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TOPIC

Retrospective study of external and middle ear surgeries in domestic carnivores in Algiers province.

Presented by:

Miss GASMI Marwa Anfal

Mr SIAD Abdelmalek

Publicly defended on 02/July/2025 before a jury composed of:

Dr. BANMOUHAND. C	MAA	President
Pr. REBOUH. M	MAA	Advisor
Dr. ZENAD. W	MCA	Examiner

Academic year: 2024/2025

Honor statement:

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Accordingly, we commit to properly citing all the sources we have used in the writing of this thesis.

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Dedication

It is an emotional moment for me to write these words. Reaching this point standing here with this accomplishment in hand was far from easy. The road was full of challenges, moments of doubt, and quiet perseverance. But none of it would have been possible without God's guidance, which I place above all else.

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Anfal

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This work is a labor of love, dedicated to all of you who've made me who I am today.

Abdelmalek

ABSTRACT:

The ear is a specialized sensory organ essential for hearing and balance, composed of three main regions: the external ear, middle ear, and inner ear. This study focuses on surgical conditions affecting the external and middle ear in domestic carnivores. A retrospective survey was conducted in Algiers Province over the year 2024–2025, targeting cases such as aural hematomas, otitis, polyps, tumors, and other auricular disorders requiring surgical intervention.

Data were collected from 26 veterinary clinics using a structured questionnaire, and the findings were analyzed based on species, breed, age, sex, origin (traumatic or not), clinical presentation, surgical procedures, and complications. Aural hematomas were the most frequently reported condition (65%), followed by tumors/polyps (19%) and otitis (16%) with cats slightly more affected than dogs. The study also includes a bibliographic review of the main disorders and surgical techniques described in the literature.

By comparing published data with local clinical trends, this work provides insight into the relevant frequency and surgical management of auricular disorders in Algerian veterinary medicine, emphasizing the importance of species-related and epidemiological factors in diagnosis and treatment planning.

Keywords: Ear, surgery,aural hematoma, middle, external.

RESUME:

L’oreille est un organe sensoriel spécialisé, essentiel à l’audition et à l’équilibre, composée de trois régions principales : l’oreille externe, l’oreille moyenne et l’oreille interne. Cette étude se concentre sur les affections chirurgicales touchant l’oreille externe et moyenne chez les carnivores domestiques. Une enquête rétrospective a été menée dans la wilaya d’Alger durant l’année 2024–2025, ciblant les cas tels que les hématomes auriculaires, les otites, les polypes, les tumeurs et autres troubles nécessitant une intervention chirurgicale.

Les données ont été recueillies auprès de 26 cliniques vétérinaires à l’aide d’un questionnaire structuré, et les résultats ont été analysés selon l’espèce, la race, l’âge, le sexe, l’origine (traumatique ou non), les signes cliniques, les techniques chirurgicales et les complications. Les hématomes auriculaires représentaient la pathologie la plus fréquente (65 %), suivis des tumeurs/polypes (19 %) puis otites (16 %) et des, avec une légère prédominance chez les chats.

L’étude comprend également une revue bibliographique des principales affections et techniques chirurgicales rapportées dans la littérature.

En comparant les données bibliographiques aux tendances cliniques locales, ce travail apporte un éclairage sur la frequence et la prise en charge chirurgicale des affections auriculaires en médecine vétérinaire algérienne, en soulignant l’importance des facteurs épidémiologiques et liés à l’espèce dans le diagnostic et le choix thérapeutique.

Mots clés : Oreille, chirurgie, othématome, moyenne, externe.

الملخص:

الأذن عضو حسي متخصص، وهي ضرورية للسمع والتوازن، وتتكون من ثلاث مناطق رئيسية: الأذن الخارجية، الأذن الوسطى، والأذن الداخلية. تركز هذه الدراسة على الحالات المرضية التي تصيب الأذن الخارجية والوسطى والتي تتطلب تدخ الا جراحيا لدى الحيوانات آكلة اللحوم المنزلية. وقد أُجريت دراسة استرجاعية في ولاية الجزائر خلال سنة 2024– 2025، وشملت حالات مثل الورم الدموي الأذني، التهابات الأذن، السلائل، الأورام، وغيرها من الاضطرابات التي تتطلب تدخلا جراحيا.

تم جمع البيانات من 26 عيادة بيطرية باستخدام استبيان منظم، وتم تحليل النتائج حسب النوع، السلالة، العمر، الجنس، الأصل (رضحي أو غير رضحي)، الأعراض السريرية، التقنيات الجراحية والمضاعفات. كانت الأورام الدموية الأذنية الأكثر شيو اعا (65٪)، تليها التهابات الأذن (16٪) ثم الأورام والسلائل (19٪)، مع غلبة طفيفة لدى القطط. كما تشمل الدراسة مراجعة للأدبيات حول أهم الأمراض والتقنيات الجراحية المتعلقة بها.

من خلال مقارنة البيانات المنشورة بالمعطيات السريرية المحلية، تقدم هذه الدراسة نظرة شاملة حول انتشار وتدبير الأمراض الأذنية الجراحية في الطب البيطري الجزائري، مع التأكيد على أهمية العوامل الوبائية والنوعية في التشخيص واختيار العلاج.

الكلمات المفتاحية: الأذن، جراحة، روم دموي، وسطى، خارجية.

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INTRODUCTION:

The ear is a specialized sensory organ responsible for two essential functions: hearing and balance. Anatomically, it is divided into three parts: the external ear (comprising the pinna and external auditory canal), the middle ear (including the tympanic membrane, tympanic cavity, and auditory ossicles), and the inner ear, which houses the cochlea and vestibular system **(Tobias and Johnston, 2017).** This study focuses on disorders affecting the external and middle ear, as these regions are more frequently subject to surgical intervention in veterinary medicine.

Auricular disorders in domestic carnivores are varied and may result from aural hematomas, otitis externa and media, foreign bodies, lacerations and wounds or neoplastic processes. While many of these conditions can be managed medically, sometimes it fails subsequently it requires surgical intervention. The ear disorders including aural hematomas, chronic otitis media, polyps, and tumors pose diagnostic and therapeutic challenges and can lead to complications such as pain, pinna deformation, hearing loss, or septicemia if not adequately addressed **(Sula, 2012; Gotthelf, 2004).**

These pathologies are not uniformly distributed across populations; their occurrence is influenced by species, breed, sex, age, origin (traumatic or not) and more. Understanding these patterns allows veterinarians to better anticipate risk, choose appropriate surgical techniques, and inform prognosis **(Villalobos and Hershey, 2023; Dhar, 2023).**

The objective of this study was to provide an accurate overview of surgical ear disorders in Algiers by retrospectively analyzing cases of external and middle ear affections in domestic carnivores treated in Algiers Province during the year 2024–2025. The study aims to evaluate the relative frequency of each condition, describe some of their clinical and epidemiological features, review the surgical procedures performed, and report complication rates.

The work is divided into two major sections; The bibliographic part, which includes anatomical reminders, a review of the main disorders requiring surgical management, and their correlation with species, breed, sex, origin, possible complications, and treatment protocols based on up-to-date veterinary literature. The practical part, which presents a retrospective epidemiological study conducted across various veterinary clinics in Algiers Province, providing real-world data to compare with the literature and highlighting the most frequent surgical cases encountered in daily practice.

FIRST PART:
BIBLIOGRAPHIC PART

BIBLIOGRAPHIC PART

I. CHAPTER Ⅰ: ANATOMICAL REMINDERS

The ear is divided into three main parts: the external ear, the middle ear, and the inner ear. The external ear includes the auricle (or pinna) and the external auditory canal. The middle ear contains the tympanic cavity, which connects to the throat via the Eustachian tube, and the inner ear, is made up of structures that are essential for hearing and balance. The tympanic membrane separates the external and middle ear, and the auditory canal leads into the middle ear. Tiny bones called the auditory ossicles connect the eardrum to the inner ear. This study will highlight the fundamental anatomical elements necessary for comprehending the different affections and surgical treatments of the external and middle ear **(Lanz and Wood, 2004).**

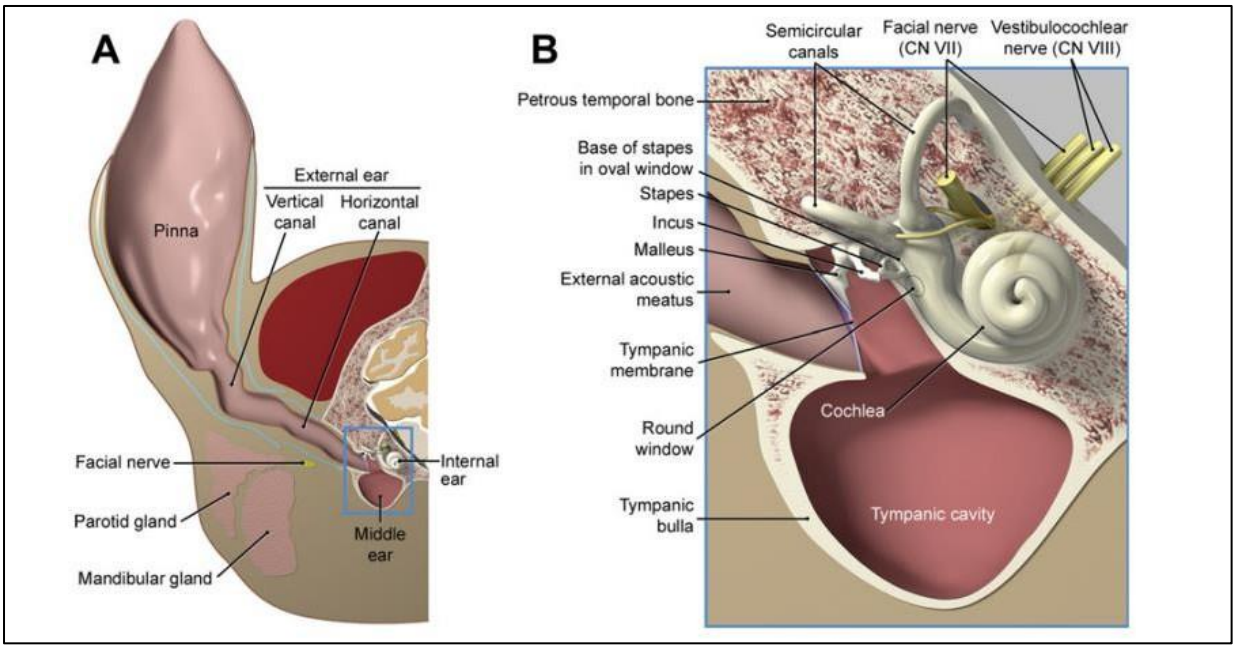

Figure 1: Schematic diagram of the external, middle, and internal ear, dog. (A) Cross-section through the skull. (B) Close up view of the middle and internal ear outlined in the blue square (Njaa et al, 2012)

I.1 External ear:

Dog breeds differ significantly in the size and form of their external ears. The auricular cartilage, through which numerous blood vessels pierce, shapes the pinna. Along with the medially neighboring annular cartilage, it develops many folds at its base before taking on a tubular shape to form the external ear canal **(Schwarz and Saunders, 2011).**

I.1.1 Ear pinna:

The pinna, or auricle, is the prominent outer ear structure. Its positioning varies by dog breed, while it generally stands upright in cats. It functions to focus and gather sound waves,

transmitting them to the eardrum. Three muscle groups (rostral, ventral, and caudal), controlled by branches of the facial nerve (cranial nerve VII), enable ear movement. The leaf-shaped pinna of the external ear is broad, with distinct rostral (medial) and caudal (lateral) margins. A small skin pouch, called the marginal pouch, is found along the caudal edge, though it serves no clear function **(Venier, 1992).** The anthelix is the medial ridge characterized by a prominent tubercle, located on the inner side of the entrance to the vertical ear canal as shown in figure 2 **(Harvey *et al*, 2001).** The skin on the concave side is tightly bound to the auricular cartilage, highlighting its shape. The pinna's size and form differ across dog breeds, due to the auricular cartilage, which contains blood vessels from the caudal auricular artery. The cartilage is the largest component of the external ear structure containing the conchal cartilage (an elastic plate that supports the pinna from base to the apex) **(Venier, 1992).**

Figure 3: The prominent tubercle of the anthelix (arrow) is clearly visible on the inner (medial) side at the entrance of this dog's external ear canal (Harvey et al, 2001)

Figure 3: Pinna of a German Shepherd (Harvey and Paterson, 2014)

I.1.2 External ear canal:

In dogs, the external ear canal measures 5 to 10 cm in length and 4 to 5 mm in width. It has two parts: an initial vertical section, which may extend up to 2,5 cm, running ventrally and slightly rostrally, followed by a shorter horizontal section that runs medially. This horizontal portion completes the external ear canal. The canal is flexible due to the elasticity of the external ear, allowing it to be straightened for otoscopic examination. Most of the canal, including the vertical and a significant portion of the horizontal sections, is cartilaginous, while the deepest

part is osseous. The canal is lined with skin containing sebaceous and ceruminous glands, as well as hair follicles. The ceruminous glands, which are modified apocrine tubular sweat glands, combine with sebaceous glands to produce earwax (cerumen). Cerumen serves to protect the external ear canal by trapping foreign particles and keeping the tympanic membrane moist and pliable. The external ear canal is separated from the middle ear by the semitransparent tympanic membrane **(Cole, 2009).**

I.2 Middle ear :

I.2.1 Tympanic cavity :

The tympanic cavity can be divided into three parts: a dorsal part, or epitympanic, a middle part, or mesotympanic, and a ventral part, or hypotympanic as shown in Figure 4.

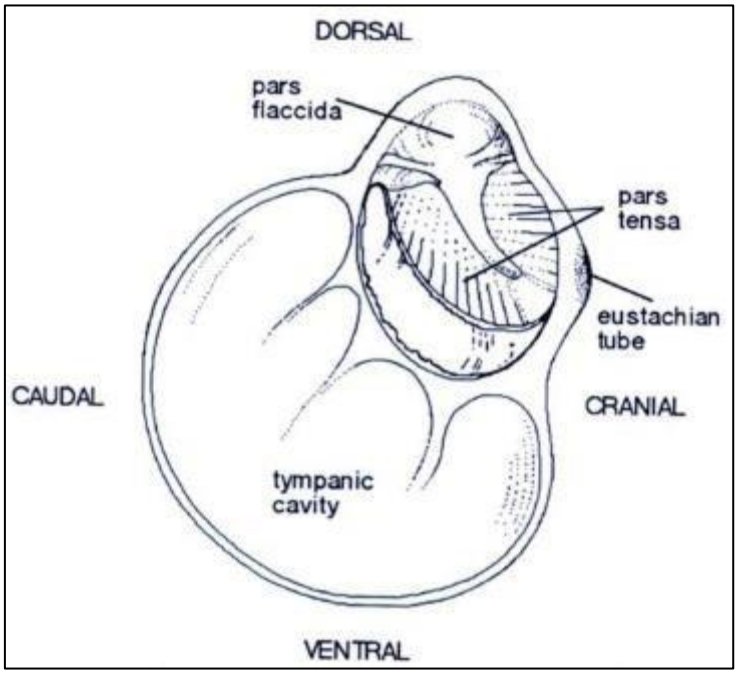

Figure 4: Interconnected Anatomy of the Tympanic Membrane, Tympanic Cavity, and Osseous Bulla (Slatter, 2003)

The auditory ossicles are located in the dorsal part, while the auditory tube opens ventrally and medially, establishing a connection with the nasopharynx.

The most ventral part is formed by the tympanic bulla, which serves as the resonating chamber of the middle ear. In most techniques, its bony structure provides access to the middle ear. On the medial surface of the wall, there is a bony prominence called the promontory, which houses the cochlea.

The vestibular window, also known as the oval window, is connected to the base of the stapes and is located dorso-laterally on the surface of the promontory. In cats, the tympanic bulla is the most important landmark on the ventral surface of the skull. The middle ear cavity is divided into two sections by a bony septum that runs along the wall of the tympanic bulla, connecting the rostral half to the lateral half. This septum is incomplete dorsally, resulting in two unequal compartments: the larger one extends ventrally, medially, and caudally relative to the smaller one. These characteristics are clearly visible on an 'open-mouth' radiograph of the tympanic bullae in cats **(Delahaye, 1993).**

I.2.2 Auditory ossicles:

The middle ear houses three ossicles the malleus, incus, and stapes that form a chain transmitting sound from the tympanic membrane to the inner ear, with joints and ligaments ensuring stability and the chorda tympani nerve passing nearby **(Njaa and Cole, 2012).**

I.2.3 Tympanic membrane :

The tympanic membrane, commonly known as the eardrum, is easily examined during clinical evaluations with an otoscope. Its external surface is lined with stratified squamous epithelium, while the internal surface is covered with simple squamous epithelium. Sandwiched between these layers is fibrous connective tissue. The membrane is circular or oval in shape and consists of two main regions: the pars flaccida and the pars tensa. Additional notable structures include the umbo, which marks the point of attachment of the malleus to the tympanic membrane, and

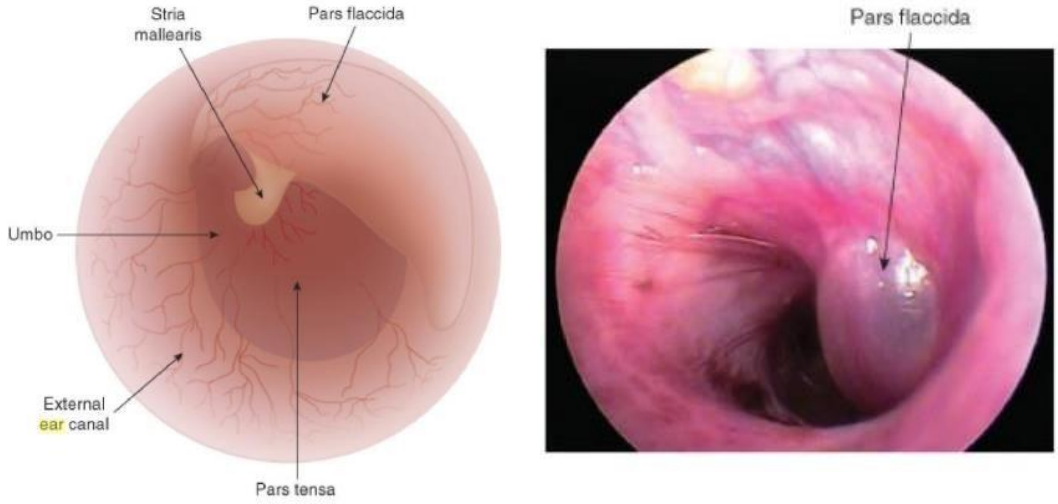

Figure 5:(A)diagram that illustrates the key anatomical features of the tympanic membrane, including the pars tensa, pars flaccida, umbo, stria mallearis, and the opening of the external ear canal. (B) Prominent Pars Flaccida potentially misinterpreted as a mass (Paterson and Tobias, 2012)

the stria mallearis, a visible ridge formed by the handle of the malleus as shown in **Figure 5 (Paterson and Tobias, 2012)**. The pars flaccida, located on the dorsorostral aspect, is a small triangular area with sparse collagen fibers. In contrast, the pars tensa makes up the majority of the tympanic membrane **(Heine, 2004).**

I.3 Surgical anatomy :

The facial nerve, exiting through the stylomastoid foramen and running ventral to the horizontal ear canal, is a critical structure in ear surgery due to its proximity to the surgical field and its superficial course in cats, increasing the risk of iatrogenic injury **(Monnet, 2023).**

A key element to ear surgery is also the vascular and muscular anatomy mastery. We mention the most important ones :the caudal auricular and superficial temporal arteries, as well as the ventral muscles especially the parotidoauricular muscle, which is the main satellite muscle in this area **(Venier,1992).**

II. CHAPTER II: EAR DISORDERS, THEIR DIAGNOSIS AAND SURGICAL TREATMENT

The disorders mentioned in this part of the study refer solely to those requiring surgical treatment, and do not include all possible external and middle ear disorders.

II.1 External ear disorders :

II.1.1 Otitis externa:

II.1.1.1 **Definition:**

Otitis externa is an inflammation of the external auditory canal, which extends from the pinna to the tympanic membrane that may be acute or chronic. The external ear canal is a specialized area of the skin. As a result, otitis externa often manifests as a clinical sign of dermatological conditions **(Carlotti, 1991).**

II.1.1.2 Importance:

According to **Ettinger *et al.* (2010),** Otitis is estimated to affect 4% to 20% of dogs and 2% to 6.6% of cats. It is most common in dogs aged 3 to 6 years (21 to 22 %), followed by >6 years (about 15 to 16 %) and 1–3 years (around 10 %) and according to the same author, out of 651 dogs, 14.47% of males and 13.65% of females had otitis externa, with no significant gender difference observed **(Gupta *et al*, 2024)**. As a cause it is found in clinical examination of 60 dogs with otitis externa, bacteria were evident in 47% of infections **(Perry *et al*, 2017)**. Breed is also a contributing factor. A study conducted in India shows that dogs with long pedunculated ears (e.g., Labradors, German Shepherds) have more chance to get otitis externa (**Roy et al, 2018).**

II.1.1.3 Diagnosis:

Otitis externa may be suspected based on visible signs such as erythema of the auricular pinnae, malodorous discharge, alopecia, crusting, hyperpigmentation, or changes in skin texture and

ear conformation. Close examination begins with careful inspection of the external ear canal, including removal of obstructive hair and assessment of the cartilage folds and canal patency. If needed, gentle cleaning is performed to enhance visualization **(Harvey and Paterson, 2014)** using appropriate antiseptic, detergent and moderately cerumenolytic agents such as chlorehexidine, povidone iodine or even acetic acid **(Carlotti, 1991).** However, if infection is suspected, a sample must be collected prior to cleaning, using a sterile swab for cytological evaluation. An accurate diagnosis also relies on thorough anamnesis, including bathing habits, exposure to drafts (e.g., car rides with open windows), swimming, contact with other animals, and excessive or improper ear cleaning **(Harvey and Paterson, 2014).** A quality otoscope and sedation, if needed, facilitate examination **(Carlotti, 1991).** Ear cytology is also found to be very useful in practice **(Chickering, 1988).**

II.1.1.4 Medical treatment:

Medical treatment should be the first approach before considering surgery, which is reserved for unresponsive or complicated cases. Therapy includes local and systemic administration of antibiotics (polymyxin, gentamicin, marbofloxacin), corticosteroids (dexamethasone, betamethasone), and antifungals (miconazole, clotrimazole). Effective treatment relies on proper drug delivery into the ear canal, accurate dosing, and regular ear cleaning to remove secretions **(Coudert and Donas, 2013).**

II.1.1.5 Surgical treatment:

Surgical treatment of otitis externa is considered when medical management fails or in the presence of structural abnormalities or neoplasia. Total Ear Canal Ablation (TECA), which involves removal of the entire vertical and horizontal ear canal cartilage and epithelium, is indicated in cases of severe trauma, irreversible hyperplasia, neoplasia of the horizontal canal, or chronic otitis externa following lateral ear resection **(Smeak and Dehoff, 1986)**. If the disease is limited to the vertical canal, Vertical Canal Ablation may be performed to address polyps, tumors, hyperplasia, stenosis, or trauma restricted to that segment **(Campbell, 2006)**. Lateral Ear Canal Resection (LECR) or Lateral Wall Resection (LWR) is used in chronic or recurrent otitis externa when medical therapy is insufficient. It improves access for topical treatment, allows removal of benign lesions on the lateral vertical canal, and enhances visualization of the tympanic membrane and middle ear. LECR also promotes better ventilation and drainage to support medical management **(Radlinsky, 2020).**

II.1.2 Aural hematomas:

II.1.2.1 Definition:

An aural hematoma is a blood-filled purplish rounded subcutaneous swelling on the pinna caused by capillary rupture and skin-cartilage separation. It may be unilateral or bilateral, often due to head shaking or scratching. It is more common in dogs than cats **(Hewitt and Bajwa, 2020).**

II.1.2.2 Importance:

A large UK-based study reported a 0.25 % annual incidence, with a median age of 8.17 years and a higher prevalence in dogs aged 10 to12 years **(O'Neill *et al*, 2021)**. Sex distribution was balanced, and certain breeds like Bull Terriers, French Bulldogs, and Saint Bernards especially those with semi-erect or drop ears were significantly predisposed. Another study in Japan found that 88.1 % of affected dogs were over 5 years old, and 76.3 % had concurrent otitis externa **(Mikawa *et al*, 2005)**. The pathogenesis in dogs is believed to involve cartilage folding stress, possibly combined with immune-mediated mechanisms **(Kuwahara, 1986).** In cats, aural hematomas are also frequently secondary to otitis externa, ear mites, allergic dermatitis, or trauma **(PetMD, 2022; Williams *et al*, 2023)**. While the incidence in cats is not well quantified, the condition is commonly seen in practice and tends to affect adult cats regardless of breed or sex **(Williams *et al*, 2023; Flanders, 2025).**

II.1.2.3 Diagnosis:

The diagnosis is guided primarily by the anamnesis, and when this proved insufficient, a fine-needle aspiration of the mass is performed. The aspirated fluid is a serious hemorrhagic exudate with low cellularity; cytological examination reveals red blood cells, occasional neutrophils, and fibrin strands **(Hedlund and Merchant, 2002).** It resorbs later during normal healing, leading to fibrosis and pinna deformation **(Hewitt and Bajwa, 2020).**

II.1.2.4 Surgical treatment:

Surgical treatment of aural hematomas focuses on resolving the hematoma and preventing recurrence by addressing underlying causes. One common method involves an S-shaped incision on the concave surface of the pinna to drain the hematoma, followed by removal of clots and cavity irrigation. Multiple rows of sutures (2–5 depending on size) are then placed through the skin and cartilage to maintain apposition and allow fibrosis, taking care to avoid

major vascular structures **(Hamaide and Griffon, 2016)**. Postoperative management includes bandaging and the use of an Elizabethan collar to minimize trauma, with suture removal typically at 14–21 days. An alternative technique utilizes carbon dioxide lasers to incise and drain the hematoma, followed by multiple micro-incisions to promote adhesion formation, eliminating the need for sutures **(Fossum, 2012)**. Closed-suction drainage involves aspiration, flushing, and placement of a fenestrated butterfly catheter connected to a vacuum tube and secured with sutures. The ear is bandaged and drainage is maintained for 7–10 days, with regular tube management and weekly bandage changes **(Hamaide and Griffon, 2016)**. The temporary cannula placement technique involves a small incision under local anesthesia at the most gravity-dependent part of the hematoma, followed by drainage and insertion of a plastic bovine teat cannula for continuous postoperative drainage. The cannula may be capped or left open depending on patient compliance and practitioner preference **(Coleman, 2024).**

II.1.3 Foreign bodies:

II.1.3.1 Definition:

Foreign bodies in the external ear canal are commonly encountered in veterinary practice, especially in dogs and cats. Grass awns are the most frequent type due to their barbed shape, which facilitates deep penetration and prevents spontaneous expulsion. Other foreign materials may include plant debris, hair shafts, and small objects like toys. These intrusions can lead to acute discomfort, inflammation, secondary infections, or even tympanic membrane rupture if left untreated **(Brennan & Ihrke, 1983; Harvey, 2005).**

II.1.3.2 Importance:

Foreign bodies especially grass awns and seeds account for a significant proportion of external ear issues in dogs and cats, with 51% of grass awn migration cases involving the ear canal, based on a retrospective study of 182 small animals (dogs and 8 cats) treated over one year **(Brennan & Ihrke, 1983)**. In a CT audit of 44 dogs and 10 cats, **7%** of the confirmed grass seed foreign bodies were located in the external ear canal **(Vansteenkiste *et al,* 2014)**. Additionally, grass seed-related disease of all types represented approximately **2.0%** of veterinary hospital admissions in an epidemiological survey from southeastern Australia **(Combs *et al,* 2017)**.

II.1.3.3 Diagnosis:

Diagnosis relies on direct examination of the ear canal, as described above (otitis externa), to visualize and locate the foreign body **(Harvey, 2005).**

II.1.3.4 Medical treatment:

medical treatment is often supportive and follows the mechanical removal of the foreign body. Once the object is extracted, the ear canal should be flushed with sterile saline or appropriate otic solutions to remove debris and reduce irritation **(Bennett, 2015)**. Topical antibiotic, antifungal, or anti-inflammatory agents may be prescribed based on the presence of secondary infections or inflammation **(Griffin, 2006)**. Systemic anti-inflammatories or analgesics (e.g., meloxicam, carprofen) can help reduce pain and swelling, particularly in severe cases **(Mathews, 2008)**. If the foreign body caused damage to the tympanic membrane or deeper tissues, systemic antibiotics may be indicated to prevent otitis media or interna **(Rosychuk, 2011).**

II.1.3.5 Surgical treatment:

Surgical intervention is considered when the foreign body is deeply embedded, causes significant trauma, or when complications such as chronic otitis externa, perforation of the tympanic membrane, or middle ear involvement arise **(Hansen, 2020)**. Lateral Ear Canal Resection (LECR) may be performed to improve access for thorough removal, especially in cases with secondary hyperplasia or when visualization is impaired **(Radlinsky, 2020)**. In rare cases where there is extension into the middle ear or failure of medical treatment, total ear canal ablation (TECA) may be indicated **(Smeak and Dehoff, 1986)**. Postoperative care involves systemic antibiotics and anti-inflammatory drugs, regular bandage changes if needed, and close monitoring for complications like infection or neurologic deficits.

II.1.4 Ear tumors:

II.1.4.1 Definition:

Tumors of the external ear in dogs and cats include both benign and malignant neoplasms, often influenced by factors such as UV exposure and chronic inflammation. Squamous Cell Carcinoma (SCC) is a malignant tumor of the squamous epithelium, frequently affecting the pinnae of white cats due to sun exposure, and diagnosed via clinical exam, cytology, and confirmed histopathology **(Kiehl and Mays, 2016)**. Hemangiomas, benign vascular tumors,

commonly occur in dogs, while hemangiosarcomas, their malignant counterparts, are more frequent in cats, particularly on the ear tips of light-colored individuals **(Sula, 2012).** Basal Cell Carcinoma, the most common skin tumor in cats, appears as a slow-growing mass but may behave aggressively in some cases. Mast Cell Tumors are often solitary and less aggressive in cats particularly on the pinna while in dogs they are more invasive and require wide excision **(Coleman, 2024).** Sebaceous adenomas, benign tumors in older dogs, typically affect the pinna and present as pedunculated, cauliflower-like growths; however, sebaceous adenocarcinomas show invasive potential. The external ear canal may develop tumors from its glandular and epithelial components, including inflammatory polyps, ceruminous gland adenomas, and papillomas as benign lesions, and ceruminous gland adenocarcinomas, SCC, and malignant melanoma among malignancies. Chronic inflammation is often considered a predisposing factor **(Maggs et al., 2013; Morrison, 2002).**

II.1.4.2 Importance:

External ear tumors in dogs and cats predominantly involve ceruminous gland neoplasms and, less frequently, aural squamous cell carcinomas (SCC). According to **Villalobos and Hershey, (2023)**, ceruminous gland tumors represent nearly 90% of neoplasms in the external ear canal across both species. A retrospective study by **MacVean *et al*, (1978)** further supports that those ceruminous adenomas and adenocarcinoma are the most common external ear tumors in dogs and cats. In canine populations, **Li, Li and Lu, (2023)** found that although ear disease is largely inflammatory in nature, ear canal tumours occur primarily in older dogs, with a notable prevalence in breeds predisposed to chronic otitis. In cats, **Dhar, (2023)** confirmed that ceruminous gland adenocarcinomas are the most frequently diagnosed, typically in middle-aged to older individuals about 9 to 11 years, commonly presenting as firm, discharging masses. **Fan and de Lorimier, (2004)** highlighted that inflammatory polyp may mimic neoplasia but are distinguishable histopathologically, though up to 100% of fine-needle aspirates could differentiate polyps from tumors but not benign from malignant forms. Additionally, **Gotthelf, (2004)** reports that surgical management such as total ear canal ablation in cats with ceruminous adenocarcinoma yields a median survival time of approximately 50 months. In dogs, ceruminous gland adenocarcinomas are less common but involve breeds like Cocker Spaniels and German Shepherds, with potential local invasion into the bulla and occasional metastases **(Villalobos and Hershey, 2023; MacVean *et al*, 1978).** Overall, external ear tumors in cats are predominantly malignant ceruminous adenocarcinomas, whereas in dogs they occur less frequently but follow similar patterns.

Squamous cell carcinoma (SCC) can also affect the middle ear of both species, although it is rare. In dogs, its prevalence is less than 1–2%, while in cats, although still uncommon, it is more frequent than in dogs, especially among white-eared individuals due to chronic UV exposure **(Scott *et al,* 2001; Moriello, 2018).**

According to **Dorn (1967)** and **Priester and Mantel (1971)**, mixed-breed dogs and cats are frequently affected by various tumors, mainly due to their population size and higher outdoor exposure.

MacVean *et al,* (1978) reported that environmental factors such as trauma and chronic inflammation play a major role in the development of auricular and ear canal tumors.

Also; it has been proven that association between squamous cell carcinoma (SCC) and prolonged sun exposure, especially in white or light-colored cats, indicating UV radiation is a key risk factor **(Harvey *et al,* 2001)**.

Rodríguez *et al*, (2021) emphasized that environmental and anatomical factors, rather than breed, are significant in the pathogenesis of auricular neoplasms and polyps, particularly those arising from chronic otitis or ceruminous gland tissue.

II.1.4.3 Diagnosis:

The diagnosis of ear tumors in dogs and cats follows a structured, multimodal approach involving history, clinical signs, imaging, cytology, and definitive histopathology **(LaFond *et al,* 2002).** Key historical clues include chronic otitis and UV exposure, particularly in light-colored animals **(Rodríguez *et al,* 2021; Harvey *et al,* 2001).** Clinical signs are often non-specific, such as discharge, ulceration, or neurologic deficits like head tilt or facial paralysis **(Maggs *et al*, 2013; Fossum, 2019).** Imaging especially CT is crucial for assessing tumor extent and bony involvement **(Monnet, 2023).** Cytology via FNA provides a preliminary diagnosis, distinguishing tumor types, but histopathology remains essential for confirming tumor identity and malignancy grade **(Morrison, 2002; Harvey and Paterson, 2014).** This integrated approach supports accurate diagnosis and informs appropriate treatment planning.

In cases of SCC affecting the middle ear, diagnosis can be particularly challenging because benign or inflammatory lesions may mimic malignant tumors. For small or thin lesions, FNA or core biopsy is often not feasible. In such instances, an excisional biopsy is recommended as the most effective diagnostic method **(Henry and Higginbotham, 2009; August, 2009).**

II.1.4.4 Surgical treatment:

Surgical treatment of external ear tumors in dogs and cats varies based on tumor type, location, and invasiveness, with approaches ranging from conservative excision to radical resections. For benign or early-stage ceruminous gland tumors confined to the external ear canal, **Pieper *et al,* (2023)** demonstrated that CO_2 laser ablation following incisional biopsy resulted in effective local control, with low recurrence in both dogs and cats. However, more invasive or malignant neoplasms often necessitate total ear canal ablation (TECA), which provides complete removal of the affected canal and associated tumor tissues. According to **Smeak and DeHoff (1986)**, TECA offers favorable long-term outcomes, especially when combined with lateral bulla osteotomy, although complications such as facial nerve paralysis can occur in up to 23% of cases. For smaller or superficial external ear tumors, cryosurgery presents a less invasive alternative. **De Queiroz *et al,* (2008)** reported that cryosurgery led to satisfactory outcomes in selected cases, particularly for skin and subcutaneous tumors, though recurrence rates may increase without wide tissue margins. **Sula (2012)** emphasized that wide surgical excision remains the cornerstone for treating malignant tumors of the external ear, including squamous cell carcinoma and ceruminous gland adenocarcinoma. **Njaa (2016)** further supports aggressive surgical margins to reduce recurrence and recommends histopathological evaluation to determine the need for adjunctive therapies. Overall, the choice of surgical intervention must balance oncologic control with preservation of ear function and patient quality of life.

For aural squamous cell carcinoma, particularly when it affects the pinna, surgical management involves pinnectomy with a 1 cm safety margin. This technique has been shown to significantly extend survival time and is considered relatively straightforward **(Murphy, 2013).** The cartilage should be trimmed and sutured in a way that conceals the edge beneath the skin to promote proper healing. In many feline cases, bilateral pinnectomy may be required.

II.1.5 Lacerations and wounds:

II.1.5.1 Definition:

Trauma to the pinna is relatively common in cats, often resulting from bite wounds during fights, though abscess formation is rare. In dogs, trauma is more frequently due to head shaking linked to underlying conditions such as ear mites, foreign bodies, otitis media, or pruritus. Bleeding disorders like von Willebrand disease may also cause persistent bleeding from minor ear wounds **(Harvey and Ter Haar, 2016).** Small, superficial lacerations may heal by second intention if properly cleaned and debrided, but primary closure is preferred for flap-type injuries to avoid deformities. Untreated peripheral lacerations may worsen over time, while surgical

closure can sometimes cause pinna cupping. Partial pinnectomy offers good cosmetic results for small peripheral wounds **(Land and Wood, 2004).**

II.1.5.2 Importance:

Wounds and lacerations of the external ear are relatively common in small animals, particularly dogs, where the ear pinna is more frequently affected due to its exposure and mobility. In a retrospective study of 200 cases of ear trauma in small animals, dogs accounted for approximately 78% of cases while cats represented 22% **(Fossum, 2019).** The most affected age group was adult animals between 2 and 8 years, making up nearly 65% of all cases, likely due to increased outdoor activity and aggressive interactions **(Smeak and DeHoff, 1986).** The most common origin of these injuries is bite wounds from other animals, responsible for 55% of the cases in dogs and 61% in cats **(Slatter, 2003).** Other causes include vehicular trauma, sharp objects, and self-induced trauma secondary to otitis. Breeds with large, pendulous ears such as Cocker Spaniels and Labrador Retrievers are overrepresented due to increased surface area and susceptibility to entanglement or hematoma formation **(Gotthelf, 2004).** Common complications include aural hematoma (in approximately 25% of canine cases with pinna lacerations), infection, and in some cases necrosis of the ear tip if vascular supply is compromised **(Sula, 2012).** Cats may additionally suffer from delayed wound healing due to their thinner skin and more limited vascularity in distal pinna tissues**.** Prompt surgical and medical management is essential to prevent chronic deformities or secondary otitis **(Noli and Santoro, 2017)**.

II.1.5.3 Diagnosis:

Diagnosis of ear wounds and lacerations in dogs and cats begins with a thorough physical and otoscopic examination to assess the extent of the injury, rule out deeper structural damage, and identify any foreign bodies or underlying causes such as otitis externa. According to **Fossum (2019)**, careful inspection of the pinna and external ear canal should be performed under adequate restraint or sedation, especially if the animal is painful or uncooperative. Otoscopy is essential to evaluate concurrent canal injury or tympanic membrane rupture. In cases of bite wounds, punctures, or penetrating trauma, palpation and flushing can help detect underlying tissue separation, hematoma, or abscess formation **(Slatter, 2003)**. Radiography may be warranted when there is suspicion of temporal bone fracture, or if the injury extends toward the middle or inner ear **(Gotthelf, 2004).** In complex or chronic wounds, advanced imaging such as CT may be useful to evaluate the extent of deep tissue involvement or foreign material **(Sula, 2012).** Cytological examination of any discharge or wound exudate is recommended to rule out

secondary infection, and bacterial culture may guide antibiotic therapy, particularly in contaminated or non-healing wounds**.** Bloodwork is not always necessary but can be considered in older animals or those showing systemic signs **(Noli & Santoro, 2017)**.

II.1.5.4 Treatment:

The treatment of traumatic injuries to the pinna in dogs varies based on the type and severity of the injury. Aural hematoma is the primary condition, as previously described, requiring evacuation of the accumulated blood. Anti-inflammatory medications and pain relief are essential components of care **(Rana, 2025; Lanz and Wood, 2004).** Lacerations and puncture wounds are treated by thorough wound cleaning, debridement, and closure using sutures. Small, superficial wounds may be left to heal by second intention, but more extensive injuries often require primary closure or, in the case of peripheral damage, partial pinna amputation for improved cosmetic outcomes **(Lanz and Wood, 2004).** For complex or large wounds, reconstructive techniques such as single pedicle flaps or secondary skin flaps may be employed. Avulsion injuries, involving partial or complete detachment of pinna tissue, demand immediate surgical reattachment, meticulous wound care, and appropriate analgesia. In all cases, proper bandaging and follow-up care are crucial to ensure healing and prevent complications **(Rana, 2025).**

II.2 Middle ear disorders :

II.2.1 Otitis media:

II.2.1.1 Definition:

Otitis media is an inflammation of the middle ear, is typically caused by infection from the external ear canal or a foreign object penetrating the eardrum and rarely, infection spreads via the bloodstream. All these causes lead to a secondary otitis media, the most common form. However, in contrast, primary otitis media is less common and occurs without an identifiable external or systemic source of infection. In cats, nasopharyngeal polyps often cause secondary otitis media by obstructing the auditory tube, predisposing to infection. Otitis interna, inflammation of the inner ear, may complicate middle ear inflammation. **(Gotthelf 2004).**

II.2.1.2 Importance:

According to **(Griffin *et al,* 2001)** otitis media is a common extension of chronic otitis externa, occurring in up to 50% of cases with chronic external ear disease in dogs, while a retrospective study established by **(Swale *et al,* 2017)** found that approximately 20–30% of cats with otitis media have chronic otitis externa. In terms of affected cats with otits media regarding the age

there are more frequent cases in 20–30% in older cats (>5 years) knowing that these cats were having an acute otitis externa with younger ones 1-2 years having less chance of getting affected (generally due nasopharyngeal polyps). For dogs, Puppies (<1 year) have rare prevalence of affections <20%, due to low chronic otitis externa prevalence **(Griffin *et al,* 1993),** which is the major cause of otitis media due to its extension as mentioned before.

II.2.1.3 Diagnosis:

Based on the observation of clinical signs: ear pain, inflammation, and discharge in the ear canal can result in hearing loss and balance problems. Recurrent inflammation of the outer ear may also be a sign. On the affected ear's side, symptoms like facial nerve paralysis, pupil constriction, eyelid drooping, eyeball sinking into the orbit, and third eyelid protrusion may occur due to the middle ear's role as a pathway for sympathetic and facial nerves. Sneezing, eye discharge, and/or nasal discharge can suggest otitis media in cats, often stemming from respiratory issues. Once mucus and dried exudates are removed, some cats with otitis media show a visible polyp in the ear canal. Additionally, a black, crumbly, dried exudate, resembling an ear mite infestation, is frequently found in the ear canals of cats with this condition.

II.2.1.4 Medical treatment:

Otitis media may be due a lot of causes which every cause might get treated using warmed tris-EDTA into the bulla if a bacterial infection is identified in order to flush the bulla followed by a suction by advancing a catheter along the floor of the horizontal canal and direct it ventrally into the bulla **(Gotthelf, 2004)**. A combination of systemic antifungal medication and acetic acid flushes can be used for chronic otitis media cases due to yeast organisms **(Church *et al,* 2008).**

II.2.1.5 Surgical treatment:

Generally, a mix of surgical techniques are applied to treat the otitis media and consists of accessing the middle ear through a lateral bulla osteotomy combined with TECA or via a ventral bulla osteotomy **(Fossum,2012)** Although the selection of the surgical approach to the middle ear is therefore largely dictated by the cause of the problem. In dogs, the most common cause of middle ear disease is chronic otitis externa, and thus the most common approach is (total ear canal ablation with bulla osteotomy) which permits simultaneous resection of diseased tissue while in cats ventral bulla osteotomy is a common procedure for managing feline middle ear disease, especially inflammatory polyps. Unlike lateral bulla osteotomy the VBO accesses the

external meatus and removes diseased tissue without requiring total ear canal ablation **(Johnston and Tobias, 2017)**.

II.2.2 Cholesteatoma:

II.2.2.1 Definition:

A cholesteatoma is a keratinized epithelial-lined epidermoid cyst in the middle ear, characterized by gradual growth that destroys nearby tissue and bone, containing keratin debris. It has two types: primary (congenital), where epithelial cysts form beneath an intact tympanic membrane, and secondary (acquired), where squamous epithelium migrates into the middle ear through a tympanic rupture from prior chronic inflammation (otitis) or persists after incomplete ear canal ablation **(Rodríguez *et al*, 2021).**

II.2.2.2 Importance:

Cholesteatoma is a rare condition of the middle ear, reported almost exclusively in dogs, with no significant data in cats **(Hardie *et al,* 2008).** The Cocker Spaniel is the most affected breed, accounting for 59% of cases **(Lilly *et al,* 2007)**. Males are slightly more represented (64%), and the average age at diagnosis is around 8.5 years. It commonly arises as a complication of chronic otitis media or following procedures like myringotomy **(Greci *et al,* 2011).**

II.2.2.3 Diagnosis:

Collaboration between the pathologist and the surgeon is necessary for a definitive diagnosis. The surgeon must carefully indicate that the origin of the tissue is the middle ear. The pathologist then looks for the presence of ciliated epithelium (to confirm that the origin of the tissue is the middle ear), presence of metaplastic epithelium, presence of cornification, and accumulation of keratin-rich cornified material (ideally lamination is observed) **(Monnet, 2003).**

II.2.2.4 Surgical treatment:

Cholesteatoma require only a surgical treatment which is based on resection of stratified squamous epithelium, removing keratinized debris and controlling infection, necessitating total ear canal ablation and lateral osteotomy of the tympanic bulla. All tissues of the external auditory meatus attached to the cranial, dorsal, and caudal areas are removed, while the facial nerve in the caudoventral area of the horizontal canal is identified and isolated, with dissection being performed carefully to avoid hyperplastic reaction or ossification. The tympanic cavity

is cleaned by removing abnormal epithelium with a curette, with the dorsal and dorsomedial areas being avoided to prevent injury to the auditory ossicles leading to the inner ear, and the horizontal canal is dissected close to the bone at the level of the external auditory meatus, with care taken to ensure no damage to the facial nerve. Before the surgical field is closed, a fenestrated tube is placed in the tympanic cavity, exiting the skin caudomedially, secured with a Chinese finger-trap suture, and 0.4 ml/kg of lidocaine-bupivacaine is administered for enhanced pain control **(Rodríguez *et al*, 2021)**.

II.2.3 Feline nasopharyngeal polyps "FNP":

II.2.3.1 Definition:

Pedunculated, benign masses, typically from the middle ear, covered by an epithelial layer (stratified squamous to ciliated columnar), encasing loosely arranged fibrovascular tissue with plasma cells, lymphocytes, and occasional neutrophils. The often-ulcerated surface may include a few mucous-secreting cells just beneath (**Lappin, 2001).**

II.2.3.2 Importance:

Nasopharyngeal polyps are described as uncommon but significant in cats, arising from the middle ear or Eustachian tube. They are more frequent in young cats and associated with chronic inflammation with a proportion of 0.1–0.5%, reflecting their uncommon nature in the broader population as mentioned by **(Gotthelf,2004).**

II.2.3.3 Diagnosis:

The diagnosis of FNP involves several examinations, beginning with a thorough otoscopic examination using a rigid fiberoptic scope to check for otitis externa and aural polyps (which may occur solely in connection with nasopharyngeal polyps) **(Kudnig, 2002)**. Radiographic and CT (Computed Tomography) scans are performed to assess the tympanic bullae, looking for thickened bone and increased fluid density **(Hedlund and Merchant, 2002)**. The most reliable method for a definitive diagnosis is histopathologic analysis of tissue typically obtained during surgical excision **(Nelson *et al*, 2019)**.

II.2.3.4 Surgical treatment:

The surgical treatment of FNP involves traction of the polyp combined with ventral bulla osteotomy. This combination is preferred because it significantly reduces the chances of

recurrence, with rates ranging between 0% and 8%, compared to recurrence rates of 36% to 41% when traction is used alone. Moreover, this combined approach is recommended in cases where otitis media is present and conversely, traction alone may be considered only when the surgeon cannot perform the osteotomy **(Kudnig, 2002)**.

SECOND PART:
PRACTICAL PART

PRACTICAL PART

I. Objective:

The objective of this study was to retrospectively catalog cases of external and middle ear disorders in dogs and cats in the Algiers province during the year 2024/2025 to assess the relative frequencies of these auricular conditions, as well as the possible medical and surgical treatments they underwent, to provide an overview of the most common auricular cases encountered by the Algerian veterinarians in their daily practice. To this end, the cases are categorized based on several criteria, including: age, breed, sex, origin of the disorder, symptoms observed at the time of consultation, possible complications, etc.

II. Materials and methods:

A structured questionnaire was distributed to veterinary clinics across all districts (wilayas) of Algiers Province to collect clinical and epidemiological data related to ear disorders in dogs and cats. The distribution was conducted between [January to June 2025], using both paper format (50%) and an online Google Form (50%). The questionnaire aimed to gather detailed information on the animal's species, breed, sex, age, and whether the condition had a traumatic origin or not. It also covered clinical signs, results of otoscopic examination, suspected diagnosis, medical and surgical treatments administered, surgical techniques used, and possible complications (see Appendix No. 1). Only small animal practitioners were included. Participation was voluntary and anonymous, and all collected data were handled confidentially. Responses were collected and analyzed through Microsoft Excel. Ethical approval was not required due to the observational and anonymous nature of the study.

III. Results and Discussion

A total of 43 veterinarians were contacted during the course of this study; among them, 26 responded and agreed to participate, while 17 did not provide any feedback or declined involvement. Based on the responses collected, here are the results we obtained. It is important to highlight that, in the following sections, only the most relevant and frequently observed factors will be discussed in detail, in order to focus the analysis on findings of greatest clinical significance.

III.1 Species:

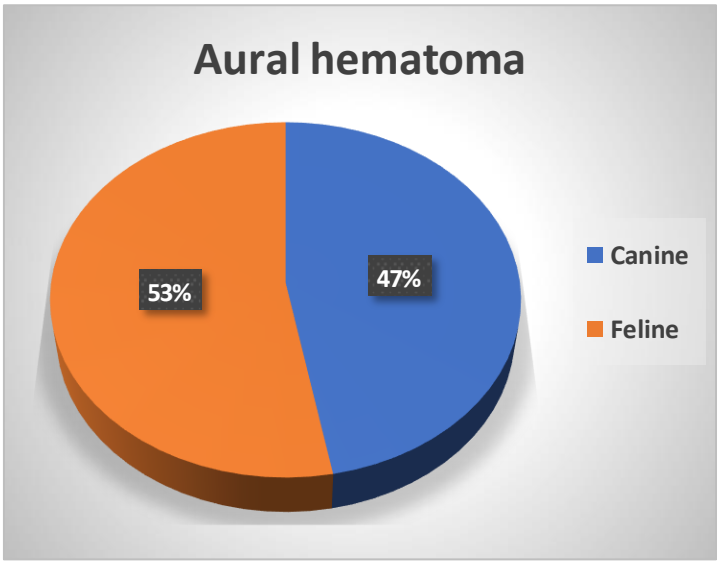

Figure 7: Graphical representation in the form of a pie chart showing the species mostly affected by auricular hematoma

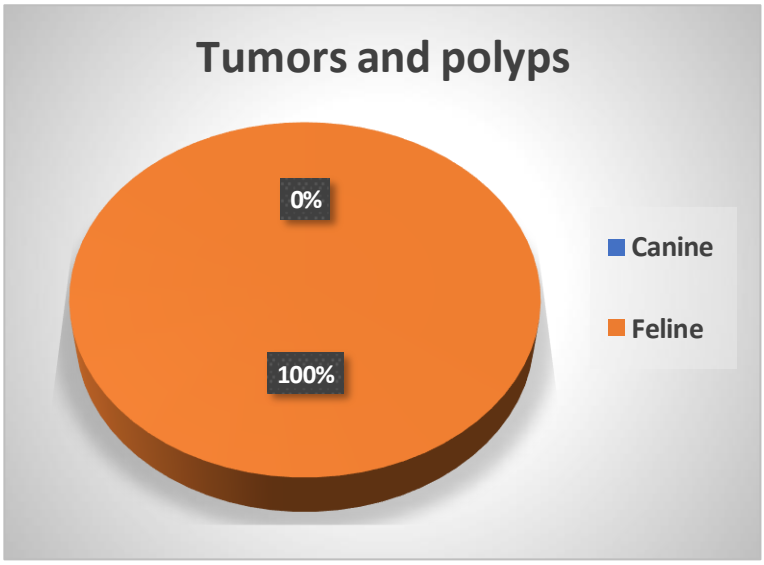

Figure 6: Graphical representation in the form of a pie chart showing the species mostly affected by ear tumors and polyps

Aural hematomas (17 cases out of 26) were observed in both species, with 53% (9 cases) in cats and 47% (8 cases) in dogs. This slight feline predominance could be explained by the larger cat population in Algeria, particularly due to the widespread presence of free-roaming and semi-owned cats in urban areas. These animals are more likely to suffer from ear mite infestations, chronic otitis externa, or trauma, which are recognized causes of aural hematoma **(Williams et al, 2023; Hewitt and Bajwa, 2020; Mikawa et al, 2005).**

All auricular tumors and polyps (5 cases out of 26) diagnosed (100%) were found in cats, with no cases recorded in dogs during the study period. This could be attributed not only to the higher number of cats encountered in veterinary practice in Algeria but also to the fact that nasopharyngeal and aural polyps, as well as ceruminous gland tumors and squamous cell carcinoma, are more commonly reported in felines **(Villalobos and Hershey, 2023; Dhar, 2023; Sula, 2012).**

III.2 Gender:

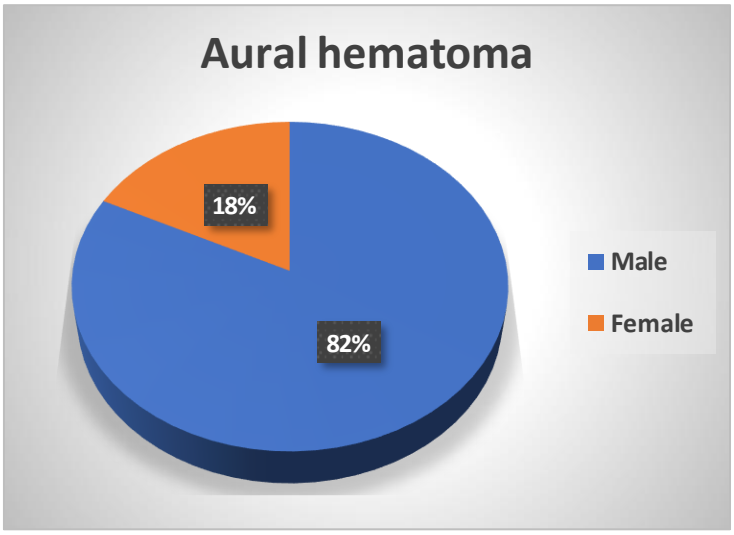

Figure 9: Graphical representation in the form of a pie chart showing the gender mostly affected by auricular hematoma

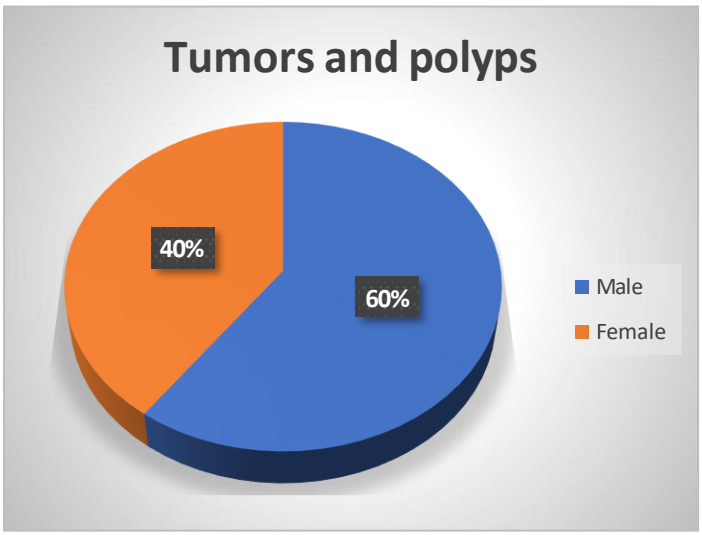

Figure 8: Graphical representation in the form of a pie chart showing the species mostly affected by ear tumors and polyps

In our results, 82% (14 cases out of 17) of aural hematomas affected males, compared to 18% (3 cases out of 17) in females. This male predominance may be due to greater exposure to trauma from fights; a behavior more common in intact males. Similar trends were noted by **Mikawa *et al*, (2005),** though other studies like **O'Neill *et al*, (2021)** found no sex bias.

Among tumor and polyp cases, 60% (3 cases out of 5) were males and 40% (2 cases out of 5) females. While the sample is small, this slight male predominance may reflect behavioral or hormonal influences, though most literature does not report a strong sex predisposition for ear tumors.

III.3 Breed:

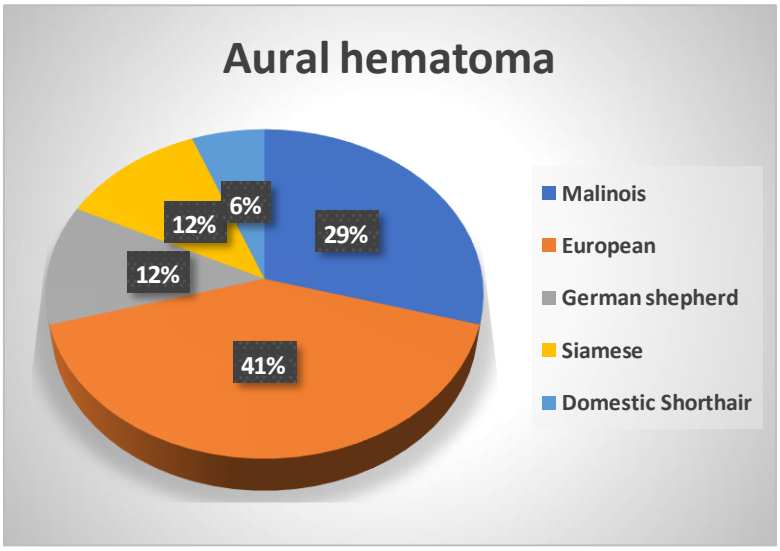

Figure 11: Graphical representation in the form of a pie chart showing the breeds mostly affected by auricular hematoma

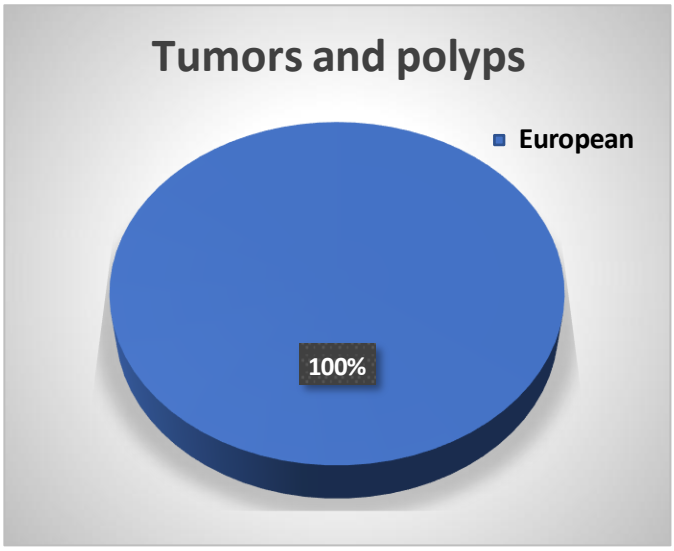

Figure 10: Graphical representation in the form of a pie chart showing the species mostly affected by ear tumors and polyps

In both aural hematoma and tumor/polyp cases, the most represented breeds were local Algerian or European (7 cases out of 17 for aural hematomas and 5 out of 5 for tumors and polyps), followed by the Malinois (5 cases out of 17). This trend reflects the general breed distribution in Algeria, where these animals are more prevalent in urban and peri-urban settings according to the veternarians. According to **MacVean *et al*, (1978);** the overrepresentation may also be linked to higher outdoor exposure, increasing the risk of trauma, chronic otitis, or sun-related lesions.

Similar findings are reported in the literature. **Dorn (1967)** and **Priester and Mantel (1971**) noted higher disease incidence in mixed breeds, often due to their larger population and free-roaming behavior. For tumors like SCC, **Harvey *et al*, (2001)** linked sun exposure in light-colored cats to increased risk. **Rodríguez *et al*, (2021)** also reported that environmental and anatomical factors outweigh breed predisposition in ear pathologies.

III.4 Age:

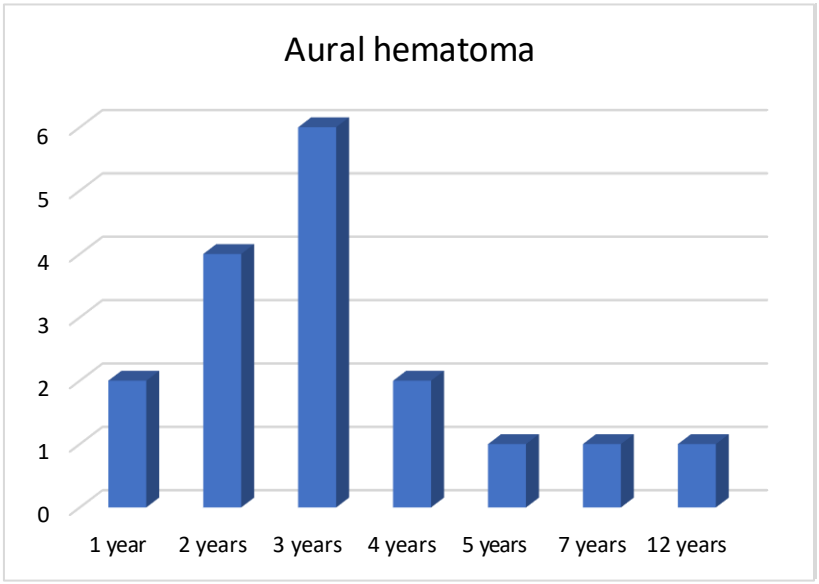

Figure 13: Graphical representations in the form of a bar chart showing the ages mostly affected by aural hematoma

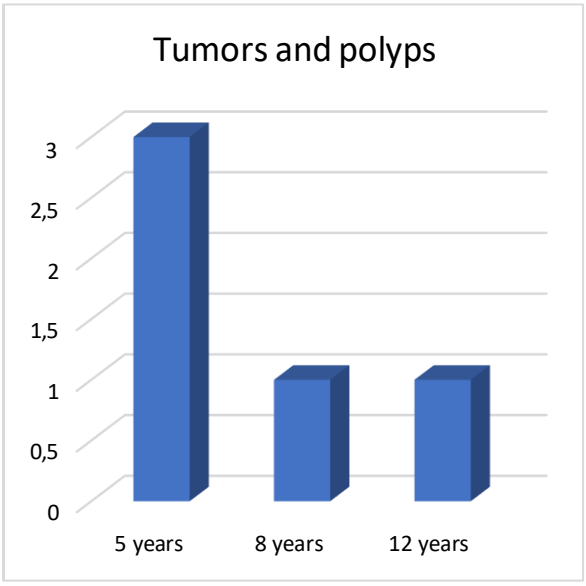

Figure 12: Graphical representations in the form of a bar chart showing the ages mostly affected by tumors and polyps

Most cases of aural hematoma were observed in young animals, with a peak incidence at 3 years, followed by 2 years of age. Fewer cases were reported progressively from 4 up to 12 years. This early onset may be related to increased physical activity, scratching, and trauma in young, energetic individuals **(O'Neill *et al*, 2021).**

The majority of polyps and tumor cases occurred in middle-aged to older animals, with a notable peak at 5 years, followed by 8 and 12 years. This pattern aligns with the progressive nature of chronic inflammation and tissue degeneration often underlying neoplastic processes **(Dhar, 2023)**

III.5 Origin:

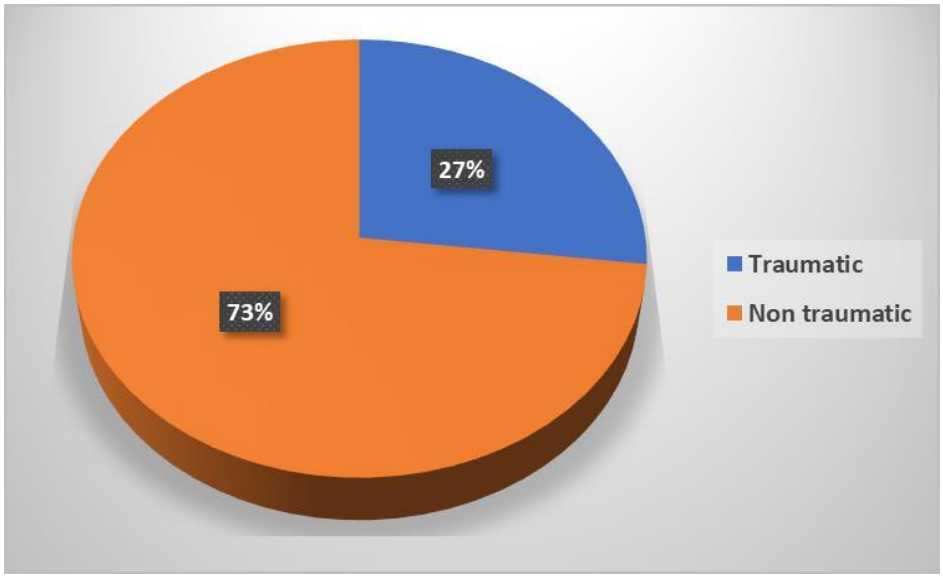

Figure 14: Graphical representation in the form of a pie chart showing the origin mostly causing auricular disorders.

In our study, 27% of the auricular conditions had a traumatic origin (7 cases out of 26), such as those related to head shaking, bites, or self-inflicted injury, particularly in aural hematomas and lacerations. The remaining 73% were non-traumatic (19 cases out of 26), associated with chronic inflammation, infections, or proliferative lesions like tumors and polyps. It is well established that aural hematomas are essentially trauma-driven, typically secondary to violent head shaking or scratching from underlying otitis that owners may not observe until the hematoma forms. UK and Japanese studies report a 0.25 % annual incidence in dogs aged 10–12 years, balanced sex distribution, and breed predispositions (Bull Terriers, French Bulldogs, Saint Bernards) with 76.3 % having concurrent otitis externa, implicating inflammation-induced cartilage stress followed by trauma **(O'Neill *et al*, 2021; Mikawa *et al*, 2005; Kuwahara, 1986).**

This was not the case in our study, which may be explained by the fact that owners often do not notice their animal scratching its ear due to otitis for example, and only become aware of the problem when the aural hematoma is already installed.

III.6 Otoscopy and otoscopic results:

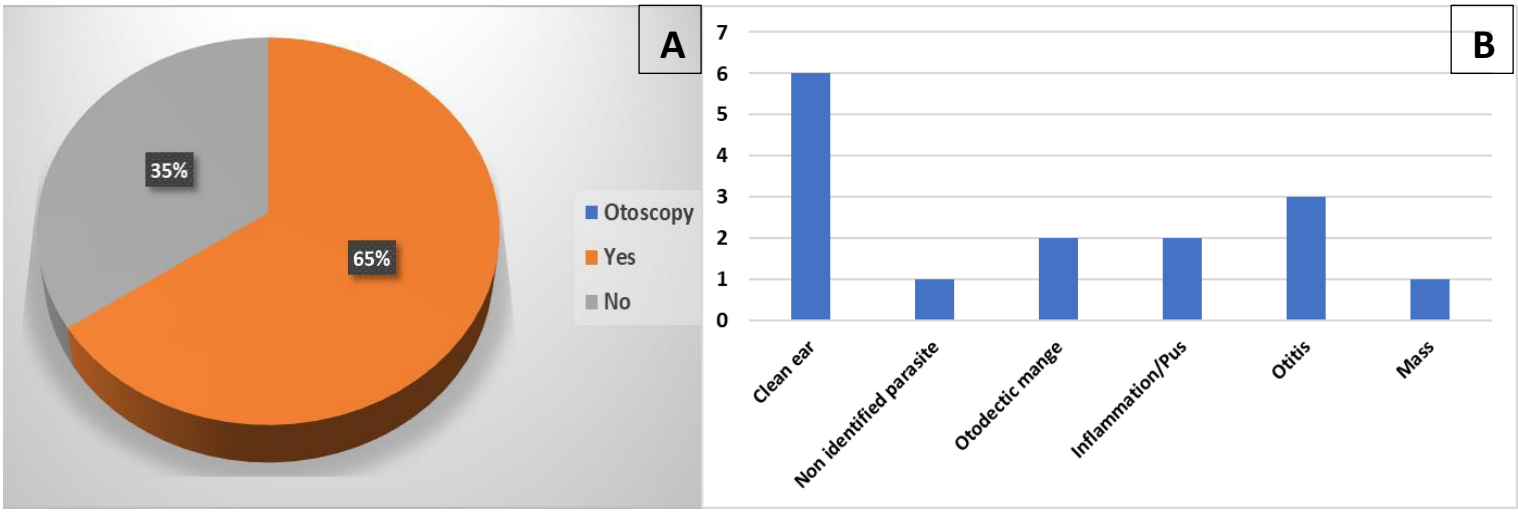

Figure 15:(A) Graphical representations in the form of a pie chart showing otoscopy prevalence practiced by veternarians , (B) Graphical representations in the form of a bar chart showing the results of the otoscopic examination.

Otoscopy was used in 65% of cases (16/26), confirming its key role in auricular diagnostics. However, 35% of veterinarians did not perform otoscopy (10/26), likely due to equipment limitations, time constraints, or patient non-cooperation, a trend also noted by **Nuttall (2016),** who emphasized the underuse of otoscopy in general practice despite its diagnostic value.

The most frequent otoscopic finding was a clean ear (6 cases), possibly reflecting early consultation, mild conditions, or even routine use of otoscopy. Still, the identification of inflammatory signs and pus aligns with the high prevalence of otitis externa, one of the most common dermatological conditions in small animals **(Rosychuk, 1994).**

Though less frequent, the detection of masses (suggestive of tumors or polyps) and parasites (notably Otodectes cynotis) highlights the essential role of otoscopy in identifying proliferative and parasitic ear diseases, as reported by **August (1988)** and **Gotthelf (2004).** These findings support the use of otoscopy not only for infection diagnosis but also for the early detection of more serious conditions.

.

III.7 Symptoms:

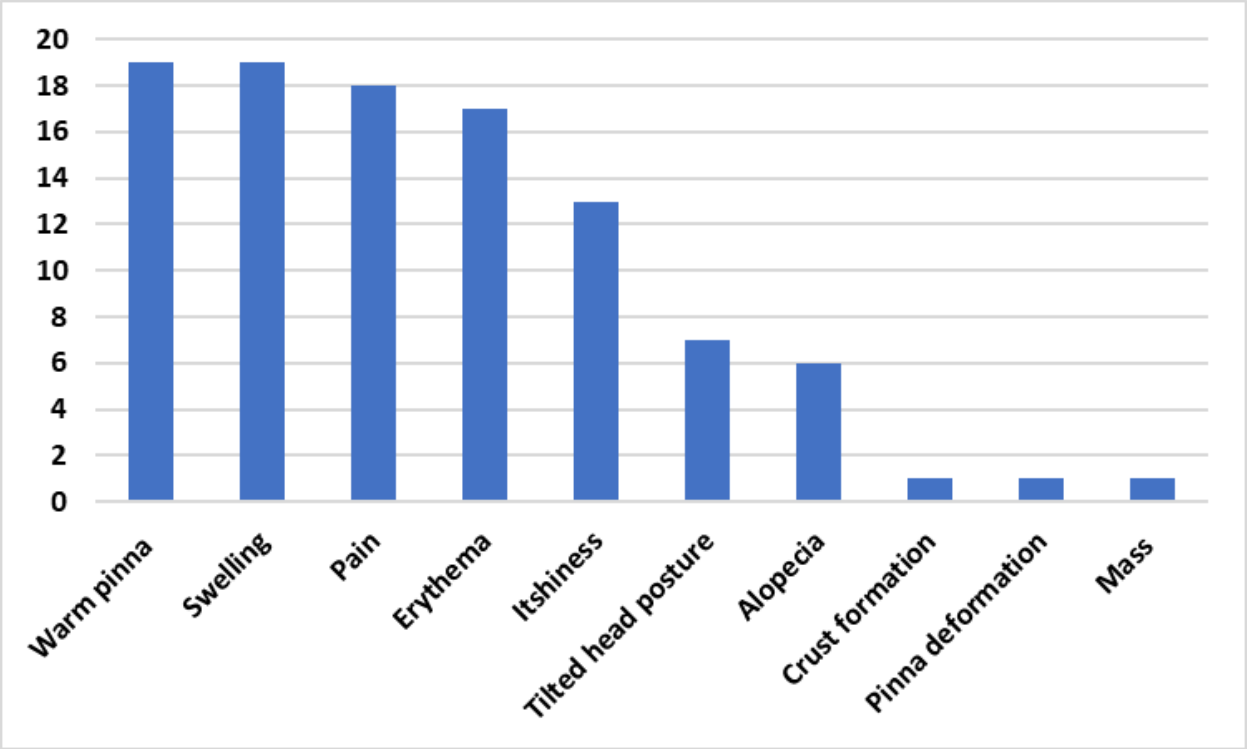

Figure 16: Graphical representations in the form of a bar chart showing the symptoms observed in presented patients

The most frequently reported clinical signs were warm pinna and swelling (19/26 each), followed closely by pain (18/26) and erythema (17/26). These are classical signs of acute inflammation, commonly observed in conditions like aural hematoma and otitis externa **(Carlotti, 1991).** Other signs such as itchiness and head tilt were also reported, suggesting auricular discomfort and in some cases, possible middle or inner ear involvement.

However, it is important to note that the majority of these symptoms likely originated from cases of aural hematoma, which were predominant in our study **(Hewitt and Bajwa, 2020).** This may explain the high frequency of inflammatory signs, since hematomas typically cause rapid swelling, warmth, erythema, and pain due to vascular rupture and subdermal blood accumulation.

Less common signs like alopecia, crusting, and pinna deformation were likely the result of chronicity or self-inflicted trauma. Masses, indicative of tumors or polyps, were rarely

identified during clinical examination, possibly due to their deep or less visible location, requiring otoscopy or imaging for detection **(LaFond *et al,* 2002).**

.

III.8 Diagnosis:

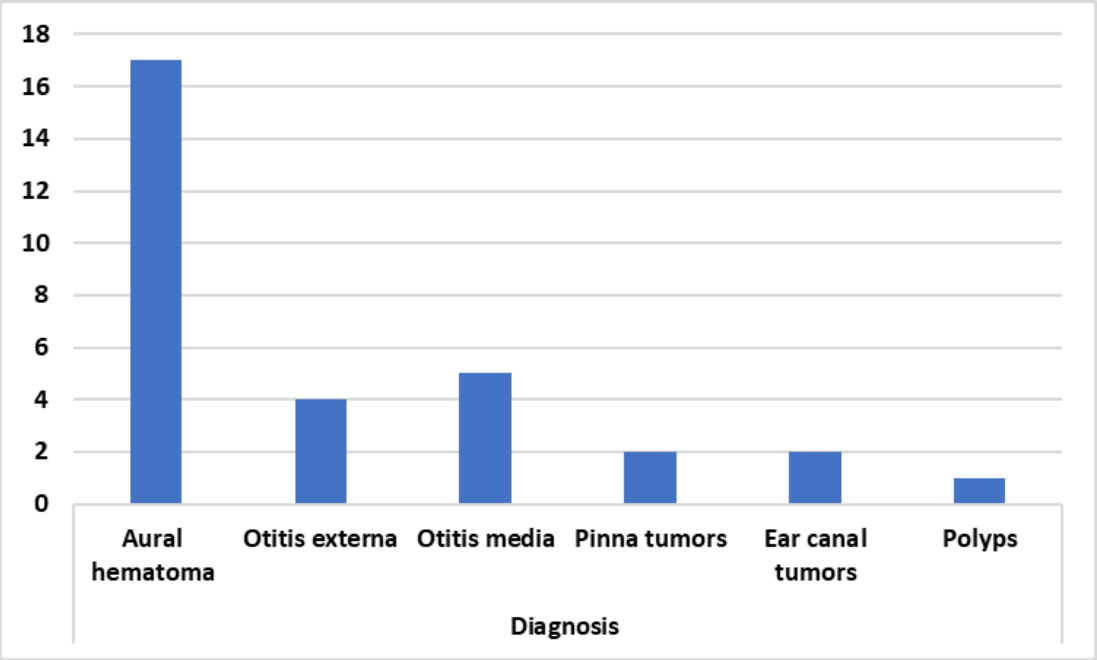

Figure 17: Graphical representations in the form of a bar chart showing the diagnosis overview

The distribution of diagnosed auricular disorders in this study revealed that aural hematomas accounted for 65% of all cases, followed by tumors and polyps at 19%, while otitis media and otitis externa represented the remaining proportion, in descending order. The overwhelming predominance of aural hematomas may be linked to several factors.

First, aural hematomas are easily detectable, even by owners, due to the characteristic swelling and discomfort they cause, prompting quicker veterinary consultation. Second, their frequent association with chronic otitis externa, ear mites, or traumatic head shaking especially in cats further explains their prevalence **(Mikawa *et al,* 2005; Hewitt and Bajwa, 2020).** The relatively lower representation of otitis cases, despite their known high prevalence in veterinary literature **(Ettinger *et al,* 2010)**, might reflect a clinical underdiagnosis or misclassification, particularly in mild or early stages where owners do not seek care. Additionally, tumors and polyps, though less frequent overall, were still significant at 19%, indicating the need for greater vigilance in chronic or recurrent cases, especially in feline patients **(Villalobos and Hershey, 2023; Dhar, 2023).**

III.9 Surgical techniques:

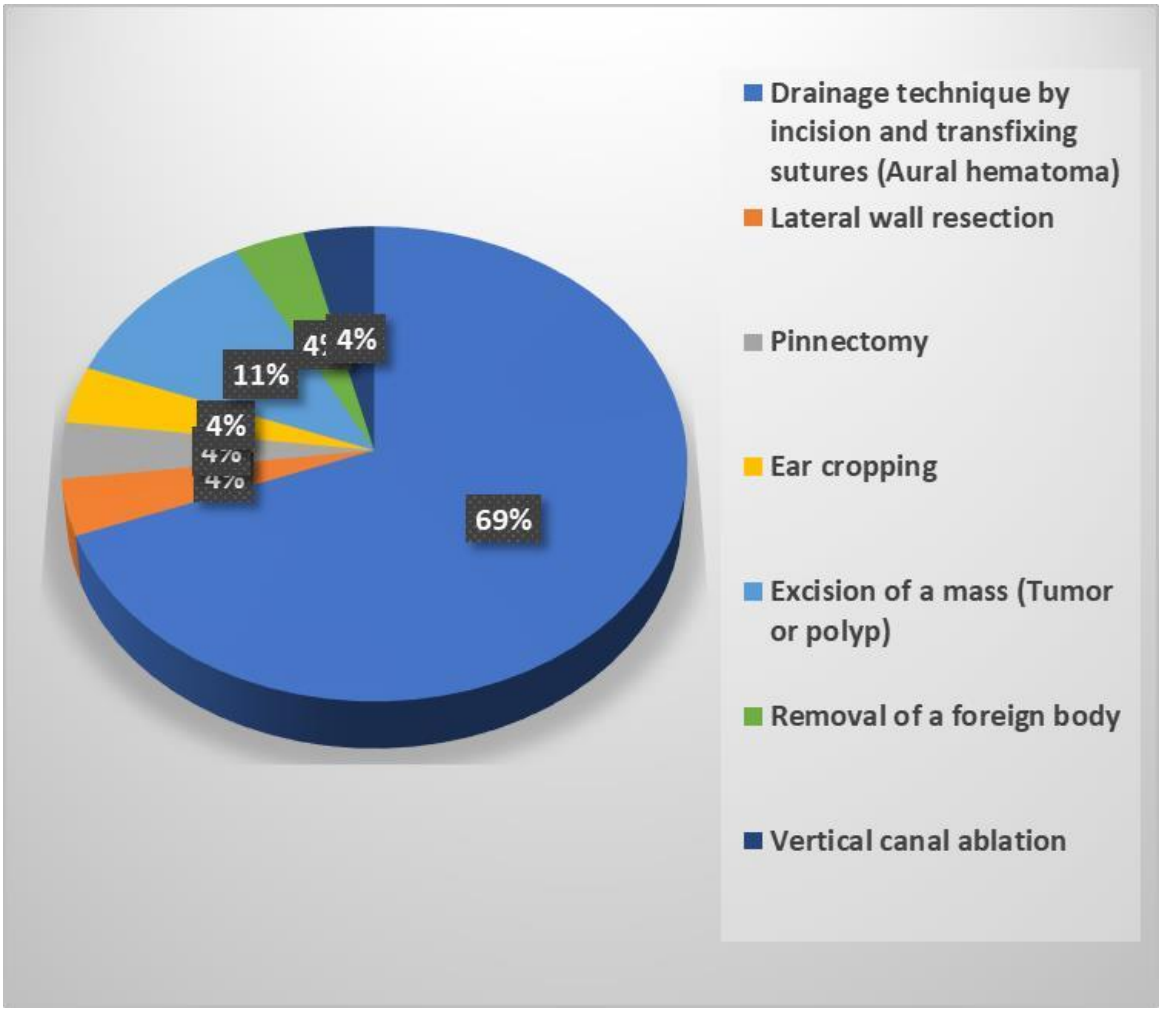

Figure 18: Graphical representation in the form of a pie chart showing the origin mostly causing auricular disorders.

The chart reveals that the most commonly performed procedure was aural hematoma drainage via incision and transfixing sutures (69% = 18), which is consistent with the high prevalence of aural hematomas in the studied population. This could be attributed to frequent ear trauma, scratching, or head shaking, especially in male and active animals, as supported by clinical data. Excision of masses or polyps (11% = 3) reflects the presence of neoplastic or inflammatory growths, particularly in cats. Despite the fact that several techniques are described for the management of aural hematomas **(Coleman, 2024)**, veterinarians not only performed surgery but also clearly preferred it, undoubtedly because it provides better results **(Hamaide and Griffon, 2016).**

The use of vertical canal ablation (4.4% =1), lateral wall resection, and pinnectomy reflects more advanced or chronic ear diseases requiring radical intervention and a specific diagnosis. However, radiography is often difficult to interpret, and MRI which is essential in certain cases such as suspected otitis media, otitis interna, or middle ear polyps is not always available. Therefore, the diagnosis of such conditions is already more challenging. Advanced imaging modalities are often required to assess the extent and nature of lesions, particularly when clinical signs are non-specific or when neurologic involvement is suspected **(Gotthelf, 2004),** as in cases of neoplasia or end-stage otitis **(Radlinsky, 2020).** Less frequent procedures, such as foreign body removal or ear cropping, were rare likely due to their lower clinical incidence or their primarily cosmetic nature rather than medical necessity **(Combs *et al,* 2017)**.

III.10 Complications:

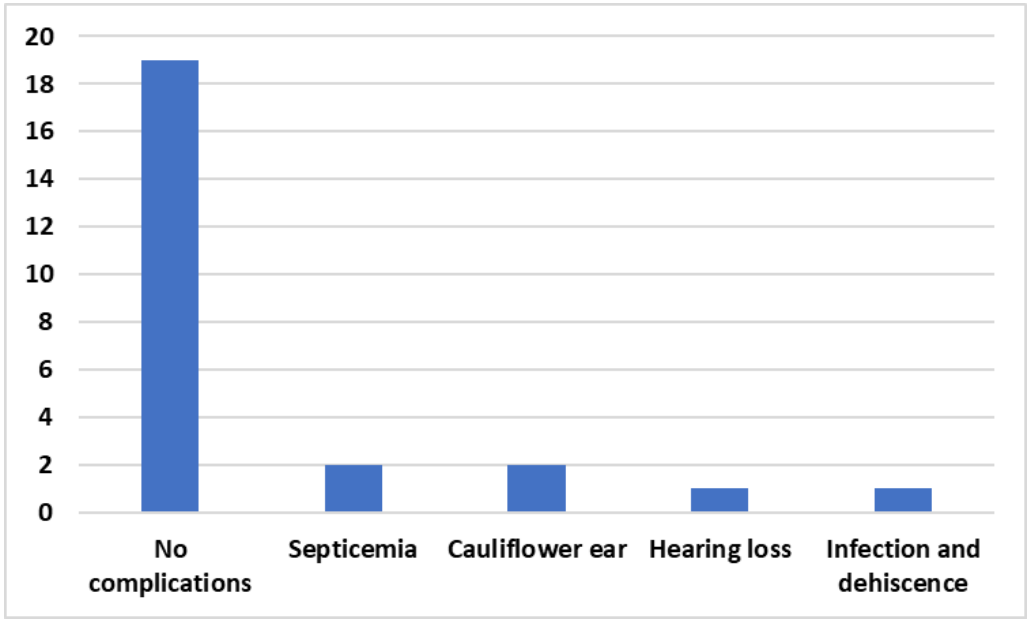

Figure 19: Graphical representations in the form of a bar chart showing the complications overview

Among all cases, 19 animals (79%) showed no postoperative complications, suggesting generally effective surgical techniques and post-op care. However, a few complications were noted.

Septicemia occurred in 2 animals, which may be due to delayed treatment or systemic infection spread, but it could also reflect improper aseptic conditions during surgery, especially if

performed in field settings or under suboptimal sterility an unfortunately common risk in veterinary practice, as noted by **Patterson (2015).** Since the data are anonymous, this remains a plausible hypothesis rather than a direct critique.

Cauliflower ear (2 cases) likely resulted from chronic, poorly resolved hematomas or failure to surgically intervene early, leading to fibrosis and cartilage remodeling **(Sula, 2012).**

Hearing loss (1 case) may have been caused by inner ear involvement, chronic otitis, or iatrogenic trauma during surgery, particularly if the tympanic membrane or deeper structures were affected **(Tobias and Johnston, 2017).**

Infection with wound dehiscence is a frequent and expected minor complication in auricular surgeries. It may result from poor wound care, self-trauma, or failure to maintain an e-collar **(Smeak and DeHoff, 1986)**. Additionally, this complication is more likely in ear canal surgeries, as the canal is anatomically difficult to disinfect thoroughly and remains exposed to moisture and debris postoperatively, making complete asepsis nearly impossible. In such cases, healing by second intention is often the appropriate solution and leads to resolution without further intervention **(Flanders, 2025).** The low rate of postoperative infection in our study (1 case) may be explained by the predominance of superficial surgeries (e.g., aural hematoma drainage) and the likelihood that minor infections were either unreported, managed conservatively, or healed by second intention, as is common in auricular procedures **(Flanders, 2025; Smeak and DeHoff, 1986).**

IV. Conclusion:

The results of our study shows that aural hematomas were the most frequently encountered auricular condition (65%), predominantly affecting young male cats, likely due to their higher exposure to trauma and otitis-related behaviors. Tumors and polyps represented 19% of the cases and were exclusively observed in older feline patients, underlining a species and age predisposition. The majority of disorders had a non-traumatic origin (73%), suggesting that chronic inflammation and underlying disease processes play a key role in auricular pathology. Local or European breeds were the most commonly affected, in line with the population distribution in Algeria. Overall, surgical management was effective, with complications being relatively rare. These findings provide insight into the clinical trends of external and middle ear disorders encountered by veterinarians in Algiers.

GENERAL CONCLUSION

This retrospective study highlights the prevalence and clinical relevance of external and middle ear disorders requiring surgical intervention in domestic carnivores in Algiers Province. Through a dual approach combining bibliographic review and field data we were able to identify the most frequently encountered conditions, namely aural hematomas, auricular tumors, and polyps, and to assess their distribution in relation to species, sex, age, breed, origin, the surgical approach practiced and associated complications.

Our findings revealed a clear predominance of aural hematomas (65%), with a higher incidence in cats than dogs, and a strong male predisposition, particularly among young, active animals. This aligns with literature suggesting trauma and chronic otitis as underlying causes. Auricular tumors and polyps, exclusively observed in cats (19% of cases), mostly affected middle-aged to older individuals, and confirmed the known feline predisposition to such proliferative lesions. Additionally, most surgical cases were found among local and European mixed breeds, reflecting the demographic reality of the Algerian pet population.

Importantly, cases of otitis media and externa were also significantly represented and should not be underestimated in the Algerian veterinary context. Their presence highlights the persistence of chronic inflammation and infection as both primary and underlying causes of surgical ear disease, as reported in the literature.

Surgical management most commonly involved drainage of hematomas via incision and sutures, followed by excision of tumors or polyps. While most cases evolved without complications, some serious outcomes such as septicemia, dehiscence, or hearing loss underscore the importance of proper surgical technique and postoperative care.

In conclusion, the study emphasizes the relevance of surgical ear diseases in small animal practice in Algeria, underlining the need for early detection, accurate diagnosis (especially history, anamnesis and via otoscopy), and tailored surgical interventions. These insights can support Algerian veterinarians in optimizing clinical management and improving outcomes for pets affected by external and middle ear disorders.

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APPENDIX

PFE Questionnaire

Bonjour, Nous sommes des étudiants à l'Ecole Nationale Supérieure Vétérinaire "*ANFAL*" et "*ABDELMALEK*". Nous menons actuellement une enquête pour évaluer les fréquences relatives et les caractéristiques cliniques et du traitement chirurgical des affections chirurgicales de l'oreille externe et moyenne (durant les cinq dernières années), en vue de la préparation de notre mémoire de fin d'étude. Nous vous serions très reconnaissants de nous aider dans notre recherche en répondant à ce questionnaire. Merci de nous accorder quelques minutes de votre temps, que nous savons précieux. **S'il vous était impossible de remplir les fiches, nous autoriseriez-vous à consulter les dossiers de vos patients relatifs à ce type de cas ?**

Renseignement du cabinet :

1. Nom du cabinet :

.....

2. Vétérinaire chirurgien(ne) (facultatif) :

.....

Renseignement de l'animal :

Merci de remplir une fiche par animal

3. Espèce : *Une seule réponse possible.*

- ☐ Féline
- ☐ Canine

4. Sexe :

- ☐ Male
- ☐ Femelle

5. Age : .....

6. Race : .....

.....

7. L'animal vit

- ☐ A l'intérieur
- ☐ A l'extérieur

8. L'animal vit :

- ☐ Seule
- ☐ En collectivité

9. Vermifuguation avec anti-gales :

☐ Oui ☐ Non

10. Motif de consultation :

.....

.....

.....

Donnés de l'examen général :

11. Origine de l'affection

- ☐ Traumatique
- ☐ Non Traumatique

12. Hyperthermie

- ☐ Oui
- ☐ Non

13. Symptômes auriculaires : *Plusieurs réponses possible*

- ☐ Prurit
- ☐ Dépilations
- ☐ Rougeur
- ☐ Pavillon chaud
- ☐ Douleur
- ☐ Port de tête penchée
- ☐ Gonflement du pavillon

Autre :.....

.....

14. Eclaircissement du poil :

- ☐ Oui
- ☐ Non

15. Présence de liquide :

☐ Oui ☐ Non

16. Abondant

☐ Oui

☐ Non

17. Si oui quelle est son aspect

☐ Transparent

☐ Séro- hémorragique

☐ Purulent

☐ Noirâtre

Autre :.....

.....

Examens complémentaires :

18. Radiographie

☐ Oui

☐ Non

19. Si oui qu'avez-vous observé ?

☐ Bulle tympanique radio transparente

☐ Bulle tympanique radio opaque

20. Otoscopie

☐ Oui

☐ Non

21. Si oui qu'avez-vous observé

.....

.....

22. Prélèvement pour observation au microscope (Parasitaire)

☐ Oui

☐ Non

23. Résultat de ce prélèvement (microscope)

.....

24. Prélèvement cytobactériologique

☐ Oui

☐ Non

25. Résultat

.....

26. Diagnostique

☐ Plaie ou déchirure

☐ Otite externe

☐ Otite moyenne

☐ Othématome

☐ Tumeur du pavillon (Épithélioma spinocellulaire)

☐ Tumeur du conduit vertical

☐ Tumeur du conduit horizontal

☐ Polype

☐ Corps étranger

27. Traitement administré avant chirurgie

☐ Oui

☐ Non

28. Si oui lequel et quelle est la durée d'administration ?

.....

.....

.....

.....

Données chirurgicales :

29. Techniques chirurgicales pratiquées :

☐ Technique de drainage par incision et sutures transfixantes (Othématome)

☐ Ponction / aspiration et pansement compressif (othématome)

☐ Multiple biopsie punchs (Othématome)

☐ Mise en place d'un Drain, d'un drain aspiratif

Ou d'une canule a trayon(othématome)

☐ Ablation d'une masse (tumeur ou polype)

☐ Ablation d'un corps étranger

☐ Ablation du canal vertical

☐ Ablation totale du canal

☐ Abaissement du conduit auditif (latéral)

☐ TECA-BO (ablation totale du canal avec

Ostéotomie de la bulle tympanique)

☐ Otectomie ou suture de plaie

☐ Myringotomie (ponction du tympan)

☐ Exsérèse d'une tumeur

☐ Pinnectomie

Evolution :

30. Guérison :

☐ Oui

☐ Non

31. Si complications :

(Plusieurs réponses possible).

☐ Infection de la plaie avec déhiscence

☐ Formation d'un abcès

☐ Septicémie

☐ Hémorragie post-chirurgicale

☐ Fibrose excessive

☐ Oreille en choux-fleurs

☐ Surdité

☐ Paralysie faciale

☐ Récidive

☐ Pas de complication

Autre :……..

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Traitement administré après chirurgie :

32. Antibiotique

☐ Oui

☐ Non

33. Si oui lequel et quelle est la durée d'administration ?

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34. Anti-inflammatoire

☐ Oui

☐ Non

35. Si oui lequel et quelle est la durée d'administration ?

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36. Autres traitement :

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