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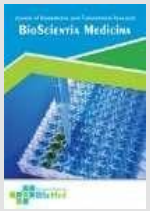

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A Diagnostic Rarity: Apocrine Hidrocystoma Presenting as a Medial Canthal Mass in Adolescence

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A B S T R A C T

Background: Apocrine hidrocystomas are benign adnexal tumors of the glands of Moll, typically diagnosed in adults. Their presentation in adolescence is an exceptional clinical finding that challenges standard diagnostic paradigms for periocular masses in this age group, necessitating a broad and meticulous differential diagnosis. **Case presentation:** A 15-year-old female presented with a two-month history of a stable, asymptomatic, 7×5×1 mm cystic mass at the inferomedial canthus of the left eye. The patient's primary concern was cosmetic. A comprehensive ophthalmologic examination was unremarkable. Orbital computed tomography confirmed a simple, preseptal subcutaneous cyst. A complete excisional biopsy was performed, and histopathological analysis revealed a unilocular cyst lined by a double layer of epithelium with inner columnar cells demonstrating pathognomonic decapitation secretion, confirming an apocrine hidrocystoma. **Conclusion:** This case highlights the necessity of including apocrine hidrocystoma in the differential diagnosis of periocular masses in adolescents. The primary lesson is that a patient's age should broaden, not narrow, the diagnostic possibilities. Definitive diagnosis relies on histopathology, not demographic probability, and complete surgical excision remains the gold standard for both diagnosis and curative therapy, yielding an excellent prognosis.

1. Introduction

The presentation of a periocular mass in a pediatric or adolescent patient invariably initiates a complex diagnostic journey for the clinician.[1] This anatomically intricate region, vital for vision and facial aesthetics, can host a wide spectrum of pathologies. These range from common inflammatory conditions and congenital developmental cysts to a host of benign and malignant neoplasms, each with its own distinct clinical course and management strategy. The diagnostic evaluation in this demographic demands a particularly rigorous approach, blending meticulous clinical examination with judicious use of imaging and, frequently, histopathological confirmation.[2] Within this landscape, tumors of the cutaneous adnexa—the specialized glands and follicles of the skin—represent a fascinating and often challenging subset of lesions. Arising from the secretory or ductal components of sweat (sudoriferous) and oil (sebaceous) glands, these tumors can mimic a variety of other conditions.[3] Among the sudoriferous neoplasms, apocrine hidrocystomas are a well-defined entity. Also known as cysts of Moll or sudoriferous cysts, they are benign cystic adenomas that arise from the secretory coil of apocrine sweat glands. The eyelid is populated by several types of glands, but it is the glands of Moll—modified apocrine glands intimately associated with the eyelash follicles—that serve as the origin for

apocrine hidrocystomas.[4] Their high concentration in this region is the primary reason why the eyelids and canthi are the most common sites for these tumors.

The classic presentation of an apocrine hidrocytoma is a solitary, dome-shaped, translucent papule or nodule, typically skin-colored but sometimes exhibiting a bluish hue due to the Tyndall effect of light scattering through the cystic fluid.[4] Epidemiologically, these lesions are overwhelmingly diagnosed in adulthood, with a peak incidence between the third and seventh decades of life.[5] Their appearance in an individual under the age of 20 is an exceptional event, with fewer than two dozen such cases documented in the global literature. This profound rarity is the central challenge addressed by this report. The presentation of a cystic mass in the medial canthus of an adolescent, as in the case presented herein, creates a significant diagnostic dilemma.[6] The medial canthus is a functionally critical and anatomically complex zone, housing the delicate lacrimal drainage apparatus. A mass in this specific location carries a unique differential diagnosis that includes not only common entities like dermoid cysts but also pathologies related to the lacrimal system, such as a dacryocystocele.[7] Furthermore, the potential for functional compromise through obstruction of the canaliculi or lacrimal sac adds a layer of urgency to the diagnostic process. The definitive diagnosis invariably rests on histopathological examination, as the clinical features of an apocrine hidrocytoma are non-specific and overlap with numerous other benign and malignant conditions.[8]

The profound novelty of this case report lies in the intersection of three rare variables: the diagnosis (apocrine hidrocytoma), the patient's age (adolescence), and the lesion's location (medial canthus).[9] This unique convergence of factors provides a rare opportunity to challenge and refine established clinical paradigms. While a clinician might not typically consider an apocrine hidrocytoma in a 15-year-old, this case demonstrates the critical importance of maintaining a broad and unbiased differential diagnosis, guided by histopathology rather than demographic probability.[10] The aim of this manuscript is therefore twofold. First, we aim to meticulously document the clinical presentation, diagnostic workup, and successful management of this rare case, adhering to the highest standards of methodological transparency. Second, and more importantly, we aim to use this case as a didactic tool to provide a deep, analytical exploration of the underlying pathophysiology, the nuanced process of differential diagnosis for adolescent periocular masses, and the practical considerations for surgical management in this functionally sensitive anatomical region.

2. Case Presentation

This case report has been prepared in accordance with the CARE (Case Report) guidelines to ensure accuracy, transparency, and utility. Written informed consent was obtained from the patient and her legal guardians for the surgical procedure, the use of clinical data and images for research and publication, and the anonymous presentation of her case. The patient and her family understood that all personal identifiers would be removed to protect her privacy. The primary concern expressed by the patient and her family was the cosmetic appearance of the lesion and the desire for its removal, with a secondary concern regarding the unknown nature of the growth. The patient is an adolescent female, aged 15 years. This demographic information is critical, as it frames the subsequent findings within the context of a patient population in which certain periocular pathologies are exceptionally rare, thereby creating a significant diagnostic challenge from the outset. The figure effectively communicates that the patient's motivation for seeking consultation was primarily cosmetic, a crucial piece of information that highlights the non-symptomatic nature of the lesion and informs the goals of subsequent management. Furthermore, the historical data clearly indicate a lack of confounding factors; the patient’s past medical and ocular histories were both unremarkable, and the family history was non-contributory. This collectively suggests that the

presenting lesion is an isolated, sporadic event rather than a manifestation of a systemic disease, a congenital syndrome, or a consequence of previous trauma or surgery. The core of the clinical history is captured in the "Chief Complaint & History" section, which describes a stable, painless, skin-colored mass located at the inferomedial canthus of the left eye. The chronicity of the lesion, with a duration of two months, combined with its stability and lack of inflammatory signs, strongly points away from an acute infectious or inflammatory process, such as a hordeolum or dacryocystitis. The absence of associated symptoms like inflammation, discharge, or epiphora (excessive tearing) is a pivotal negative finding that further characterizes the lesion as a quiescent, well-established pathological entity. This clinical profile is highly suggestive of a benign, encapsulated, and slow-growing subcutaneous growth. The lower portion of the figure transitions from the patient's history to the objective findings of the clinical examination, which serve to corroborate and quantify the initial impressions. The lesion is meticulously described as a 7×5×1mm firm, non-tender subcutaneous cyst, providing precise details about its size, texture, and location within the superficial tissue layers. The term "firm" implies a well-defined structure, while "non-tender" reinforces its non-inflammatory nature. Most importantly, the comprehensive ophthalmologic evaluation, as summarized in the figure, confirms that the lesion had no impact on the patient's vital ocular functions. Visual acuity was excellent and symmetrical at 20/20 bilaterally, and the intraocular pressure was normal at 14 mmHg bilaterally. These findings are critical as they rule out any compromise to the globe's integrity, optic nerve function, or internal aqueous dynamics. The unremarkable status of the anterior and posterior segments further solidifies the assessment that the pathology is confined to the adnexal tissues, external to the eyeball itself. Finally, the figure highlights a key finding related to the lesion's specific location: the lacrimal system was patent with no epiphora. Given the proximity of the mass to the lacrimal drainage apparatus, this is a significant finding, indicating that the cyst was not compressing or obstructing the delicate canalicular system or lacrimal sac. Figure 1 masterfully synthesizes all the pertinent information to paint a complete clinical picture of an isolated, asymptomatic, stable subcutaneous cyst in a young patient, providing the essential foundation for the subsequent diagnostic and therapeutic interventions.

Given the patient's age and the lesion's location, the initial differential diagnosis was broad. A congenital lesion such as a dermoid cyst was considered, though the location was not classic. An epidermal inclusion cyst was also a possibility. To better characterize the lesion and, critically, to delineate its relationship with the adjacent lacrimal sac and orbital structures, an orbital computed tomography (CT) scan was ordered. The choice of CT over other modalities, such as high-frequency ultrasound (HFUS) or magnetic resonance imaging (MRI), was based on several factors. While HFUS would have provided excellent resolution of the superficial cyst, CT offered superior visualization of the adjacent bony anatomy and the precise location of the lacrimal sac, which was a key concern for pre-operative planning. Given the well-defined, cystic appearance on clinical exam, the low pre-test probability of a complex soft-tissue tumor reduced the necessity for the superior soft-tissue contrast of an MRI. The CT scan revealed a well-defined, thin-walled, homogeneous, and hypodense lesion confined to the preseptal subcutaneous tissue, confirming its simple cystic nature and, importantly, showing no connection to or compression of the lacrimal drainage system. The visual component of Figure 2 displays a series of CT images in both axial and coronal planes. This multiplanar approach is fundamental in orbital imaging, as it allows for a complete, three-dimensional understanding of the lesion's anatomy and its relationship to the complex surrounding structures. The caption, "CT images demonstrating the well-defined cystic lesion," immediately orients the viewer to the primary radiological feature of the mass.

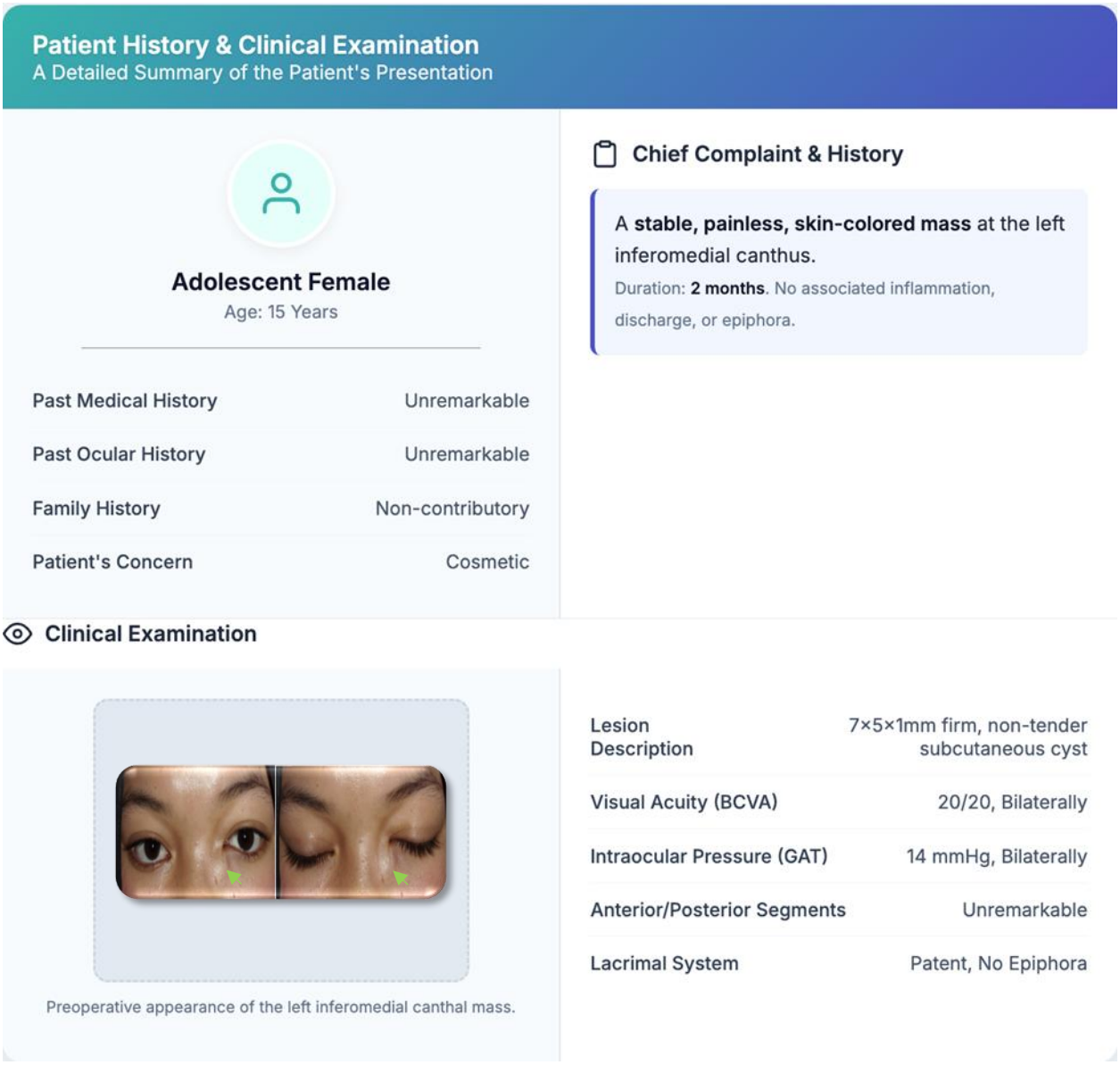

Figure 1. Patient history and clinical examination.

The detailed interpretation of these images is presented as a list of "Key Findings," beginning with the lesion's precise Location. The mass is identified as being within the subcutaneous tissue of the left inferomedial canthus, specifically in the preseptal space. This anatomical localization is of paramount importance; the orbital septum is a fibrous membrane that acts as a critical barrier, separating the superficial eyelid structures (preseptal) from the deep orbital contents (postseptal), which include the globe, optic nerve, and extraocular muscles. Placing the lesion in the preseptal space, as shown in Figure 2, immediately suggests a less aggressive pathology and significantly simplifies the surgical approach, as the orbit itself does not need to be entered. The Morphology of the lesion is described as a "well-defined, ovoid, thin-walled cystic lesion". Each of these descriptors contributes to a benign impression. "Well-defined" indicates that the mass has a clear boundary with the surrounding tissue, a feature that is

characteristic of slow-growing, non-infiltrative processes. The "ovoid" shape and "thin-walled" nature are classic radiological signs of a simple cyst, as opposed to a solid tumor, which would typically be more irregular, lobulated, or thick-walled. Further supporting this conclusion are the Internal Characteristics of the mass. The contents are described as "homogeneous" and "hypodense," consistent with "simple fluid". This means the fluid within the cyst is uniform in consistency and less dense than the surrounding soft tissues, similar to water. Critically, the report notes "No enhancement" after the administration of intravenous contrast. This is a powerful negative finding, as contrast enhancement highlights areas of increased blood flow, which are often associated with inflammation or the neovascularity of solid tumors. The absence of enhancement strongly argues against these possibilities. Finally, and perhaps most importantly for surgical planning, Figure 2 details the lesion's relationship with Adjacent Structures. The scan confirmed "No invasion or mass effect on the globe, extraocular muscles, or lacrimal sac". This finding provides crucial reassurance that the lesion, despite its location in a functionally dense area, has not infiltrated or compromised any vital ocular or adnexal structures. It is a discrete entity, separate from the eyeball and the tear drainage system. All of these individual findings culminate in the final Radiological Impression: "A simple, benign-appearing subcutaneous cyst".

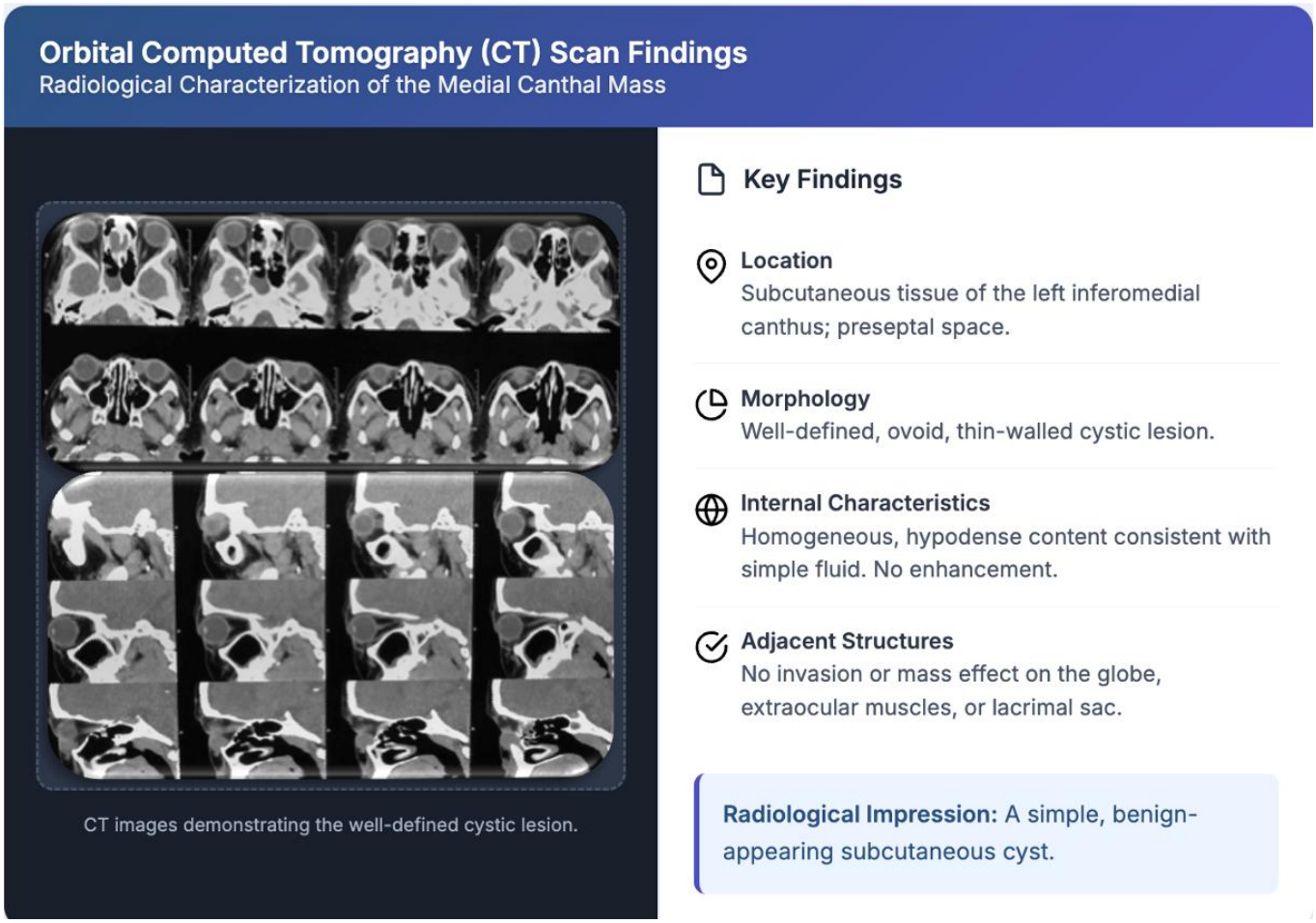

Figure 2. Orbital computed tomography (CT) scan findings.

Based on the patient's desire for removal and the need for a definitive diagnosis, a complete excisional biopsy was performed under general anesthesia. An elliptical incision was made within a relaxed skin tension line overlying the mass. During meticulous dissection, the thin cyst wall was inadvertently ruptured, releasing a small amount of clear, serous fluid. Following the rupture, the surgical field was carefully inspected, and the entire cyst wall was identified and completely excised from the surrounding subcutaneous tissue to minimize the risk of recurrence. The deep subcutaneous tissue was closed with 6-0 polyglactin sutures, and the skin was meticulously re-approximated with 6-0 nylon interrupted sutures. The excised tissue was sent for histopathological analysis. Microscopic examination with hematoxylin and eosin (H&E) staining revealed the definitive diagnosis. Figure 3 is logically tripartite, with each section building upon the last to present a complete and compelling picture of the successful resolution of the case. The first panel, dedicated to the surgical intervention, outlines the methodical and definitive approach taken to manage the medial canthal mass. The chosen procedure was a Complete Excisional Biopsy, a gold-standard technique that is concurrently therapeutic and diagnostic. By completely removing the lesion, this approach aims for a cure, while simultaneously providing the entire specimen for pathological analysis, thereby eliminating the risk of sampling error inherent in lesser biopsies. The use of General Anesthesia was an appropriate choice for a 15-year-old patient undergoing a delicate procedure in a sensitive anatomical area, ensuring patient comfort, cooperation, and immobility. A key detail highlighted is the Intraoperative Event of cyst wall rupture, which resulted in the release of clear, serous fluid. This finding is diagnostically significant; it is highly consistent with the contents of a simple benign cyst, such as a hidrocystoma, and stands in stark contrast to the thick, keratinaceous material of an epidermal inclusion cyst or the purulent discharge of an infected lesion. Transitioning to the central panel, Figure 3 delves into the Histopathology, which represents the climax of the diagnostic process. The provided micrograph offers a high-power view of the cyst's lining, vividly displaying the microscopic features that led to the final diagnosis. The first key feature noted is the Double-layered epithelial lining of the cyst wall. This observation is crucial, as it points toward a glandular origin and immediately distinguishes the lesion from more common epidermal cysts, which are lined by a stratified squamous epithelium. However, the most critical piece of evidence is the Pathognomonic Finding: the presence of Apical "snouts" on luminal cells. This is the microscopic correlate of decapitation secretion, a unique mode of glandular function exclusive to apocrine glands. This irrefutable finding, as captured in the figure's micrograph, serves as the definitive diagnostic marker. Based on this classic and unmistakable evidence, the figure presents the Definitive Diagnosis: Apocrine Hidrocystoma. This final diagnosis resolves the clinical question posed by the rare presentation of this tumor in an adolescent patient. The final panel of Figure 3 brings the patient's journey to a successful conclusion by documenting the Postoperative Outcome. A clinical photograph, showing the patient's appearance at the 7-day follow-up, visually substantiates the claim of excellent wound healing. The narrative details of the Recovery are described as "Uneventful," indicating the absence of common postoperative complications such as infection, significant scarring, or hematoma. Critically, the figure addresses the oncological and surgical success of the procedure through the long-term follow-up data, which confirmed no evidence of recurrence at 6 months post-surgery. This outcome validates the completeness of the excision and reinforces the benign nature of the lesion. Finally, and most importantly from a patient-centered perspective, the figure notes high patient satisfaction due to the excellent cosmetic result. This directly addresses the patient's primary concern for seeking treatment, as established in the initial history.

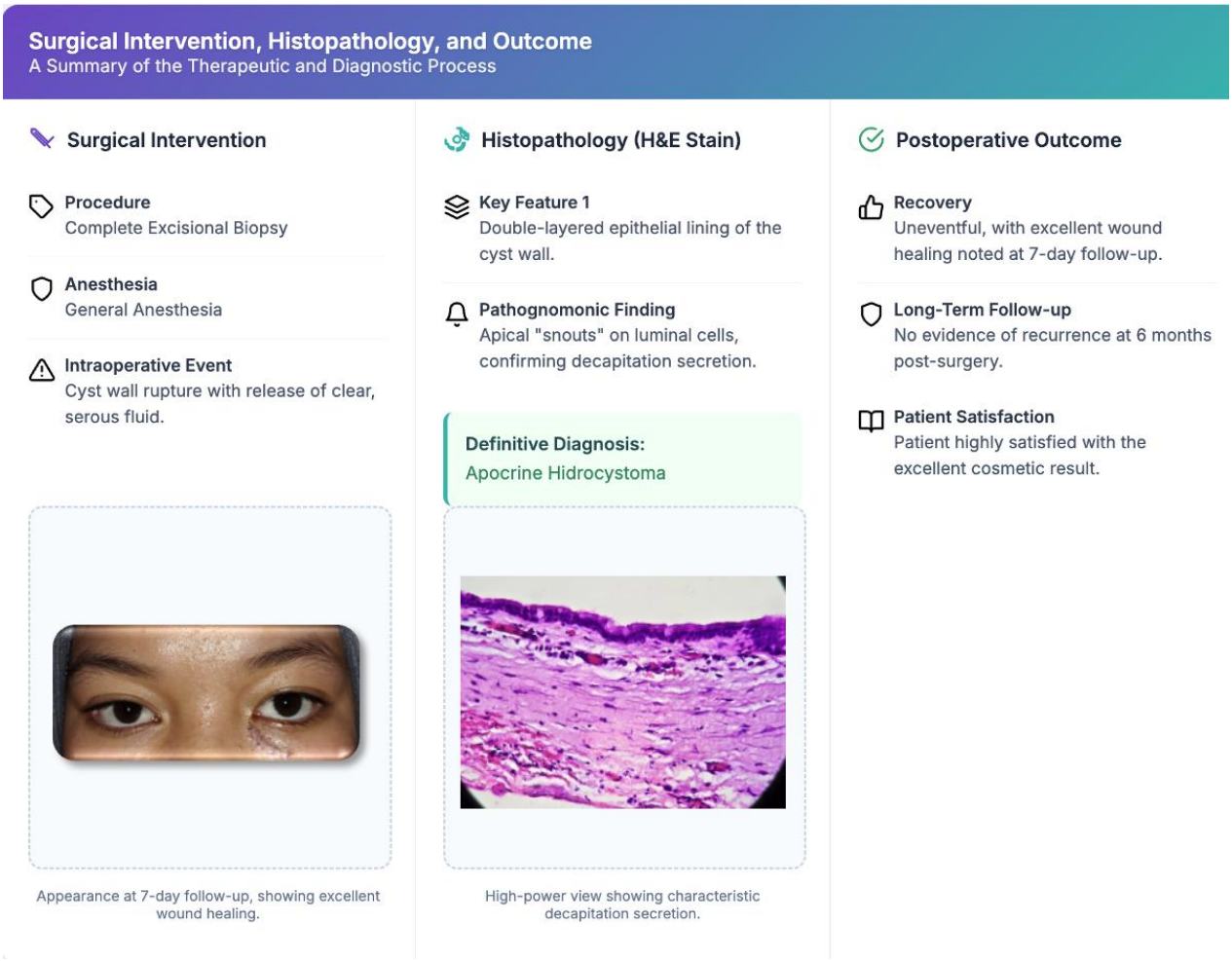

Figure 3. Surgical intervention, histopathology, and outcome.

3. Discussion

The diagnosis of an apocrine hidrocystoma in a 15-year-old patient is a profound departure from established epidemiological patterns, offering a rare opportunity for a deep, analytical discussion. This case is not merely a clinical curiosity; it is a powerful didactic tool that compels us to re-examine our diagnostic frameworks and delve deeper into the fundamental biology of adnexal tumors. The standard theory for hidrocystoma formation—ductal obstruction coupled with adenomatous proliferation—provides a mechanical explanation but fails to address the central question raised by this case: what is the biological trigger for this proliferation in an adolescent? The answer likely lies in the potent and dynamic hormonal milieu of puberty.[11] Apocrine glands are fundamentally different from their eccrine counterparts; they are secondary sexual characteristics.[12] Inactive and rudimentary throughout childhood, they undergo significant maturation and become functionally active only under the influence of the hormonal surge of puberty. These glands are end-organs for sex hormones, particularly androgens. The secretory cells of apocrine glands are rich in androgen receptors (AR).[13] During puberty, rising levels of circulating androgens, such as testosterone and dehydroepiandrosterone sulfate (DHEA-S), bind to these receptors, initiating a cascade

of events that leads to glandular maturation, cell growth (hyperplasia), and the onset of active decapitation secretion. Given this, it is highly plausible that the development of an apocrine hidrocystoma in a 15-year-old is not a random event but is mechanistically linked to this pubertal hormonal surge. The adnexal tissue in the patient's medial canthus may have possessed a localized population of apocrine glands with an increased density of androgen receptors or a post-receptor signaling pathway that was hypersensitive to normal circulating levels of pubertal androgens.[14] This could lead to an exaggerated proliferative response, tipping the balance from normal maturation to benign neoplastic growth (adenoma formation). It is possible that a subtle, congenital micro-anatomical abnormality, such as a narrowed or tortuous duct of a gland of Moll, was present from birth. This subclinical obstruction may have remained inconsequential during childhood when the gland was quiescent. However, with the onset of puberty and the commencement of active, viscous apocrine secretion, this pre-existing "bottleneck" could have become a site of frank obstruction, leading to cystic dilation and proliferation. While the patient had no signs of a systemic endocrinopathy, subtle variations in the ratio of androgens to estrogens during puberty could theoretically influence glandular activity, though this is more speculative. This hormonal context is critical. It reframes the apocrine hidrocystoma in this adolescent not as an "old person's disease" in a young person, but as a pathology that may be intrinsically linked to the very biological processes defining her stage of life.[15]

To appreciate the diagnostic histology, it is useful to contrast the three primary modes of glandular secretion. Merocrine secretion (used by eccrine glands) is an elegant process of exocytosis, releasing products without cellular loss.[16] Holocrine secretion (used by sebaceous glands) is destructive; the entire cell disintegrates to release its contents. Apocrine secretion is a unique intermediate, involving the controlled, non-lethal sacrifice of the apical portion of the cell. This "decapitation" is what fills the cell's cytoplasm with eosinophilic secretory granules and creates the distinctive apical snouts seen on H&E staining, providing an unassailable microscopic diagnosis. Confronted with a non-inflammatory, cystic medial canthal mass in an adolescent, the clinician must construct a differential diagnosis that is both broad and prioritized. The following narrative, structured by pathological category, walks through the clinical reasoning process, using the present case as a framework. Dermoid cyst was the primary initial consideration. A dermoid cyst is a choristoma resulting from sequestrated ectoderm. However, several features in our case argued against this diagnosis.[17] The classic location for a periocular dermoid is superotemporal, near the frontozygomatic suture. While medial dermoids occur, they are less common. Furthermore, dermoids are often very firm, rubbery, and may be fixed to the periosteum, sometimes causing a smooth, pressure-induced scalloping of the underlying bone on CT. Our patient's lesion was subcutaneous and mobile, and the CT showed no bony changes, lowering the probability of a dermoid. Dacryocystocele specific location in the medial canthus made a dacryocystocele a critical differential. However, these typically present inferior to the medial canthal tendon and are often associated with a bluish hue and, most importantly, epiphora due to the underlying nasolacrimal obstruction. Our patient had no epiphora, and the lesion was not located directly over the lacrimal sac. The CT scan provided the definitive exclusion, showing a normal, non-distended lacrimal sac. Epidermal Inclusion Cyst (EIC) is the most common cutaneous cyst and was another high-probability differential. EICs arise from occluded pilosebaceous units or traumatically implanted epidermis.[18] However, the clinical phenotype was not classic. EICs often have a central punctum (the occluded follicle) and are filled with cheesy, foul-smelling keratin. Our patient's lesion lacked a punctum and, upon rupture, released clear serous fluid, making an EIC highly unlikely. While extremely common, a chalazion is a

lipogranulomatous inflammation of a meibomian gland within the tarsal plate. It would be exceptionally rare for a chalazion to present as a discrete subcutaneous cyst in the medial canthus, away from the tarsus. Eccrine vs. Apocrine Hidrocystoma: Clinically, these two entities can be indistinguishable. Both present as translucent, dome-shaped cysts. Eccrine hidrocystomas are often multiple and can be exacerbated by heat, whereas apocrine lesions are typically solitary and stable.[19] Our patient's solitary, stable lesion was slightly more suggestive of an apocrine origin, but this distinction is not reliable clinically.

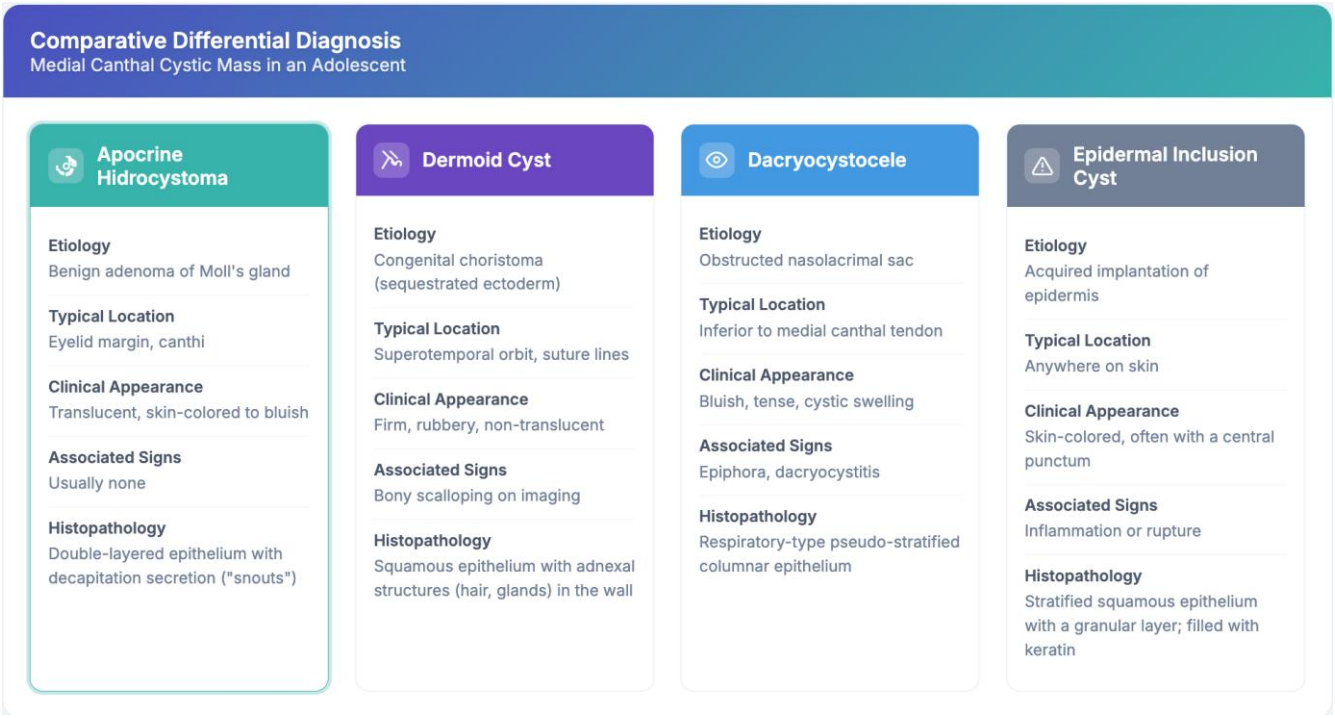

Figure 4. Comparative differential diagnosis.

Figure 4 provides a masterful and succinct schematic that is essential for understanding the clinical reasoning behind the diagnosis of a medial canthal cystic mass in an adolescent. The figure serves as a powerful didactic tool, systematically deconstructing the differential diagnosis by placing four key pathological entities side-by-side for direct comparison. By organizing the information across five critical domains—Etiology, Typical Location, Clinical Appearance, Associated Signs, and Histopathology—the schematic allows for a nuanced and evidence-based differentiation that transcends simple clinical observation. This comparative analysis is fundamental to appreciating why, despite its rarity in this age group, apocrine hidrocystoma was the definitive diagnosis. The first column, highlighted for emphasis, details the Apocrine Hidrocystoma. Its etiology is defined as a "Benign adenoma of Moll's gland", a crucial starting point that classifies it as a true, benign proliferation of a specific type of sweat gland, rather than a simple retention cyst. Its typical location in the "Eyelid margin, canthi" aligns perfectly with the clinical presentation of the case in question. The clinical appearance is described as "Translucent, skin-colored to bluish", features that are consistent with a thin-walled, fluid-filled subcutaneous structure. A key negative finding is that there are "Usually none" for associated signs, indicating a

quiescent, non-inflammatory process. However, the most critical information lies in the histopathology: a "Double-layered epithelium with decapitation secretion ('snouts')". This microscopic finding is pathognomonic, serving as the unique and irrefutable fingerprint that confirms the diagnosis with absolute certainty, distinguishing it from all potential mimics. In the second column, Figure 4 presents the Dermoid Cyst, a common congenital lesion in the pediatric population. Its etiology as a "Congenital choristoma (sequestrated ectoderm)" contrasts sharply with the adenomatous nature of the hidrocystoma. This fundamental difference in origin explains its distinct clinical features. Its typical location is the "Superotemporal orbit, suture lines", which is anatomically distinct from the canthal presentation in this case. Clinically, it appears as a "Firm, rubbery, non-translucent" mass, lacking the cystic translucency of a hidrocystoma. A significant differentiating sign is the potential for "Bony scalloping on imaging", indicating long-term pressure on the bone, a feature not associated with the more superficial hidrocystoma. Histopathologically, the presence of "adnexal structures (hair, glands) in the wall" provides a definitive distinction. The third column details the Dacryocystocele, another important differential specific to the medial canthal region. Its etiology is entirely functional, resulting from an "Obstructed nasolacrimal sac". This is a matter of faulty drainage, not a neoplastic growth. This is reflected in its highly specific location, "Inferior to medial canthal tendon", and its primary associated signs of "Epiphora, dacryocystitis" (tearing and infection), which are direct consequences of the blocked tear duct. The clinical appearance as a "Bluish, tense, cystic swelling" can mimic a hidrocystoma, but the associated functional symptoms are a key differentiator. The histopathology, consisting of "Respiratory-type pseudo-stratified columnar epithelium", reflects the lining of the lacrimal sac and is entirely different from the secretory epithelium of an apocrine gland. Finally, the fourth column addresses the Epidermal Inclusion Cyst, arguably the most common clinical mimic. Its etiology is acquired, due to the "Acquired implantation of epidermis". Unlike the hidrocystoma, its location is non-specific, occurring "Anywhere on skin". The key distinguishing feature in its clinical appearance is the frequent presence of a "central punctum", representing the plugged follicle from which it arose. Its potential for "Inflammation or rupture" is a common associated sign, as the body mounts a foreign-body reaction to the internal keratin. This inflammatory potential contrasts with the typically quiescent nature of a hidrocystoma. The histopathology is definitive: a "Stratified squamous epithelium with a granular layer; filled with keratin", essentially a pocket of skin turned inward. Figure 4 serves as an invaluable visual guide, systematically demonstrating how a methodical comparison of key clinical and pathological features allows for the precise differentiation of a rare entity like an apocrine hidrocystoma from its more common clinical mimics.

Figure 5 presents a sophisticated and highly informative clinical algorithm, meticulously designed to guide the clinician through the diagnostic evaluation of an adolescent presenting with a non-inflammatory medial canthal mass. This flowchart is more than a mere sequence of steps; it represents a visual codification of the complex clinical reasoning process, transforming a potentially ambiguous clinical scenario into a structured, logical, and evidence-based pathway. It serves as an invaluable educational and practical tool, promoting a standardized approach that prioritizes patient safety, diagnostic accuracy, and efficiency. The algorithm's strength lies in its ability to distill a broad differential diagnosis into a series of well-defined decision points, ensuring that the diagnostic workup is both thorough and appropriately tailored to the specific findings at each stage. The pathway begins with a precisely defined starting point: an "Adolescent with Non-Inflammatory Medial Canthal Mass". Each component of this initial presentation is critically important.

Figure 5. Diagnostic pathway for medial canthal mass.

The "Adolescent" demographic immediately frames the clinical problem, alerting the clinician to a patient in a unique physiological state of hormonal flux, where the incidence and presentation of certain pathologies can differ significantly from both younger pediatric and older adult populations. The "Non-Inflammatory" qualifier is a crucial filter, directing the diagnostic focus away from acute infectious or inflammatory conditions, such as hordeola or acute dacryocystitis, and toward a differential diagnosis that includes chronic, structural, congenital, or neoplastic lesions. Finally, the "Medial Canthal Mass" specifies a location of high anatomical importance, as this region houses the delicate lacrimal drainage system, making any lesion in this area a potential threat to normal tear function. From this well-defined starting point, the algorithm proceeds to its first major decision point, which is based on a key anatomical landmark: the "Location Relative to Medial Canthal Tendon (MCT)?". This step is a masterful example of using simple clinical anatomy to significantly narrow the diagnostic possibilities. The flowchart correctly identifies two distinct and mutually exclusive pathways based on this finding. If the mass is located "Inferior to MCT & Epiphora Present," the algorithm directs the clinician down a highly specific path. This combination of a mass located directly over the lacrimal sac and the functional symptom of tearing (epiphora) is strongly suggestive of a primary lacrimal system pathology. Therefore, the flowchart logically recommends that the clinician should "Suspect Dacryocystocele" and proceed with specialized "Lacrimal Imaging (DCG/CT)" to confirm the obstruction and delineate the anatomy of the dilated sac. The mention to "consider DCR" (dacryocystorhinostomy) correctly points toward the definitive surgical treatment for such a condition. Conversely, if the mass is located "Superior to / At MCT & No Epiphora," as was the case in the manuscript's patient, the algorithm pivots away from a lacrimal sac etiology. This clinical picture makes an intrinsic obstruction of the nasolacrimal system less likely and points toward a pathology arising from the more superficial structures of the skin, subcutaneous tissue, or adnexal glands. This logically leads to the next step: a "Detailed Clinical Exam". The flowchart specifies the key features to assess: "mobility, color, consistency, and presence of a punctum". Each of these features provides valuable clues. Mobility helps differentiate between superficial, encapsulated lesions and those that may be fixed to deeper structures like the periosteum. The color can suggest a vascular lesion (bluish) or an epidermal cyst (skin-colored). The consistency can distinguish between a soft, fluid-filled cyst and a firm, rubbery, or hard solid mass. The presence of a central punctum is a classic, though not universal, sign of an epidermal inclusion cyst. The synthesis of these clinical findings informs the next crucial decision point: the selection of "Appropriate Imaging". The algorithm intelligently bifurcates the imaging strategy based on the level of clinical suspicion. If the examination suggests a "Superficial & Clearly Cystic" lesion, the recommended modality is "High-Frequency Ultrasound (HFUS)". This recommendation reflects a commitment to the principle of ALARA (As Low As Reasonably Achievable) regarding radiation exposure, especially in a young patient. HFUS is a superb non-invasive tool that provides excellent real-time resolution of superficial soft tissues, can definitively confirm the cystic nature of a lesion, and avoids the ionizing radiation of a CT scan. However, if the clinical findings are more ambiguous or concerning—for instance, if the mass feels "Deep, Fixed, or Solid"—the algorithm correctly advises a more comprehensive imaging modality like "CT / MRI". CT is unparalleled for its visualization of bony anatomy and its relationship to the lacrimal fossa, while MRI offers superior soft-tissue characterization, which is invaluable for complex or potentially neoplastic masses. Ultimately, the flowchart illustrates that all pathways for an undiagnosed mass converge on a single, definitive endpoint. Regardless of the clinical and radiological findings, the final step for any persistent or diagnostically uncertain lesion is an "Excisional Biopsy for Histopathology". This represents the "ground truth" in the diagnostic process. The

algorithm correctly labels this as the "definitive step," acknowledging that while clinical acumen and advanced imaging can provide a highly accurate presumptive diagnosis, the final, irrefutable answer can only be rendered by microscopic examination of the tissue. This final step underscores a fundamental principle of medicine: the importance of obtaining a tissue diagnosis to guide treatment and provide an accurate prognosis. In its entirety, Figure 5 provides an elegant, comprehensive, and scientifically sound framework that embodies the principles of modern, evidence-based clinical practice. It is a clear and actionable guide that would be of immense value to any clinician faced with this uncommon but challenging clinical presentation.

Figure 6. Comparative immunohistochemical profiles.

Figure 6 provides an exceptionally clear and scientifically rigorous comparison of the immunohistochemical (IHC) profiles for several key periocular cystic lesions, serving as an advanced diagnostic tool for pathologists and clinicians. While a diagnosis can often be rendered on standard hematoxylin and eosin (H&E) stained slides, IHC offers a powerful adjunctive method to resolve diagnostically challenging cases by providing a "molecular fingerprint" of a lesion's cellular lineage. This schematic elegantly illustrates how a panel of specific protein markers can definitively distinguish between tumors that may appear clinically or even histologically similar. The figure compares the staining patterns of four distinct entities—Apocrine Hidrocystoma, Eccrine Hidrocystoma, Epidermal Inclusion Cyst, and the malignant mimic, Sebaceous Carcinoma—across six different antibodies, creating a high-yield data matrix that is both informative and visually intuitive. The central focus of the figure is the IHC profile of an Apocrine Hidrocystoma, which is highlighted in the first column. The schematic shows that this tumor is characteristically positive for Gross Cystic Disease Fluid Protein-15 (GCDFP-15) and the Androgen Receptor (AR). This combination is highly specific for apocrine differentiation. GCDFP-15 is a

glycoprotein that is a known product of apocrine gland secretion, making its presence a direct marker of apocrine cellular function. Similarly, the expression of the Androgen Receptor reflects the embryological origin and hormonal sensitivity of apocrine glands, which become functional under androgenic stimulation during puberty. Conversely, the figure shows that an apocrine hidrocystoma is negative for markers of eccrine differentiation, such as Carcinoembryonic Antigen (CEA) and S-100 protein, as well as for the epithelial marker Ber-EP4. This distinct positive and negative staining pattern provides a robust and reliable method for confirming an apocrine lineage with a high degree of certainty.In direct contrast, the second column in Figure 6 details the profile of an Eccrine Hidrocystoma. This entity, which can be clinically indistinguishable from its apocrine counterpart, displays a nearly opposite IHC fingerprint. It is negative for the apocrine markers GCDFP-15 and AR but is characteristically positive for CEA and S-100. CEA is an antigen expressed in the luminal cells of eccrine ducts, while S-100 is a protein found in the secretory cells of eccrine glands. This positive staining for eccrine markers, combined with the negative staining for apocrine markers, allows for a definitive and unambiguous differentiation between the two types of sweat gland cysts, a distinction that is impossible to make on clinical grounds alone. The figure also shows that both apocrine and eccrine hidrocystomas are positive for Epithelial Membrane Antigen (EMA), which is a general marker of glandular epithelium and is therefore less useful in distinguishing between the two. The third column presents the IHC profile for an Epidermal Inclusion Cyst (EIC), a common lesion that is fundamentally different in its origin. As it arises from the epidermis, not from glandular structures, its IHC profile is distinct. The figure shows it is negative for all glandular markers, including GCDFP-15, AR, CEA, and S-100. However, it is positive for EMA, which stains most epithelia, and crucially, it is also positive for Ber-EP4. Ber-EP4 is an epithelial cell adhesion molecule that is typically positive in epidermal structures and is useful in distinguishing epidermal cysts from other lesions. This profile, which lacks any markers of sweat gland differentiation, clearly separates an EIC from both types of hidrocystomas. Figure 6 wisely includes the IHC profile of Sebaceous Carcinoma, an important malignant differential diagnosis for any periocular lesion. While it is a malignancy of sebaceous (oil) glands, not sweat glands, it can sometimes be a clinical mimic. Its IHC profile can be complex. The figure shows it is typically positive for EMA and the Androgen Receptor (AR), the latter being a feature it shares with apocrine lesions. Importantly, it can also show variable or focal positivity for GCDFP-15, which can create a potential diagnostic pitfall, as this could be mistaken for apocrine differentiation. However, it is characteristically negative for the eccrine markers CEA and S-100, which helps in its differentiation. In clinical practice, other specific markers for sebaceous differentiation, such as Adipophilin, would also be used to confirm a diagnosis of sebaceous carcinoma. Figure 6 serves as an invaluable scientific and educational resource. It clearly demonstrates that while different periocular cystic lesions can present with overlapping clinical features, their underlying cellular origins are distinct and can be reliably identified through immunohistochemistry. The schematic powerfully illustrates how a panel of well-chosen antibodies can provide a definitive molecular-level diagnosis, which is the cornerstone of modern, precise pathology. This is particularly crucial in differentiating benign lesions like hidrocystomas from each other and from more common cysts or, most importantly, from malignant tumors

For any undiagnosed lesion, the surgeon faces a choice: a small incisional biopsy for diagnosis followed by a second procedure for definitive treatment, or a single-stage complete excisional biopsy. In this case, a one-step excisional biopsy was chosen. The rationale was sound: the lesion was small, clinically and radiologically appeared benign, and was easily accessible. A single procedure under general anesthesia was preferable for the adolescent patient.

An excisional biopsy offered the dual advantages of providing the entire lesion for pathological review (preventing sampling error) and being curative in a single event. An incisional biopsy might have been considered if the lesion were much larger, if malignancy were strongly suspected (requiring pre-operative planning for wider margins), or if the lesion were intimately involved with the canaliculi, where a definitive diagnosis might alter the surgical approach. Surgery in this region requires finesse to ensure functional preservation and cosmetic excellence. The placement of the elliptical incision along a relaxed skin tension line was critical for minimizing the final scar. These lines should be marked pre-operatively with the patient sitting upright. The greatest risk in medial canthal surgery is iatrogenic injury to the canalicular system.[19] Although pre-operative probing was not performed in this case, as the lesion was sufficiently superficial, it is a crucial step if there is any doubt about the lesion's depth. Intraoperatively, gentle dissection is paramount, and the surgeon must maintain a constant awareness of the likely course of the canaliculi. The intraoperative rupture of a thin-walled cyst is a common event, not a surgical failure. The key to preventing recurrence is the surgeon's response: meticulous inspection of the surgical cavity to identify and remove every remnant of the glistening epithelial cyst wall.[20] A multi-layered closure using fine absorbable sutures (6-0 polyglactin) for the subcutaneous tissue and non-absorbable monofilament (6-0 nylon) for the skin ensures a tension-free, well-approximated wound that heals with a fine-line scar.

4. Conclusion

The primary, unequivocal lesson from this case is that the age of a patient should serve to broaden, not restrict, the clinician's differential diagnosis. While classic epidemiological profiles provide a useful framework, they are not infallible, and the astute clinician must be prepared for the rare but possible occurrence of "adult" pathologies in younger populations. This case of an apocrine hidrocystoma in an adolescent powerfully illustrates that the definitive management of an unknown periocular mass must be guided by the objective certainty of histopathology rather than the demographic probability. This principle is the cornerstone of safe and effective patient care. This report contributes a valuable data point to the literature and, more importantly, serves as a comprehensive didactic tool, reinforcing a systematic, evidence-based approach to the diagnosis and management of periocular tumors across all ages.

5. References

1. Hidalgo L, Abusleme E, Navarrete-Dechent C, Abarzúa-Araya Á. Dermoscopy as an aid in the differentiation of recurrent eyelid basal cell carcinoma versus apocrine hidrocystoma. Dermatol Pract Concept. 2022; 12(2): e2022090.
2. Wu S-Y, Huang J-W, Lee Y-C, Chang F-L, Li M-H, Chen N. Apocrine hidrocystoma with IgG4 plasma cell infiltration presenting as recurrent chalazion: a case report. Medicina (Kaunas). 2022; 58(7): 840.
3. Cape HT, Mukit FA, Mukit M, Anelo OM, Krassilnik N, Dadireddy K. Apocrine hidrocystoma of the upper eyelid. Eplasty. 2022; 22: ic13.
4. Ludzik J, Lee C, Mengden S, Nguyen H, Pleshakov D, Witkowski A. Dermoscopy and reflectance confocal microscopy of apocrine hidrocystoma. Dermatol Pract Concept. 2023; 13(1): e2023039.
5. Sahu SK, Poddar C, Parija S, Moharana B. Rare presentation of apocrine hidrocystoma along the nasolacrimal duct. Eplasty. 2023; 23: e74.
6. Epperson J, Bergfeld W. Apocrine papillary hidrocystoma with mucinous metaplasia (goblet cell type): a case report and review of the literature. Am J Dermatopathol. 2023; 45(5): 330–2.
7. Noviello C, Romano M, Trotta L, Alfano R, Ronchi A, Papparella A. Unusual location of

apocrine hidrocystoma in children: Case series. Int J Surg Case Rep. 2023; 108(108419): 108419.
8. Kitagawa H, Sugimoto I, Bito T, Yamanaka K, Terashi H. Partial excision and ablative carbon dioxide fractional laser therapy for multiple apocrine hidrocystomas on the periorbital regions and cheeks. Case Rep Dermatol Med. 2023; 2023: 6318220.
9. Bharti S, Bharti JN, Madhubala R, Kumar P. Apocrine hidrocystoma: a rare benign cystic skin tumor at uncommon site. Int J Trichology. 2024; 16(1–6): 52–4.
10. Al Ghulaiga FM, Alsulaiman AM, Maktabi AMY, Alkatan HM. Peri-ocular proliferative apocrine hidrocystoma (cystadenoma): a clinicopathological case series. Int J Surg Case Rep. 2024; 114(109085): 109085.
11. Fatima R, Sharma M. Unveiling rarity: two cases of apocrine hidrocystoma. Int Dent J. 2024; 74: S244.
12. Mirzania D, Jacobson A, McHugh J, Demirci H. Conjunctival apocrine hidrocystoma: a case report and review of literature. Cornea. 2024; 43(11): 1431–5.
13. Choi S, Lew B-L, Kwon S-H. A case of multiple apocrine hidrocystomas accompanied by inflammation on bilateral axillae. Ann Dermatol. 2024; 36(1): 62–3.
14. Connolly DM, McGeehin EL, Lee JB. Apocrine cystadenoma: a long-standing apocrine hidrocystoma with an adenomatous proliferation. J Cutan Pathol. 2024; 51(3): 251–7.
15. Di Marino M, Quaranta Leoni F, Ranazzi G, Quaranta Leoni FM. Orbital apocrine hidrocystoma. Report of two cases. Eur J Ophthalmol. 2024; 34(3): NP42–5.
16. Patil S, Iswariya J, Bhatnagar A, Mitra D, Mehta R. Apocrine hidrocystoma: a candelabrum of the eye – A case report. Indian Journal of Postgraduate Dermatology (IJPGD). 2024; 2(107): 107–9.
17. Ghavami S, Rieu-Chevreau C. Retroauricular apocrine hidrocystoma: a very rare case report. Acta Otolaryngol Case Rep. 2025; 10(1): 72–4.
18. Palaniappan V, Elango RR, Karthikeyan K. Apocrine hidrocystoma of the scalp with positive transillumination. Indian Dermatol Online J. 2025; 16(3): 527–8.
19. Akgoz E, Derin Sengun G, Dashdamirova S, Hacisalihoglu UP, Kaynak P. Multiple eyelid apocrine hidrocystomas in a patient with prolactinoma. Ophthal Plast Reconstr Surg. 2025; 41(3): e96–8.
20. Kosuke M, Fukuoka H, Sotozono C. Bilateral apocrine hidrocystomas in the lower conjunctival fornix: a case report. Cureus. 2025.