathological result confirming the clinical diagnosis of a cyst, determines the method of treatment. The choice of treatment method depends on the structure and nature of the lesion. Treatment consists of surgery via an incision adapted to the site of the cyst. If the cyst is infected, treatment with an antibiotic is necessary before planning surgical excision. Easier and safer stratification is possible once the inflammation has completely subsided. A skin incision is made along the Langer line over the center of the cyst (Koch et al., 2018). It is essential to identify the critical anatomical structures of the neck. It is necessary to carefully distinguish the facial nerve, facial vessels, and their relationship to the cyst or fistula because of their proximity and to seek to spare these structures.

Complete surgical excision is curative. En-bloc resection should be performed if possible (Lofgren et al., 2020). Recurrences have been reported but are unusual. The total size and volume of the cyst described above make it one of the largest reported to date. Cysts with a maximum dimension exceeding 8 cm, that is are referred to as giant cysts (Bocchialini et al., 2017). Thus, this is how we should classify the cyst described in the manuscript.

4. CONCLUSION

The etiology of neck cyst is unknown, noteworthy the treatment is a submitted and challenging clinical problem. Branchial cleft cysts require precise diagnostic testing, the primary goal of which should be the rapid exclusion of malignant neoplasm, which allows the implementation of precise conservative or surgical treatment. Accurate imaging makes it possible to precisely plan the scope of surgery. Then to perform a radical resection that provides the patient a complete cure.

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Authors Contribution

B Zabielska & J Kołodziej (Their contribution to being the first author was equally 50%): Conceptualization, Developed the theory, Writing- drafted the manuscript, and performed the literature review, performed the computations, and verified the analytical methods, prepared the final draft. Conceived of the presented idea and supervised findings of this work. K Kulej, A Krekora-Smolak, P Tarkowska, J Perdas, K Koziol-Wójcik, B Biernacka, A Chloupek: Writing- Review & Editing, Supervision. All authors discussed the results and contributed to the final version of manuscript.

Informed Consent

Written and oral informed consent was obtained from patient before the surgery. Additional informed consent was obtained for information included in this manuscript.

Ethical approval

Not applicable

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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