Hydrocele in the Canal of Nuck - CT appearance of a developmental groin anomaly.

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ABSTRACT

Hydrocele in the Canal of Nuck is a condition of female fetal development. The Canal of Nuck is a patent tubular peritoneal fold that travels with the round ligament to its attachment on the labia major. Failure of complete obliteration of the Canal of Nuck during fetal development predisposes females to development of a hydrocele or an inguinal hernia during post-pubertal or adult stages. We present a case of a 21 year old female with a tender reducible labial mass diagnosed as a Hydrocele in the Canal of Nuck.

CASE REPORT

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A 21 year old (Gravid 1 Para 1) female presented to family physician for evaluation of a subcutaneous mass in the right labial region. The patient reported that it had been present for about one year, it first appeared within 2 months after her c-section delivery and never resolved. The mass was subcutaneous and round-to-oval in shape. Palpation revealed a fluctuant, reducible and minimally tender mass, without a bruit or thrill to suggest vascular anomaly. There were no cutaneous findings. The family physician referred her to a general surgeon, who ordered CT Abdomen & Pelvis for better visualization and surgical planning. CT showed an oval fluid collection in the right inguinal region extending to the right labia majora [Figure 2, 4] and measuring 11.7 x 4.9 x 3.6 cm. No solid component was present. There was no communication with the peritoneal cavity, uterus or ovary [Figure 1,3]. It did not correspond to her c-section scar, which was located in the midline ventral body wall rather than the inguinal canal. At patient's request, the surgeon successfully removed the lesion via outpatient procedure 3 weeks later.

DISCUSSION

Etiology & Demographics:

Hydrocele in the Canal of Nuck is a rare condition of female development. Only about 400 cases are reported in literature worldwide. During normal female development, the round ligament descends from the cornu of the uterus and courses anteriorly to pass through the inguinal canal to where it inserts on the labia majora. A fold of parietal peritoneum follows the normal path of the round ligament through the inguinal canal creating a potential communication between the labia majora and the peritoneum known as the Canal of Nuck. It is analogous to processus vaginalis in males. In normal female fetal development, the Canal of Nuck should obliterate by itself. Failure to close predispose to development of a hydrocele or an indirect inguinal hernia in post-pubertal or adult stages depending on the size of the communication [1, 2]. Three types of hydroceles that can form depending on the extent of patent communication: hydrocele that communicates with peritoneal cavity, labia majora, or both [2, 3, 4]. The hydrocele in our patient communicates with the labia majora but not the peritoneal cavity. Incidences of bladder, ovarian or fallopian tube herniation have also been described in literature [4].

Clinical & Imaging Findings:

Typical clinical findings include a unilateral palpable soft and reducible groin or labial mass. There is no erythema, pain or tenderness. On CT imaging, there's presence of a thin walled fluid collection extending along the path of the inguinal canal to the labia majora. There is no soft tissue component to this otherwise fluid filled cyst, however thin septations may sometimes be seen. Calcifications are never seen and if present should steer the radiologist away from this diagnosis [8]. On ultrasound imaging, a thin walled anechoic or hypoechoic fluid collection will be seen, sometimes with septation. However, one should never visualize thick wall, soft tissue nodule or vascularity as presence of these findings would indicate another possibly aggressive process. [2,3,6,7]

Treatment & Prognosis:

Hydroceles can be addressed conservatively, aspirated or surgically removed. The plan of care depends largely on patient presentation such as size and symptoms of the mass. Surgical excision with hydrocelectomy and high ligation prevents recurrence and is usually the treatment of choice [1,6] . Aspiration of fluid can provide prompt relief of symptoms but the potential for reaccumulation of fluid is high. Hydroceles in the Canal of Nuck have potential for secondary infection and in such cases antibiotics should be administered promptly [1, 4, 5]. No malignant transformation has ever been reported in literature.

Differential Diagnosis:

Unilateral inguinal swelling in a female can have many other causes including inguinal hernia, abscess, lipoma, leiomyoma and sarcoma. A c-section scar may also present with post-operative seroma or hematoma but is located in the midline ventral body wall rather than the inguinal canal. Inguinal hernia is indicated by presence of bowel sounds on stethoscope, while ultrasound demonstrates actively peristalsing bowel loops as seen by their "target echo" pattern. CT shows bowel loops in inguinal canal with or without blood vessels and mesentery. Clinical signs of abscess can include pain, fever or tenderness. Ultrasound demonstrates thickened walls with increased vascular flow. Internal septations are often present as well. CT signs of abscess include collection with irregularly thickened and/or enhancing walls. Gas in the collection if present is highly indicative of an abscess. Aspiration can be performed to evaluate equivocal cases and for pathogen diagnosis. Soft, well defined mass with internal echoes on ultrasound that are aligned parallel to long axis of the tumor suggests lipoma. On CT, a lipoma demonstrates classic fat attenuation (-65 to -120 Hounsfield Units). A leiomyoma on ultrasound is seen as a circumscribed mass hypoechoic to myometrium, with poor posterior acoustic transmission, and shadowing even in absence of calcifications. A leiomyoma can appear heterogeneous if cystic degeneration or hemorrhage has occurred. On CT, a leiomyoma will demonstrate similar attenuation to uterus with variable enhancement, it may contain coarse calcifications and may appear heterogeneous if cystic degeneration or hemorrhage has occurred. On the other hand, a sarcoma on ultrasound appears as a polypoid mass of heterogeneous echotexture. On CT, it will demonstrate enhancement as well. [2,5,6,7,8]

TEACHING POINT

Hydrocele in the Canal of Nuck is a benign female developmental abnormality that presents as a labial mass. It is treated conservatively, with surgical management reserved for symptomatic cases.

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FIGURES

Figure 1: A 21 year old female with right groin mass subsequently diagnosed as hydrocele in the Canal of Nuck.
FINDINGS: Axial CT Pelvis in soft tissue window showing a thin-walled fluid collection (white arrow) originating superiorly within the subcutaneous tissues of the right abdominal wall. It demonstrates simple fluid attenuation. It contains no thick walls or calcifications. There is no surrounding fat stranding. It measures 2.3 x 1.1 cm axially at this level.
TECHNIQUE: Axial CT images from 64-slice scanner (Siemens Somatom Sensation 64), 120mAs, 120kV, 5 mm slice thickness, with IV contrast utilizing 100 cc of Omnipaque 350.

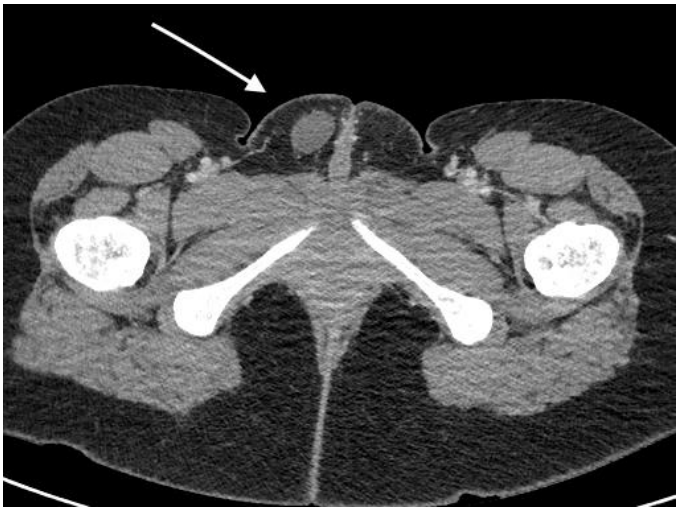

Figure 2: A 21 year old female with right groin mass subsequently diagnosed as hydrocele in the Canal of Nuck.
FINDINGS: Axial CT Pelvis in soft tissue window showing a thin-walled septated fluid collection (white arrow) extending inferiorly to subcutaneous tissues of the right labia majora. It demonstrates simple fluid attenuation. It contains no thick walls or calcifications. There is no surrounding fat stranding. It measures 1.1 x 0.8 cm axially at this level.
TECHNIQUE: Axial CT images from 64-slice scanner (Siemens Somatom Sensation 64), 120mAs, 120kV, 5 mm slice thickness, with IV contrast utilizing 100 cc of Omnipaque 350.

Figure 3 (right): A 21 year old female with right groin mass subsequently diagnosed as hydrocele in the Canal of Nuck.
FINDINGS: Simple fluid containing mass (white arrows) extending through the inguinal canal to the labia majora. It measures 4.9 cm craniocaudally.
TECHNIQUE: Reconstructed coronal CT images from 64-slice scanner (Siemens Somatom Sensation 64), 120mAs, 120kV, 1 mm slice thickness, with IV contrast utilizing 100 cc of Omnipaque 350.

Figure 4 (left): A 21 year old female with right groin mass subsequently diagnosed as hydrocele in the Canal of Nuck. FINDINGS: Simple fluid containing mass (white arrows) bulging in the subcutaneous tissues of the right labia majora. TECHNIQUE: Reconstructed sagittal CT images from 64-slice scanner (Siemens Somatom Sensation 64), 120mAs, 120kV, 1 mm slice thickness, with IV contrast utilizing 100 cc of Omnipaque 350.

Etiology	Developmental tumor
Incidence	Rare (400 cases in literature)
Gender	Females only
Age	Post pubertal/young adult
Risk factors	None
Clinical presentation	Palpable reducible unilateral inguinal mass
Treatment	Conservative, Aspiration, Surgical excision for cosmesis
Prognosis	Benign lesion/excellent prognosis
Imaging findings	Thin walled fluid collection from peritoneal cavity to labia majora, without communication with the inguinal canal
Pathology findings	Fluid filled thin walled cystic collection.

Table 1: Summary table of hydrocele in the Canal of Nuck.

	Ultrasound	CT	MRI
Hydrocele in Canal of Nuck	• Anechoic or hypoechoic thin-walled fluid collection in the inguinal canal. • Thin septations may or may not be present.	• Fluid attenuating well-circumscribed non-enhancing collection in the inguinal canal. • Thin septations may or may not be present.	• Thin walled T2 hyperintense collection in the inguinal canal. • Variable T1 signal may be present depending on the degree of proteinaceous debris.
Inguinal hernia	• "Target" echo pattern with strong central echoes representing luminal air or fluid. • Peristalsing bowel loops are characteristic. • Increase in hernia size during cough, Valsalva or standing.	• Gas filled bowel loops seen with or without mesentery and blood vessels.	• Fluid (T2 hyperintense) or gas (T1 and T2 dark) bowel loops with or without mesenteric fat and vascular flow voids.
Abscess	• Complex fluid with thickened walls and often contains septations. Increased Doppler flow of walls. • Clinical signs can include pain, fever or tenderness.	• Thick walled enhancing irregular shaped collection with or without gas.	• Thick walled enhancing irregular shaped collection, with varying T1 and T2 signal.
Lipoma	• Soft, well defined mass with internal echoes aligned parallel to long axis of the tumor.	• Fat attenuating (-65 to -120 HU), well defined mass without surrounding stranding.	• Well-defined mass demonstrating T1 and T2 high signal.
Leiomyoma	• Circumscribed mass hypoechoic to myometrium, poor posterior acoustic transmission, shadowing even without calcifications, heterogenous if cystic degeneration or hemorrhage has occurred.	• Similar attenuation to uterus, may contain coarse calcifications, heterogenous if cystic degeneration or hemorrhage, variable enhancement.	• Well defined mass demonstrating low T1 and T2 signal. • May contain central areas of T2 bright necrosis or T1 bright hemorrhage.
Sarcoma	• Polypoid mass of heterogenous echotexture.	• Heterogeneously enhancing polypoid pelvic mass.	• Heterogeneously enhancing infiltrating mass with variable T1 and T2 signal.

Table 2: Differential diagnosis for hydrocele in the Canal of Nuck.

ABBREVIATIONS

C-section = cesarean section
CT = Computed Tomography
MR = Magnetic Resonance

KEYWORDS

Hydrocele; Canal of Nuck; labia; mass; swelling; CT; inguinal canal; female; fetal development