

Solid and cystic inguinal masses in women: case report and topic review

Masas sólidas y quísticas inguinales en mujeres. Presentación de caso y revisión de tema

Luis Carlos Llorente Portillo[1]
Eduardo De Núbila Lizcano[2]
Israel Díaz Yunez[3]
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Summary

Inguinal masses involve a significant number of differential diagnoses. They have distinct clinical manifestations, particularly discomfort and psychosocial distress. Knowing the anatomy, embryology and physiology associated with the formation of anomalies, especially in women, in order to comprehend their onset and progression, among them, alterations associated with Nuck's canal, which is the female counterpart of the peritoneum-vaginal process in the man. As part of its normal development, its obliteration occurs during the first year of life, but sometimes, abnormally, communicating hydroceles or cysts are generated in its extension that manifest as inguinal masses. However, differential diagnoses should not be forgotten. A literature search was conducted in PUBMED using keywords to obtain relevant information. A clinical case report and the main characteristics of the differential diagnoses are presented.

Key words (MeSH)

Epidermoid cyst
Inguinal region
Inguinal canal

Palabras clave (DeCS)

Quiste epidermoide
Región inguinal
Canal inguinal

Resumen

Las masas inguinales involucran un número importante de diagnósticos diferenciales. Tienen manifestaciones clínicas distintas, particularmente malestar y angustia psicosocial. Es crucial conocer la anatomía, embriología y fisiología asociadas con la formación de anomalías, especialmente en mujeres, para comprender su inicio y progresión, entre estas, de las alteraciones asociadas al canal de Nuck, el cual es la contraparte femenina del proceso peritoneo-vaginal en el hombre. Como parte del desarrollo normal, su obliteración se da durante el primer año de vida; sin embargo, hay ocasiones en las que, de manera anómala, se producen hidroceles comunicantes o quistes en su extensión que se manifiestan como masas inguinales. Sin embargo, no se deben olvidar los diagnósticos diferenciales. Se hizo una búsqueda de la literatura en PubMed utilizando palabras clave para obtener la información relevante. Se presenta un caso clínico y las características principales de los diagnósticos diferenciales.

Case Description

A 3-year-old female patient whose mother noticed a lump in the inguinal region; she has no significant personal or family history.

Visual inspection revealed no abnormalities; however, palpation revealed a small, round, painless nodule in the right inguinal-vulvar region, measuring less than 1 cm in size, which was not fixed to deeper structures. Changes in the size or mobility of the lesion during the Valsalva maneuver were not objectively assessed due to the patient's age.

An ultrasound examination was performed in the right inguinal region, in the subcutaneous plane, revealing an oval-shaped image with well-defined margins, homogeneous hypoechoic content, posterior acoustic enhancement, and avascular on Doppler assessment, measuring 1.3 × 0.7 × 1.5 cm and with an approximate volume of 0.7 cm³ (Figure 1). Abdominal and pelvic ultrasound demonstrated internal visceral and genital structures of normal position, size, and structure. The female internal genitalia were of the size expected for the patient's age. Both ovaries had typical characteristics (Figure 2).

The initial diagnosis was "right Nuck's duct cyst" based on its location, physical examination, ultrasound findings, and the absence of other abnormalities.

The patient was scheduled for laparoscopic surgery. The intraoperative findings revealed no abnormalities or defects of the internal inguinal canal; therefore, the lesion was removed via an anterior surgical approach with a skin incision. The pathology report of the specimen indicated a keratinous cyst with complete resection.

[1]Doctor of Medicine and Surgery, Universidad de Antioquia, Medellín, Colombia. Resident in Radiology and Diagnostic Imaging, Universidad del Norte, Barranquilla, Colombia. https://orcid.org/0000-0002-3366-989X

[2]Specialist in Radiology and Diagnostic Imaging, CEDIUL, Barranquilla, Colombia.

[3]Scientific Director, CEDIUL. Barranquilla, Colombia.

Discussion

In women, the round ligament is attached to the uterus near the origin of the fallopian tubes. The extension of the parietal peritoneum continues as this ligament passes through the internal inguinal ring. This evagination of the parietal peritoneum, called the Nuck's canal—named after the Dutch anatomist Anton Nuck, who described it in 1969 (1)—is the female counterpart of the processus vaginalis in men (2).

Failure of the distal portion of the canal to obliterate can result in a sac (1). The vaginal process in women usually obliterates and disappears before birth. If it fails to close, a persistent vaginal process forms, creating a passage from the pelvic cavity to the labia majora, which can lead to inguinal hernias (3).

Communicating and non-communicating

The most common type of Nuck's duct anomaly involves cystic (noncommunicating) hydroceles that do not communicate with the peritoneal cavity (2,4). As a result, a cyst forms that may extend along the course of the round ligament, from the internal inguinal ring to the vulva. Multilocular or partitioned presentations have also been described when the cysts are large (4).

In contrast to the above, there may be no cystic formation, but rather a sac-like continuity with the peritoneal cavity (communicating or true hydroceles) (4).

To facilitate the surgical approach and technique, Nuck's canal anomalies are classified into four types based on morphology: Type A, subcutaneous hydrocele located above the inguinal canal; Type B, hydrocele located within the inguinal canal; Type C, hydrocele restricted and limited to the internal inguinal ring; Type D: hydrocele extending along the length from the internal inguinal ring to the inguinal canal, or extending along the length from the internal inguinal ring toward the subcutaneous space (5) (Figure 3, Table 1).

Table 1. Surgical technique based on the location of the lesion (Nuck's canal hydrocele classification)

Location		Surgical technique
Type A	Subcutaneous location over the inguinal canal	Anterior approach
Type B	Location within the inguinal canal	TAPP* + anterior exploration
Type C	Confined to the internal inguinal canal	TAPP
Type D	Extending from the internal inguinal ring to the inguinal canal, or subcutaneously	TAPP or TEP** + anterior approach

*TAPP: Transabdominal preperitoneal. A laparoscopic technique for inguinal hernia repair involving access to the peritoneal cavity, with mesh fixation through an incision in the peritoneum, placing the mesh between the preperitoneal tissue and the abdominal wall.

**TEP: Total extraperitoneal. Unlike the TAPP technique, the peritoneal cavity is not entered, and the mesh is fixed from outside the peritoneum.

Clinical evaluation and physical examination

Inguinal masses present with varying degrees of pain, size, and reducibility. Ultrasonography is a convenient method for initial evaluation due to its availability, cost-effectiveness, safety, and accuracy (6).

Certain characteristics have been described to clinically differentiate them from other causes of inguinal masses. For example, abnormalities of the Nuck's duct may become more noticeable when standing and remain visible when lying down, unlike inguinal hernias (7).

With the Valsalva maneuver, Nuck's duct anomalies may retract into the inguinal canal, whereas inguinal hernias may increase in size (7).

However, it is difficult to approach the differential diagnoses based solely on clinical findings, as they share similar characteristics (Tables 2 and 3) (7).

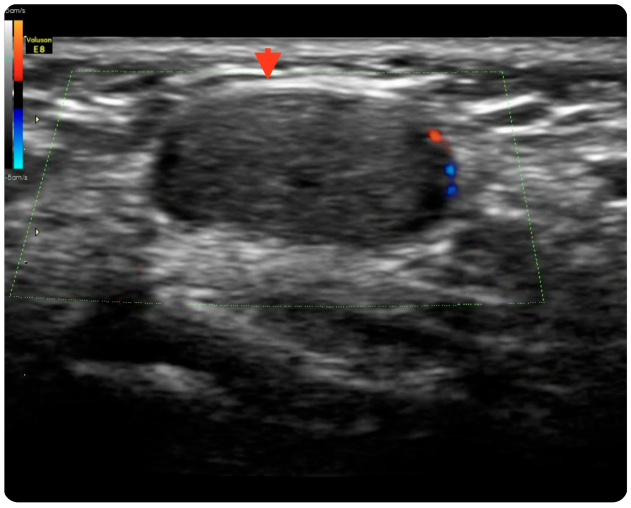


Figure 1. Soft-tissue ultrasound with a linear transducer in the right inguinal region. Subcutaneous plane: an oval-shaped image with well-defined margins, homogeneous hypoechoic content, posterior acoustic enhancement, and no blood flow on Doppler imaging, measuring 1.3 × 0.7 × 1.5 cm, with an approximate volume of 0.7 cm^3.

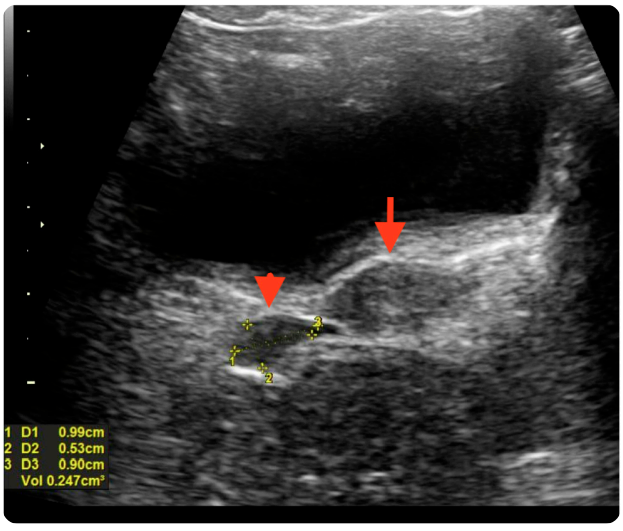


Figure 2. Transabdominal ultrasound of the abdomen and pelvis. Uterus in transverse view (red arrow) and right ovary (red arrowhead) located intra-abdominally.

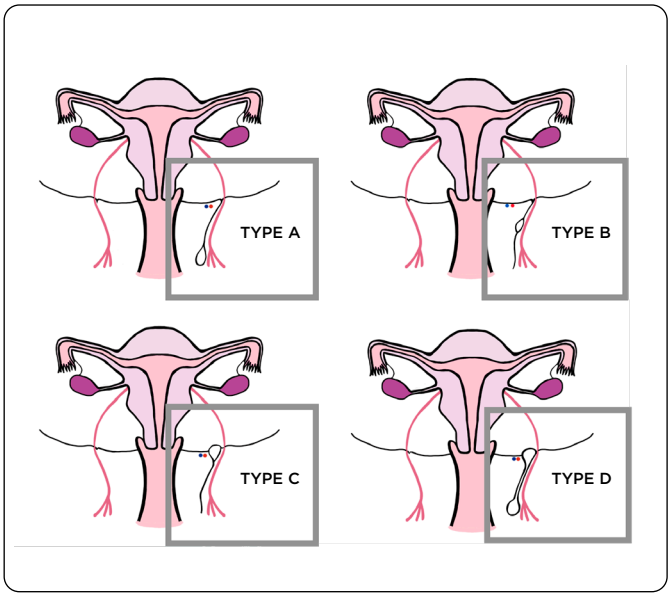


Figure 3. Classification of Nuck's canal hydroceles according to Wang et al. a) Type A: subcutaneous hydrocele, over the inguinal canal. b) Type B: hydrocele located within the inguinal canal. c) Type C: hydrocele confined and limited to the internal inguinal ring. d) Type D: hydrocele extending along the length from the internal inguinal ring to the inguinal canal, or extending along the length from the internal inguinal ring into the subcutaneous space. Adapted from Wang et al. (5).

Cystic masses that may occur in the female groin include: mesothelial cysts of the round ligament, anomalies of the Nuck's duct, varicosities of the round ligament, cystic lymphangioma, epidermal inclusion cysts, abscesses, pseudoaneurysms, and ovarian herniation (7-11).

Table 2. Differential Diagnoses of Inguinal-Labial Cystic Masses in Women

Mass	Characteristics
Mesothelial cyst of the round ligament	Oval, fusiform, or comma-shaped cystic or solid-cystic mass (8), unilocular or multilocular, without peristalsis, pedunculated (stalk-like structure) (9).
Varicosity of the round ligament	More common in pregnant women. Cystic masses with prominent flow on Doppler imaging, venous plexus. Changes in shape during the Valsalva maneuver (10, 11).
Cystic lymphangioma	Unilocular or multilocular with serous or chylous contents. No vascular flow. Appears to slide over adjacent structures (11).
Epidermal inclusion cyst	Hypoechoic masses containing variable internal echoes in the subcutaneous layer (11).
Abscesses	Painful. Anechoic or hypoechoic with debris or septa inside. Thickening of the adjacent skin. Poorly defined margins (11).
Pseudoaneurysms	Anechoic cavity communicating with an artery. Swirling blood flow (11).
Ovarian herniation	Variable findings depending on the cystic component of the ovary (11).

The differential diagnoses for solid inguinal-labial masses in women include: indirect hernia, endometriosis of the round ligament, lymphadenopathy, and vulvovaginal tumors and cysts (leiomyoma, Bartholin's cyst, lipoma, sarcoma, epidermoid cyst) (7, 12-18).

Table 3. Differential diagnoses of inguinal-labial solid masses in women

Mass	Characteristics
Indirect inguinal hernia	Defect lateral and superior to the inferior epigastric artery, with a dynamic effect on the Valsalva maneuver (12).
Endometriosis of the round ligament	Visualized when they form endometriomas, generating hypoechoic, heterogeneous masses, fluid-fluid levels, or multiple locules with various levels. They may or may not show Doppler flow (12).
Lymphadenopathy	Hypoechoic outer cortex and a hyperechoic inner core containing lymphatic sinuses, fat, and vessels (12).
Tumors	Variable
Leiomyoma*	A hormone-dependent tumor common in reproductive-age women (13). A solid mass with variable echogenicity, depending on the amount of fibrous tissue and smooth muscle, or heterogeneous due to necrosis as it increases in size (14).
Bartholin's cyst*	Anechoic if simple. With internal echoes, thick wall, and/or septa if complicated by hemorrhage or infection. No internal vascularity. Reactive hyperemia around the cyst if abscessed. Located on the distal posterolateral vaginal wall, medial to the labia minora (15).
Lipoma*	Hypoechoic fibrolipomas. Hyperechoic angiolipomas. Well-defined round or oval structures located in the dermis or hypodermis with hyperechoic septa aligned with the skin layers (16).
Sarcoma*	Ultrasound has low specificity for identifying this type of tumor. Size, distortion, and irregular borders should raise suspicion. Color Doppler can help determine the vascular pattern of suspicious tumors (17).
Epidermal cyst*	Solid, avascular, well-defined masses that may contain short, bright linear reflectors or short hypoechoic indentations, or may also present with concentric echogenic rings or a pseudotesticular appearance (18).

*Vulvovaginal cysts.

Regarding the final diagnosis in this patient's clinical case, epidermal cysts—also known as epidermoid cysts, pilar cysts, or sebaceous cysts (a misnomer, since they do not involve the sebaceous glands [8]), infundibular cysts, or epidermal inclusion cysts, are sac-like intradermal or subcutaneous structures whose walls are composed of stratified epithelium containing keratohyalin granules (19). These cysts can appear anywhere on the body of mammals and develop from the infundibulum of the hair follicle. On ultrasound, these cysts are described as solid, avascular, well-defined masses that may contain short, bright linear reflectors or short hypoechoic indentations; they may also present with concentric echogenic rings or with a pseudotesticular appearance (18).

Analysis

Masses in the inguinal region involve a wide range of differential diagnoses, for which clinical findings and an initial ultrasound evaluation can provide an initial assessment. However, a definitive diagnosis can only be established based on intraoperative and histopathological findings. This explains why, as in the present case, other authors describe final alternative diagnoses following the initial diagnostic impression (7, 20, 21).

On physical examination, the absence of acute inflammatory changes allows for the exclusion of abscesses, ruptured epidermal inclusion cysts, complicated Bartholin's cysts, or reactive lymphadenopathy (12, 15).

Dynamic changes during the Valsalva maneuver allow for the detection of femoroinguinal hernias, as well as round ligament varices (11, 12).

Pregnancy and reproductive age are more commonly associated with round ligament varices and leiomyomas, respectively. A history of recent surgery, as well as the presence of a pulse, should raise suspicion of a pseudoaneurysm (10, 11, 13, 14).

Ultrasound remains the first-line diagnostic modality given its availability, cost-effectiveness, and the absence of adverse effects on the patient (22, 23).

On ultrasound, findings to consider when evaluating differential diagnoses include: the presence of a stalk in the cephalic portion (mesothelial cyst of the round ligament) (8, 9), a sliding appearance over an adjacent structure (cystic lymphangioma) (11), variable cystic component and absence of ovaries in the pelvic cavity (ovarian herniation) (11), and hyperechoic septa aligned with the skin layers (lipoma) (16). However, these characteristics are not pathognomonic, and variations may occur (7).

Simple Nuck's cysts appear as anechoic collections with a thin wall, posterior acoustic enhancement, and no internal vascular flow on color Doppler. A complex cyst will have avascular septa and/or low-level internal echoes without necessarily indicating a superimposed infection (22). Furthermore, these cysts may present not only as anechoic cystic masses due to their serous content, but also as hypoechoic cystic masses due to a viscous mucous content (also characteristic of epidermal cysts) resulting from increased glycoprotein secretion by mesothelial cells induced by inflammatory cytokines, which line the internal surface of the mesothelial cells (24).

The classification of Nuck's duct cysts described by Wang et al. (5) thus allows the surgeon to determine the appropriate surgical approach, even if the initial diagnosis is subsequently revised based on histopathological findings, as in the case described here, in which an unnecessary laparoscopic intra-abdominal approach was avoided. Therefore, grouping diagnostic imaging findings according to this classification could aid in decision-making.

Conclusion

Given this diagnostic impression, the characterization of the ultrasound findings described for the different types of hydroceles or Nuck's duct lesions (types A, B, C, and D) (5) can be useful in determining the appropriate surgical approach, regardless of any postoperative alternative diagnoses, thereby saving time and costs.

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Correspondence

Luis Carlos Llorente Portillo
Calle 64 # 10-21
Montería, Córdoba, Colombia
luiscarlosllorente@hotmail.com

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