

## Hydrocele of the canal of Nuck: a case report of an unusual disease

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### Abstract

**Background:** Hydrocele of the canal of Nuck is a rare pathology with a prevalence of approximately 1% in females aged 0-16 years. Its prevalence in adults remains unknown. The condition develops due to persistent patency or failed obliteration of the canal of Nuck. Several factors may contribute to its development, including lymphatic disorders, trauma, infection, inflammation, or idiopathic causes. Clinically, it presents as edema in the groin or genital region without additional symptoms. Ultrasonography is the preferred diagnostic modality for hydrocele of the canal of Nuck. **Case report:** We present the case of a 20-month-old female patient who presented with pain and a “lump” in the right inguinal region for 3 days. The patient was diagnosed with type 1 hydrocele of the canal of Nuck through ultrasonography, which was subsequently confirmed during surgery. The patient was discharged on the same day as the procedure and remains asymptomatic. **Conclusions:** Although rare, hydrocele of the canal of Nuck should be considered in the differential diagnosis of groin or genital region edema presenting without additional symptoms. Its diagnosis can be challenging due to several common differential diagnoses, including indirect inguinal hernia, tumors, cysts, abscesses, and lymphadenopathies, which occur more frequently. Therefore, ultrasonography plays a crucial role in evaluating these differential diagnoses and confirming the hydrocele of the canal of Nuck.

**Keywords:** Ultrasonography. Hydrocele of the canal of Nuck. Diagnosis. Case report.

### Hidrocele del canal de Nuck: informe de caso de una enfermedad poco común

#### Resumen

**Introducción:** El hidrocele del canal de Nuck es una patología rara con una prevalencia aproximada del 1% en mujeres de 0 a 16 años. Su prevalencia en adultos aún se desconoce. La afección se desarrolla debido a una permeabilidad persistente o a una obliteración fallida del canal de Nuck. Varios factores pueden contribuir a su desarrollo, como trastornos linfáticos, traumatismos, infecciones, inflamaciones o causas idiopáticas. Clínicamente, se presenta como un edema en la ingle o en la región genital sin síntomas adicionales. La ecografía es la modalidad diagnóstica preferida para el hidrocele del canal de Nuck. **Caso clínico:** Presentamos el caso de una paciente de 20 meses de edad que presentó dolor y un “bulto” en la región inguinal derecha durante tres días. Se le diagnosticó hidrocele del canal de Nuck de tipo 1 mediante ecografía, que se confirmó posteriormente durante la intervención quirúrgica. El paciente fue dado de alta el mismo día de la intervención y permanece asintomático. **Conclusiones:** Aunque poco frecuente, el hidrocele del canal de Nuck debe considerarse en el

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*diagnóstico diferencial del edema inguinal o de la región genital que se presenta sin síntomas adicionales. Su diagnóstico puede ser difícil debido a varios diagnósticos diferenciales comunes, incluida la hernia inguinal indirecta, tumores, quistes, abscesos y linfadenopatías, que se presentan con mayor frecuencia. Por lo tanto, la ecografía desempeña un papel crucial en la evaluación de estos diagnósticos diferenciales y la confirmación del hidrocele del canal de Nuck.*

**Palabras clave:** Ultrasonografía. Hidrocele del canal de Nuck. Diagnóstico. Reporte de caso.

## Introduction

The female hydrocele or cyst of the canal of Nuck is a rare pathology with a prevalence of approximately 1% in females aged 0-16 years. The pathophysiology can be explained by embryological development. During embryogenesis, an evagination of the parietal peritoneum accompanies the round ligament, forming the vaginal process that extends to the genital tubercle, giving rise to the inguinal canal. The segment of the vaginal process within the inguinal canal is known as the canal of Nuck. Pathology develops when this canal fails to obliterate or persists<sup>1</sup>.

The female hydrocele appears to develop due to an imbalance between fluid secretion and absorption by the secretory membranes of the canal of Nuck<sup>1</sup>. Several factors may contribute to its development, including lymphatic disorders, trauma, infection, inflammation, or idiopathic causes. Clinically, it presents as edema in the groin or genital region without additional symptoms, making diagnosis challenging due to various differential diagnoses, including indirect inguinal hernia, tumors, cysts, abscesses, and lymphadenopathies<sup>2,3</sup>. While ultrasonography is the preferred diagnostic imaging modality, additional imaging studies may be employed to delineate the patient's anatomy better<sup>1</sup>.

Herein, we present the case of a 20-month-old female patient who presented with pain and a "lump" in the right inguinal region for 3 days.

## Clinical case

Our case is a 20-month-old female patient presented with pain and a "lump" in the right inguinal region that had lasted for 3 days. The parents reported no history of previous illnesses or surgical procedures. At the time of her visit, the patient tested positive for COVID-19, confirmed by reverse transcription polymerase chain reaction testing.

Physical examination revealed a mobile, non-tender swelling in the right inguinal region, which showed no changes with the Valsalva maneuver. Ultrasonographic examination demonstrated a well-defined cystic lesion

with anechoic content and a thin neck communicating with the right inguinal canal, consistent with type 1 hydrocele of the canal of Nuck (Fig. 1).

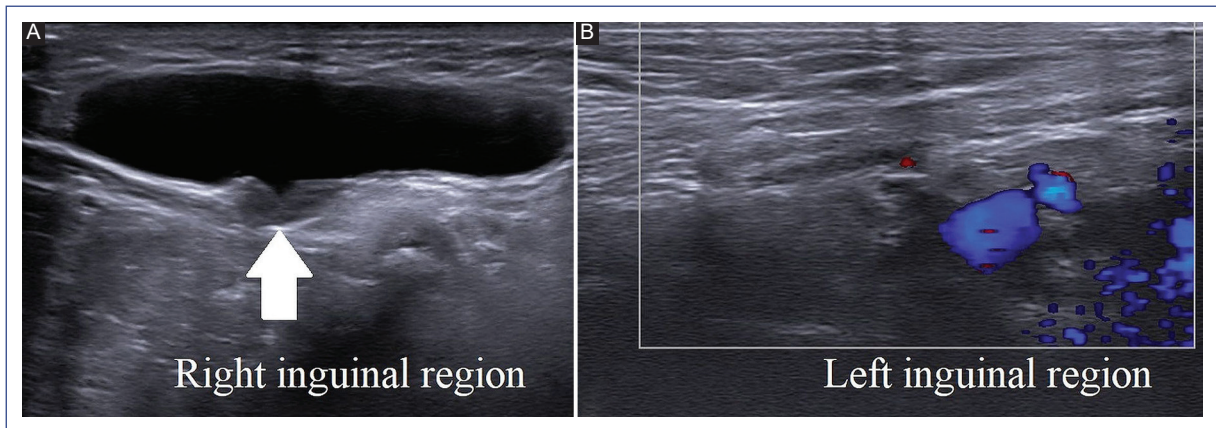
The patient was managed conservatively at home until the COVID-19 resolution. Three weeks after recovery, surgical intervention was performed, confirming the ultrasonographic diagnosis. The patient was discharged on the same day of surgery and remains asymptomatic.

## Discussion

Hydrocele of the canal of Nuck is a rare pathology in the literature<sup>4,5</sup>. Paperela *et al.* reported a prevalence of 0.74% among 353 female patients aged 1-14 years with compatible clinical presentation<sup>6</sup>. Similarly, Akkoyun *et al.*<sup>7</sup> documented a prevalence of 0.76% in a cohort of girls aged 0-16 years<sup>7</sup>, while Huang *et al.* found a prevalence of 1% in girls aged 1 month-14 years<sup>4</sup>. The prevalence in adults remains undocumented. This rarity highlights the need for increased awareness and training among clinicians, surgeons, and radiologists regarding this condition.

The pathophysiology is rooted in embryological development. The formation of the inguinal canal, including the canal of Nuck, involves two primary structures: the gubernaculum and the vaginal process<sup>2</sup>. In males, the distal portion of the gubernaculum continues to develop under androgenic hormone influence, facilitating testicular descent through the inguinal canal into the scrotal sac<sup>3</sup>. In females, the absence of androgenic and anti-Müllerian hormones arrests gubernacular development, with its caudal portion forming the round ligament, which enables proper positioning of the pelvic organs<sup>2,3</sup>.

The vaginal process, an evagination of the parietal peritoneum forming during the first trimester of gestation, attaches to the ventral portion of the gubernaculum<sup>2</sup>. While in males, it facilitates testicular descent to the scrotal sac, in females, its inguinal canal portion becomes the canal of Nuck<sup>1,3</sup>. Normal obliteration of the canal of Nuck typically occurs in a craniocaudal



**Figure 1.** Point-of-care ultrasound examination of the inguinal regions using a linear probe. **A:** transverse plane image of the right inguinal region demonstrates a cystic lesion with a thin neck communicating with the inguinal canal (white arrow), characteristic of hydrocele of the canal of Nuck (female hydrocele). **B:** left inguinal region showing normal anatomy.

direction between the 8<sup>th</sup> month of gestation and the 1<sup>st</sup> year of life. Failed obliteration results in canal persistence, potentially leading to hydrocele of the canal of Nuck –also termed Nuck’s cyst– through accumulation of fluid secreted by mesothelial cells<sup>3</sup>.

Hydrocele of the canal of Nuck can be classified into three types<sup>2</sup>:

Type 1: this is the most common variant, resulting from partial obliteration of the proximal portion of the canal, with no communication with the peritoneal cavity. It typically presents as an irreducible, translucent, and painless mass and is frequently misdiagnosed as an incarcerated hernia. On ultrasonography, the lesion’s size remains unchanged with transducer pressure, appearing as an anechoic collection with posterior acoustic enhancement bounded by a thin wall. The content may appear hypoechoic if protein-rich.

Type 2: this variant features communication between the cyst and the peritoneal cavity through a small posterior canal, increasing susceptibility to contamination by pus or blood in the presence of concurrent pathology. It develops due to the complete failure of canal obliteration and presents as a reducible mass, often becoming apparent only during the Valsalva maneuver. Ultrasonographic visualization of this type is typically possible only during strain.

Type 3: this variant exhibits a characteristic hourglass configuration resulting from deep inguinal canal compression. The inferior portion extends into the canal of Nuck within the inguinal canal and labia majora, while the superior portion remains intra-abdominal.

Clinical manifestations and findings are scarce, thus necessitating differentiation and exclusion of other pathologies such as indirect inguinal hernia, tumors, cysts, abscesses, and lymphadenopathy<sup>3</sup>. In the present report, the patient presented with a fluctuating inguinal mass without other associated symptoms, which is highly characteristic of this disease that is more prevalent in childhood<sup>1</sup>. However, during the physical examination, the patient exhibited mobile and painless bulging in the right inguinal region without changes during the Valsalva maneuver, which differs from the literature as it typically reports that the mass can extend to the labia majora<sup>3</sup>. Another evaluation method would be transluminescence to aid in diagnosis, which may be positive if the herniation is large enough and not reducible<sup>3</sup>.

The diagnosis is challenging to establish. The preferred initial investigative method for Nuck canal abnormalities is ultrasonography, which shows a well-defined anechoic lesion with posterior acoustic reinforcement<sup>5</sup>. Computed tomography (CT) should not be routinely used due to radiation exposure. In cases of diagnostic uncertainty, magnetic resonance imaging can be used for better analysis of the anatomy and extent of the lesion, showing the hydrocele as an elongated cystic structure in the inguinal canal with low-signal intensity on T1-weighted sequences and high-signal intensity on T2-weighted sequences<sup>5</sup>. Another diagnostic method, which also serves as a treatment option, is laparoscopy, which determines the hydrocele and anatomical conditions more definitively<sup>3</sup>.

To date, there is no defined standard therapeutic procedure for the disease. If the patient is asymptomatic, expectant management can be undertaken with monitoring alone, although conservative therapies such as aspiration or sclerotherapy are described in the literature<sup>3</sup>. However, when symptomatic, surgical treatment should be performed, involving excision of the cystic structure with concurrent closure of the inguinal canal defect to reduce the chance of recurrence<sup>2,5</sup>. Surgical treatment presents various technical possibilities that differ according to the patient's anatomical and pathological conditions, such as necrosis of the round ligament<sup>1</sup>. Some authors suggest correcting intraoperative defects with polyurethane mesh<sup>1</sup>. If the condition extends to the labia majora, esthetic correction of the vulva can be performed<sup>1</sup>. Therefore, the surgical intervention should be carefully selected and analyzed according to the patient's anatomical conditions and the surgeon's expertise, considering the risk-benefit ratio before surgery<sup>1</sup>.

After the improvement of imaging methods enabling adequate visualization of this pathology and its anatomical characteristics, the number of published cases has increased significantly<sup>1</sup>. Consequently, as more health-care professionals understand the hydrocele of the canal of Nuck, its reported prevalence increases, as it becomes more easily diagnosed, allowing for the establishment of appropriate standards of care for affected patients<sup>1</sup>.

## Conclusions

Hydrocele of the canal of Nuck, although rare, should be included among the differential diagnoses of groin or genital region edema without other associated symptoms. Its diagnosis is challenging since there are several differential diagnoses such as indirect inguinal hernia, tumors, cysts, abscesses, and lymphadenopathies, which are diseases with a much higher incidence. Therefore, ultrasonography is essential in analyzing

these differential diagnoses and the hydrocele of the canal of Nuck itself.

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## Conflicts of interest

The authors declare no conflicts of interest.

## Ethical considerations

**Protection of humans and animals.** The authors declare that no experiments involving humans or animals were conducted for this research.

**Confidentiality, informed consent, and ethical approval.** The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

**Declaration on the use of artificial intelligence.** The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

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