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Case Report

Cervical Infectious Panniculitis in a Dog: Successful Treatment with En Bloc Excision Including Jugular Vein Resection and Omentopexy

Tom Ablassmaier [1], Lucia Bel [1,*], Liviu Oana [1], Iosif Vasiu [1], Raluca Marica [2], Robert Purdoiu [3] and Adrian Todor [4]

[1] Department of Anesthesiology and Surgery, Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, 3-5 Mănăştur Street, 400372 Cluj-Napoca, Romania tom-adrian.ablassmaier@usamvcluj.ro; lucia.bel@usamvcluj.ro; iosif.vasiu@usamvcluj.ro;
[2] Department of Pathology, Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, 3-5 Mănăştur Street, 400372, Cluj-Napoca, Romania; raluca.marica@usamvcluj.ro
[3] Department of Imagistics and Internal Diseases, Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, 3-5 Mănăştur Street, 400372 Cluj-Napoca; robert.purdoiu@usamvcluj.ro
[4] Department of Pediatric Orthopedics and Trauma Orthopedics, Faculty of Medicine, "Iuliu Haţieganu" University of Medicine and Pharmacy, 8 Victor Babeş Street, 400012 Cluj-Napoca, Romania; atodor81@gmail.com
* Correspondence: lucia.bel@usamvcluj.ro

Abstract: Panniculitis is an inflammation of the *panniculus adiposus* rarely seen in dogs and cats. In this case, the dog developed multiple cervical nodules, some forming fistulas that discharged serosanguineous or purulent fluid. Preoperative CT scans showed the mass was closely attached to the right jugular vein, and microbiological tests detected *Staphylococcus pseudintermedius*. Due to inadequate response to conservative treatment, the mass and part of the jugular were surgically removed *en bloc*. To address the large defect post-removal, an omental pedicle flap was created, tunneled under the skin to the neck, and covered with a skin flap. Follow-up ultrasonography and Doppler exams confirmed the flap's vascularization remained intact. The dog recovered well despite minor postoperative complications. At eight months post-surgery, the omentum remained in place, with no recurrence or complications.

Keywords: cervical panniculitis, jugular vein resection, omental pedicle flap

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1. Introduction

Panniculitis is characterized by inflammation of the subcutaneous fat, which can lead to the formation of single or multiple nodules and is caused by infectious or non-infectious agents. The non-infectious causes may also be idiopathic, resulting in sterile nodular panniculitis (SNP) [1–3]. The pathogenesis and clinical progression of SNP are not well understood, although clinicians often suspect a systemic origin, such as pancreatic or liver diseases. Treatment for SNP typically involves oral glucocorticoids used as immunosuppressive agents [1,2]. Infectious panniculitis is usually triggered by agents like Actinomyces spp., *Staphylococcus pseudintermedius*, or *Mycobacterium* spp. [3]. Other causes include fungal, viral, or parasitic infections, as well as post-injection site inflammation, vasculitis, drug eruptions, thermal reactions, or insect bites, which can cause inflammation of the adipose tissue leading to non-sterile nodular panniculitis (NSNP). This condition often results in ulcerated or fistulous skin lesions [1–3].

These skin lesions can be localized or generalized, may vary in size and consistency, and, while they are more often found on the trunk in dogs, they are more commonly found on the ventral abdomen in cats. The skin may appear normal or change color to yellow, brown, or red, and it may become necrotic [3]. Histologically, sterile panniculitis often

shows granulomatous inflammation, whereas pyogranulomatous or suppurative infiltrates suggest an infectious cause [4]. Treating panniculitis can be lengthy and challenging; moreover, conservative approaches do not always yield satisfactory results. Rapidly progressing nodules of infectious origin or with secondary infection may require special attention, such as surgical removal of the masses. The resulting defects can slow recovery, increase costs, and delay healing.

Transposing the greater omentum as a pedicle flap offers the opportunity not only to support but also to accelerate healing. Its ability to enhance angiogenesis through vascular endothelial growth factor (VEGF)-mediated mechanisms, promote lymphatic and tissue fluid drainage, and support immune function via its milky spots and fat-associated lymphoid clusters (FALCs), along with its regenerative potential due to resident stem cells, has made the greater omentum a valuable tool in the surgical management of traumatic tissue defects and substance loss [5–9]. The greater omentum consists of three major compartments: the bursal, splenic, and, in carnivores, the veil portion, each with a unique vascularization pattern [10–13]. In addition to the previously described properties, it provides mechanical stability and has been used in chest wall reconstruction and to support abdominal hernia repairs [14,15]. The objective of this retrospective case report is to describe the management and evolution of a dog after resection of multiple nodules caused by panniculitis in the cervical region, combined with the use of an omental pedicle flap, and the follow-up involving frequent ultrasonographic examinations to ensure an intact vascularization of the omental pedicle flap.

2. Material and Methods

2.1 Case Description

A four-year-old female mixed-breed dog weighing 24 kg was presented to the Surgical Clinic at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca (USAMV) in mid-May 2025. According to the owner, a swelling in the right cervical region had first been noticed in early January 2025 (Fig. 1A). A few days later, the enlarging mass began draining serosanguineous and purulent discharge.

In early March, an exploratory surgery was performed at another veterinary clinic to investigate the possible presence of a foreign body. Postoperatively, the dog was treated with metronidazole, amoxicillin-clavulanic acid and drotaverine. Shortly after the surgery, a second mass appeared adjacent to the first. The surgical wound healed slowly and additional masses subsequently developed (Fig. 1B).

A microbiological examination performed in April identified an infection with *S. pseudintermedius*. Based on culture and antimicrobial susceptibility testing, the dog was prescribed amoxicillin-clavulanic acid. By the time of presentation at USAMV in mid-May 2025, multiple masses had developed, discharging serosanguineous and purulent fluid, consistent with fistula formation (Fig. 1C and D).

2.2 Imaging Modalities

A 20G catheter (B. Braun Melsungen, Germany) was inserted into the left cephalic vein, and a blood sample was collected for biochemistry and a complete blood count (CBC) analysis, which showed no abnormalities. To check for metastases, a full-body contrast-enhanced CT scan was performed (SOMATOM Scope Siemens, Germany). An intravenous contrast medium (Iohexol; Omnipaque 35%, GE Healthcare AS, Norway; 2 ml/kg IV) was administered. The dog received lactated Ringer's solution (Ringer-Lactate, B. Braun Melsungen, Germany; 10 ml/kg/h IV) throughout the procedure.

The CT scan revealed a subcutaneous mass infiltrating the dermis and subcutaneous adipose tissue, extending to the right jugular vein. The mass was well-defined, showed marked contrast enhancement, and exhibited increased vascularization. Furthermore, no evidence of metastasis was detected (Fig. 2A and D).

Figure 1. Appearance of the cervical mass before surgery: (**A**) Initial mass observed in early January 2025; (**B**) Development of new masses following the first exploratory surgery, with ulceration and formation of draining tracts; (**C**) Lesions at the first visit to the surgery clinic of USAMV Cluj-Napoca; (**D**) Rapid growth of additional nodules observed just two days after the initial presentation.

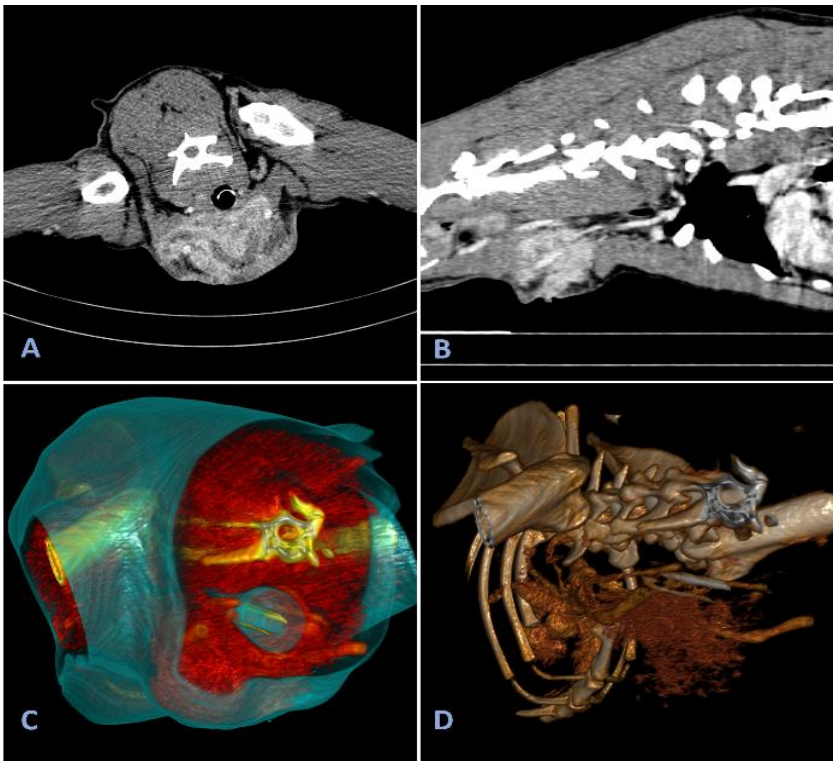

Figure 2. Axial (**A**) and sagittal (**B**) views of the cervical region. Mild to moderate fat stranding and heterogeneous contrast enhancement of the soft tissues in the ventral part of the caudal cervical area. Contrast enhancement emphasizes the left and right jugular veins, which are surrounded by inflamed soft tissue. (**C and D**) Volume-rendered images showing increased contrast enhancement of the inflamed soft tissue.

2.3 Biopsy and Histopathology

Under the same anesthesia, following the CT scan, a biopsy of the mass was sent for histopathological analysis of the lesion. The histological examination of the biopsy specimen showed severe inflammatory and necrotic changes. More than 70% of the dermis and subcutaneous fat tissue were replaced and distended by multiple coalescent pyogranulomas of various sizes, centered on large bacterial colonies embedded in hyalinized, eosinophilic material with a radiating appearance, consistent with the Splendore-Hoeppli phenomenon (immune complexes) (Fig. 3A and B). The pyogranulomatous lesions exhibited central necrosis and contained numerous intact and degenerated neutrophils, along with epithelioid macrophages, multinucleated giant cells, and a moderate number of lymphocytes and plasma cells. The inflammatory infiltrate was associated with fibrosis and was accompanied by multifocal hemorrhage, fibrin deposition, interstitial edema, and a moderate number of siderophages. Inflammation extended into the musculature, where muscle fiber fascicles were separated by interstitial edema, fibrin, and inflammatory cells. A diagnosis of severe, multifocal, pyogranulomatous dermatitis and panniculitis was made, with intralesional bacterial colonies and associated Splendore-Hoeppli material (Fig. 3C and D).

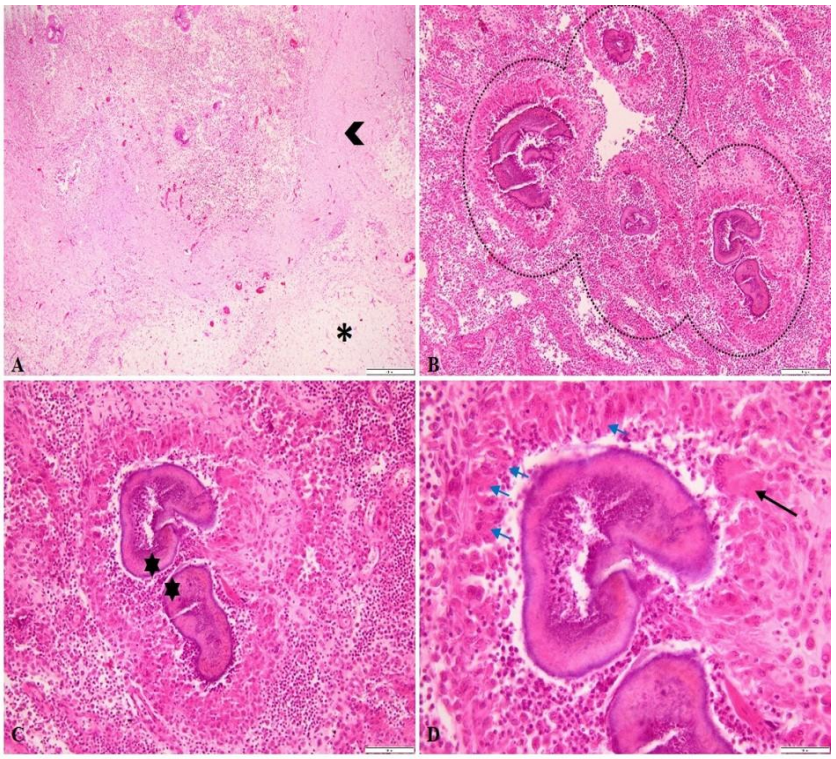

Figure 3. Histological appearance of severe, multifocal, pyogranulomatous dermatitis and panniculitis: (**A**) inflammation in the dermis is accompanied by congestion, interstitial edema, and extensive fibrosis (arrowhead), with infiltrates into the subcutaneous adipose tissue (asterisk), bar=500μm; (**B**) multiple coalescing pyogranulomatous lesions centered on immune complexes, bar=200μm; (**C**) Splendore-Hoeppli phenomenon (stars) observed in the center of the inflammatory infiltrate, bar=100μm; (**D**) bacterial colonies surrounded by an inflammatory infiltrate dominated by macrophages and neutrophils, with a moderate number of epithelioid cells (blue arrows) and multinucleated giant cells (black arrow), bar=20μm; HE stain.

2.4 Anesthetic and Surgery Protocol

After the histopathological examination results ruled out malignancy, the animal was prepared for surgery. The dog was premedicated with methadone (0.2 mg/kg IV) and dexmedetomidine (4 μg/kg IV), and induced with ketamine (3 mg/kg IV) and propofol (30 mg IV given slowly). Following intubation, anesthesia was maintained with isoflurane in oxygen. To ensure a painless procedure, the dog also received a constant rate infusion (CRI) containing lidocaine (1.2 mg/ml) and ketamine (0.1 mg/ml).

The dog was placed in lateral recumbency, and the cervical to abdominal areas were clipped and prepared aseptically. The mass was surgically removed *en bloc* along with the affected segment of the jugular vein and overlying skin. The jugular vein was ligated cranially and caudally beforehand. Afterwards, the

greater omentum was accessed through a midline laparotomy and externalized (Fig. 4A). An omental pedicle flap was prepared from the bursal portion (Fig. 4B) and brought to the cervical region via a subcutaneous tunnel, passing over the thorax at the sternal level (Fig. 4C). The omentum was then double-folded over the exposed tissue (Fig. 4D) and covered with a skin flap (Fig. 4E and F). The abdominal wall was then carefully closed to preserve the vascularization of the omental pedicle flap while reducing the risk of abdominal organ herniation.

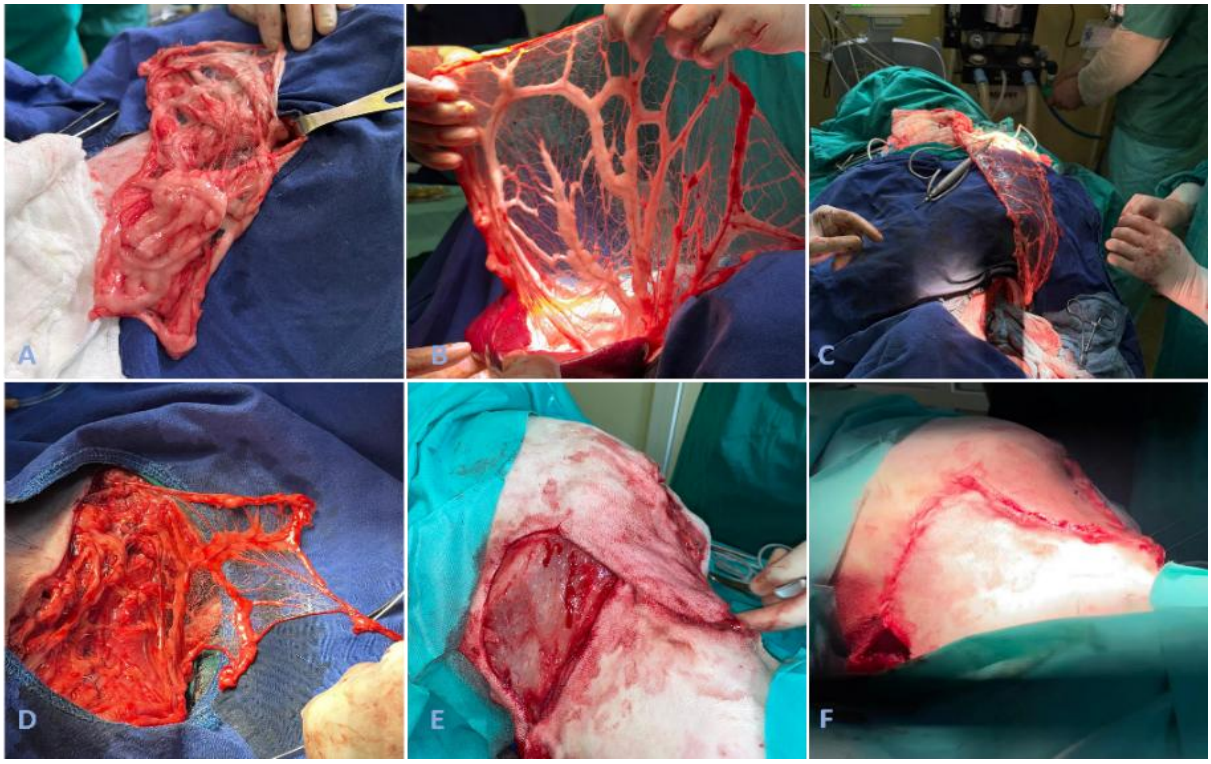

Figure 4. Preparation of the omental pedicle flap after excising the mass: (**A**) Exposure of the bursal part of the greater omentum; (**B**) Dorsal elongation of the bursal part; (**C**) After further elongation, the omental pedicle flap was placed on the surgical drapes to check if enough length was achieved to reach the cervical area; (**D**) Placement of the omental pedicle flap onto the excision site in the cervical area. Note that the flap is double-folded; (**E**) Preparation of a skin flap for covering the omental pedicle flap; (**F**) Final closure of the cervical area after flap transposition.

2.5 Postoperative Treatment Plan

The post-operative protocol focused on pain control and minimizing the dog's activity and stress levels. Medications included paracetamol (10 mg/kg PO), gabapentin (300 mg PO), pentoxifylline (400 mg PO), meloxicam (initial dose 0.2 mg/kg SC followed by 0.1 mg/kg SC), and tramadol (2 mg/kg PO), along with preventive antibiotic therapy with amoxicillin–clavulanic acid. Regular blood tests were scheduled to monitor for systemic changes. A primary focus was the assessment of proper vascularization of the omental pedicle flap, with Doppler ultrasonography scheduled three times a week during the first two weeks, then weekly if the outcome was favorable.

3. Results

3.1 Post-op outcome

Three days post-operatively, multiple hematomas appeared across the entire cervical region (Fig. 5A). A hematological examination revealed inflammatory leukocytosis (WBC 21.0 × 10^9/L) with neutrophilia (16.65 × 10^9/L). One week after surgery, small parts of the sutured tissue began to dehisce, accompanied by purulent fluid (Fig. 5B and C). A microbiological examination identified infections with *S. pseudintermedius* and *Pseudomonas aeruginosa*. As a result, the antibiotic protocol was changed to Amikacin (15 mg/kg IM for 12 days), based on culture and sensitivity results. The wound was cleaned daily with diluted chlorhexidine along with NaCl (0.9%) and rinsed with pure NaCl (0.9%). Over the following month, progressive wound closure with complete epithelialization was observed, and the small dehiscence closed via secondary intention, while the other stitches around the skin flap were safely removed. By two weeks postoperatively, the

hematomas had completely resolved (Fig. 5D). The abdominal incision uneventfully, with no evidence of incisional hernia. The omental pedicle flap remained in situ without complications.

Figure 5. Postoperative appearance of the cervical region (**A, B and C**) and abdomen (**D**): (**A**) Three days postoperative, minor hematomas are present, extending to the incision site on the abdomen; (**B**) One week postoperative: the cervical region has been reconstructed using a skin flap; (**C**) Two weeks postoperative: caudally, a small portion of the suture line shows early signs of dehiscence with purulent discharge; (**D**) Abdomen two weeks postoperative: note the resolution of the postoperative hematomas.

Moreover, periodic follow-up ultrasonography with Doppler was performed to confirm vascularization of the omental pedicle flap (Fig. 6). Throughout the recovery period, the pedicle flap maintained healthy blood flow and showed no significant complications, except for a small seroma, which was drained under ultrasound guidance.

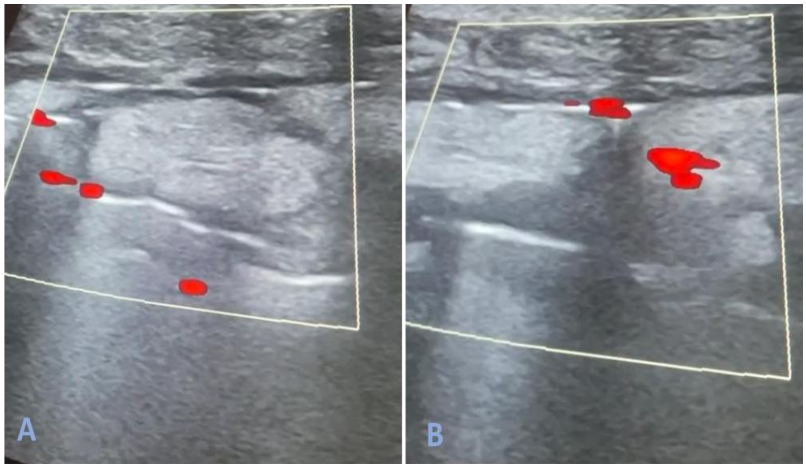

Figure 6. Power Doppler – mild panniculitis and fat presence from the omentum tissue positioned during surgery at the level of the jugular vein, with normal Power Doppler flow at the same level.

Figure 7. The clinical appearance of the dog eight months post-surgery.

4. Discussion

The following case involved severe, rapidly progressive cervical panniculitis requiring surgical excision, with additional support from an omental pedicle flap. While SNP can sometimes be managed conservatively, NSNP may be more challenging due to its potential for quick expansion, ongoing dispersion, and tendency to produce painful nodules [4]. These nodules may become necrotic and ulcerate or develop fistulas, discharging serosanguineous or purulent fluid, which is typical of lesions caused by infectious agents [1,2].

The literature often describes NSNP spreading to the dermis, subcutis, and sometimes musculature—especially in chronic infectious processes [4]. Neuber et al. (2011) stated that these lesions can extend deeper and into adjacent muscles, and another study highlighted the importance of removing as much abnormal tissue as possible, a procedure that often leads to significant loss of subcutaneous fat [3,16]. The loss of dermal tissue from large mass removals, whether the lesion is benign or malignant, challenges the surgeon—particularly in the sternal region—and requires preparation of a left omocervical flap to cover the defect while reducing tension [17].

The dog presented with severe, multifocal pyogranulomatous dermatitis and panniculitis, with bacterial involvement within the lesions. The nodules grew rapidly and involved a large part of the right jugular vein. Therefore, the surgeon decided to perform a wide excision of the mass along with removal of the right jugular vein. Previous studies have shown that dogs can survive with only one jugular vein, even in severe cases [18,19].

To support tissue regeneration, an omental pedicle flap was routed through a subcutaneous tunnel to the cervical region and sutured onto the defect. The greater omentum is not merely a passive fat deposit but an immunologically active organ; it contains milky spots and FALCs, which are rich in macrophages, B- and T-cells, and dendritic cells, thereby functioning as an immune filter and site of immune response [9]. In addition, it promotes angiogenesis through VEGF-mediated mechanisms, thereby contributing to tissue regeneration [7].

A post-surgical infection involving *P. aeruginosa* and *S. pseudintermedius* slowed the healing process and caused a minor dehiscence of the caudal part of the skin flap. Antimicrobial therapy with an antibiotic based on culture and sensitivity was crucial for treating the infection; however, in this case, the potential supportive role of the omental pedicle flap in managing the local infection cannot be excluded [5,7,9].

The initial infection with *S. pseudintermedius* was deemed the primary suspected trigger. Nonetheless, given the complex pathophysiology of panniculitis, other etiopathogenic factors cannot be entirely excluded. Although mycobacterial involvement seems less likely, it cannot be definitively ruled out, especially without a Ziehl–Neelsen stain [16].

However, the histological features observed, including pyogranulomatous inflammation and Splendore–Hoeppli material, along with the results of the initial microbiological examination, align with pathogens described in the literature and strongly suggest infectious panniculitis caused by *S. pseudintermedius* [3].

Periodic follow-up ultrasonography with color Doppler was performed to evaluate the vascular integrity of the omental pedicle flap, confirming adequate perfusion. Doppler sonography has been proven to be a safe, non-invasive technique for assessing tissue perfusion and vascular patency in soft tissues [20,21]. Eight months after surgery, the dog exhibited no signs of new nodules or complications related to omentopexy or resection of the right jugular vein (Fig. 7). The omental pedicle flap remained in place.

5. Conclusion

The case report describes a dog suffering from severe and severe, rapidly progressing infectious cervical panniculitis near the right jugular vein that required surgical treatment. Conservative management showed no results, and new masses appeared adjacent to the original one. After a CT scan, which revealed the size of the masses encasing the jugular vein as well, the decision for *en bloc* resection, including the jugular, was justified. An omental pedicle flap was placed to enhance perfusion, support local immune regulation, and promote tissue repair. Serial Doppler ultrasonography allowed non-invasive monitoring of the vascularization of the omental pedicle flap throughout the postoperative period. The dog showed no signs of recurrence or procedure-related complications at an eight-month follow-up.

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Institutional Review Board Statement: Ethical review and approval were waived for this study, due to its nature as a retrospective clinical case report describing standard diagnostic and therapeutic procedures. No experimental protocols were involved, and informed owner consent was obtained for treatment and publication of anonymized data.

Data Availability Statement: The data supporting the findings of this study are available within the article. No additional datasets were generated or deposited in a publicly available repository.

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Conflicts of Interest: The authors declare no conflict of interest.

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