Lymphology 52 (2019) 143-148

SURGICAL TREATMENT OF CYST OF THE CANAL OF NUCK AND PREVENTION OF LYMPHATIC COMPLICATIONS: A SINGLE-CENTER EXPERIENCE

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ABSTRACT

The canal of Nuck is a residue of the peritoneal evagination that runs along the round ligament through the inguinal canal in women. Its partial or total patency can lead to a cystic lymphangioma (CL). CL of the canal of Nuck in an adult female is a rare entity and its clinical diagnosis can be difficult or incorrect. Ultrasonography can be useful to identify the nature of groin masses. A potential CL of the canal of Nuck should always be considered in the differential diagnosis of inguinal swelling in adult females. Even if it is possible to consider conservative treatment, the optimal therapeutic option is surgical excision of the cystic mass and closure of the inguinal ring by an anterior approach. In this study, we report a case series of four women affected by a cyst of the canal of Nuck to underline the surgical treatment's therapeutic role of this pathological condition and the importance of preliminary identification of lymphatic vessels with BPV (Blue Patent Violet) in order to prevent lymphatic injuries such as lymphorrea and lymphocele in the groin after surgery due to the disruption of inguinal lymph nodes and lymphatics.

Keywords: canal of Nuck; hydrocele; cystic lymphangioma; lymphatic surgery

The canal of Nuck is the peritoneal fold that usually runs along the round ligament of the uterus through the inguinal canal and is analogous to a patent processus vaginalis in males. If its obliteration fails, the result is a communication between the canal of Nuck and the peritoneal cavity that could cause an indirect hernia or a cystic lymphangiomas (CL). CL of the canal of Nuck may present as a painless or painful, elastic, soft mass which forms in the inguinal region. The recommended treatment of the CL of the canal of Nuck is surgical excision and closure of the inguinal ring by an anterior open approach. Lymphatic injuries following surgery in the inguinal region have a relevant incidence in the literature (1-7).

The inguinal region is a critical area because of the anatomical characteristics of lymphatic distribution (8). In fact, the main lymphatic bundle reaches the groin and even a minimal dissection of subcutaneous tissue in this area may cause significant lymphatic damage (3). The most common lymphatic complications are lymphocele, lymphorrea, lymphangitis, and lymphedema (1).

MATERIALS AND METHODS

In this case series, we report four cases of CL of the canal of Nuck in women surgically treated in our center between 2017 and 2018.

We identified four women aged 38 to 68 with the diagnosis of canal of Nuck cyst based on clinical examination and ultrasonography (US). Two patients were referred to MRI for diagnostic confirmation.

Case 1

A 68-year-old woman presented with one year of left inguinal swelling associated with ascites. The patient was also affected by lymphedema in the right limb and a cystic lymphangioma in the right thigh. The left groin region showed a mobile mass without evidence of incarceration or strangulation. Ipsilateral lymphadenopathy was present. The patient had undergone surgical treatment for bilateral crural hernia few years before. The US examination demonstrated a hypo-anechoic subcutaneous mass, consistent with a cyst with some internal debris. A subsequent MRI performed two months later showed multiloculated fluid collection in the left groin with a maximum diameter of 9 cm *(Fig. 1)*. The patient was directed to surgery. A skin incision was made in the left inguinal region. Through subcutaneous tissue and external oblique muscle it was possible to reach the inguinal canal. The cyst was carefully separated from the fibrotic tissue which had occurred as a result of the previous surgery. During the groin dissection, lymphatic collectors were highlighted in blue and were carefully spared. The Nuck cyst contained clear fluid which was sent for cytological examination and the presence of amorphous material with erythrocytes, neutrophil granulocytes, lymphocytes and spumous cells were observed. The histopathological findings demonstrated thick-walled lymphatic vessels in the cyst capsule. The cyst was completely separated from the round ligament, excised completely and sent for hystopathological examination *(Fig. 2)*. The patient was discharged four days after surgery. At one year follow-up, there was no recurrence of the mass or ascites.

Case 2

A 38-year-old woman was referred to our department for reducible swelling in her left groin. She had complained of this painful mass for one year. On physical examination, the mass was soft, fixed on the deep level, and there was ipsilateral inguinal lymphadenopathy. Ultrasonography of the left inguinal region showed an anechoic fluid collection that partially changed in size on Valsalva maneuver. We surgically performed excision of the Nuck cyst, preserving lymphatic vessels by injecting Blue Patent Violet (BPV) dye into the left inguinal region ten minutes prior to surgery. The patient was discharged two days after surgery and at six month follow-up had no recurrence of the cyst.

Case 3

A 41-year-old woman was referred to our department for a painful cyclic right groin mass that appeared after intense exercise. The lump was mobile, elastic and painful on palpation. A conservative approach was unsuccessfully attempted, and surgical management was undertaken. We identified and carefully isolated the multiloculated cyst measuring 5x5x2 cm and performed surgical excision of the cyst of the canal of Nuck and closure of the right inguinal ring by an anterior open approach. Lymphatic vessels were preserved by injecting BPV dye into the right inguinal region a few minutes prior the surgery. The

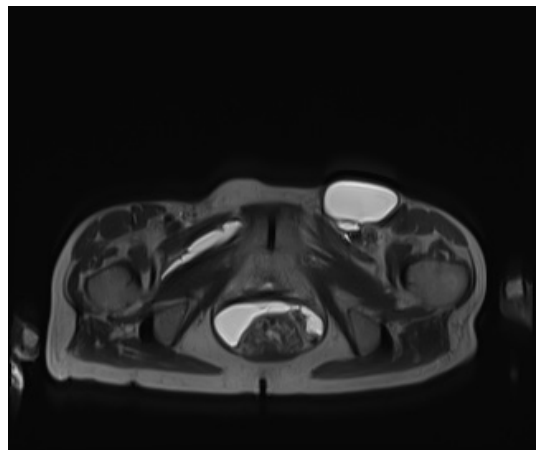

Fig. 1. Axial T2-weighted image clearly shows the hyperintense subcutaneous lesion within the left inguinal canal.

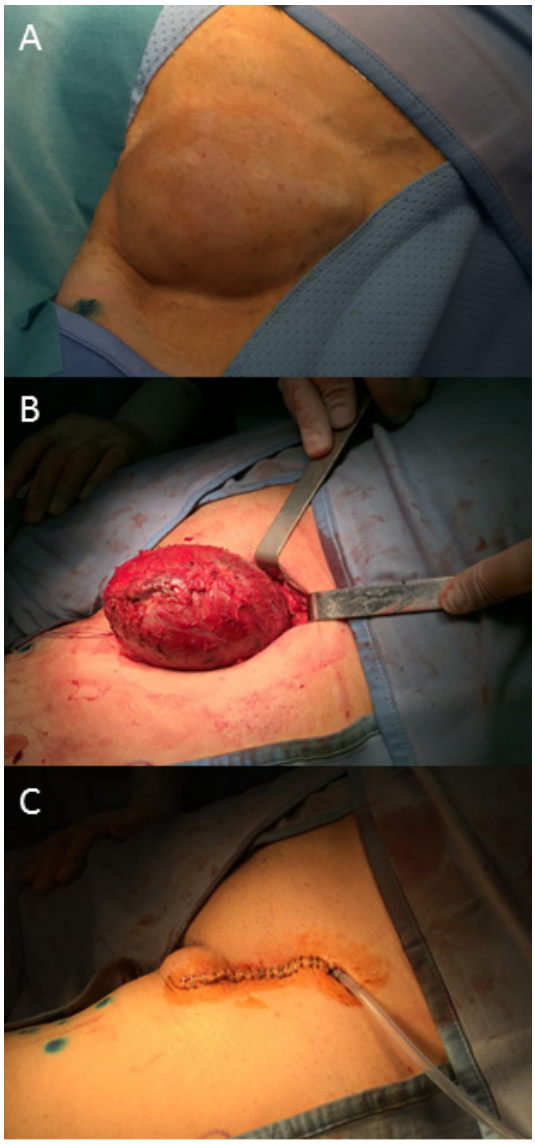

Fig. 2. A) The clinical examination revealed a mobile mass in the left groin with a maximum diameter of 9 cm. Below the mass, the site of the injection of BPV in the left inguinal region. B) Surgical excision of the cyst of the canal of Nuck from the left groin. A pole of the cyst is connected to the round ligament. The fluid collection can be appreciated by the translucency of the cyst. C) After the complete excision of the cyst, a surgical drain was placed and removed two days after surgery.

mass was sent for hystopathological examination. The postoperative course was uneventful and the patient was discharged three days after surgery. At two-year follow-up, there was no recurrence of the pathology.

Case 4

A 59-year-old woman presented with a painful right groin mass. She had been complaining about inguinal pain for a few months. Physical examination revealed a palpable, mobile mass with ipsilateral lymphadenopathy. The initial US examination demonstrated a cystic, anechoic structure in the right groin, measuring at a maximum of 3.5 cm in size. The patient was hospitalized because of onset of abdominal pain. During hospitalization, the swelling significantly decreased. A second US examination showed a cystic mass in the right groin measuring a maximum of only 2 cm in size with ipsilateral lymphadenopathy. The subsequent MRI revealed a small, oval, cyst measuring 2.3x1.6 cm with hypointense T1 signal and hyperintense T2 signal characteristics. A few days after the MRI, the patient underwent surgery. Surgery started with a right groin incision. After cutting the external oblique aponeurosis, we dissected the cyst from the round ligament and closed the canal of Nuck at the inguinal deep ring. Lymphatic vessels, previously colored in blue dye, were carefully spared. Histopathological examination confirmed the diagnosis and showed mesothelial cells on the cystic wall.

RESULTS

The postoperative period of our patients was satisfactory and uneventful. In all cases, histopathological examination confirmed the preoperative diagnosis and showed the presence of a partially de-epithelialized cystic mass with fibrous walls, containing hemorrhage and lymphoplasmacytic and histiocytic infiltrate. All patients were discharged a few days after surgery. The prevention of lymphatic injuries avoided the onset of surgery-related

early and late lymphatic complications. No patient had any recurrence of the pathology in the follow-up period, which varied from six to eighteen months.

DISCUSSION

The processus vaginalis peritonei, called "canal of Nuck" in the female, is a tubular fold of the peritoneum that follows the round ligament of the uterus as it passes through the female inguinal canal (9). In males, the upper part usually closes at or just before birth and obliteration proceeds gradually, while in females, the entire processus normally becomes obliterated (10). However, in some women the canal of Nuck does not completely close and if it remains completely patent, it forms a pathway for an indirect inguinal hernia. If the obliteration is partial, fluid may also become trapped within the canal not communicating with the peritoneal cavity. This pathological condition is called the cyst of the canal of Nuck, and it is represented by a cystic lymphangioma. Enlargement of the cyst is due to the hypersecretion or underabsorption of the secretory membrane that covers the processus vaginalis. This imbalance may be a result of an impairment of lymphatic drainage caused by inflammation or trauma but in most cases it is idiopathic (9).

The diagnosis of a CL is often difficult because this condition is rare and there are many differential diagnoses for groin masses. Its incidence in adult females is not clear because there are few cases of cysts of the canal of Nuck in the literature. Huang et al reported that the incidence of this condition in children is 1% (11). Sometimes the diagnosis is made during surgery performed for suspicious inguinal hernias. Diagnosis is often entertained first because an inguinal hernia is present in one-third of the patients with a cyst of the canal of Nuck (12,13). The typical presentation of a cyst of the canal of Nuck is a painless or moderately painful fluctuant inguinal mass which is irreducible and can be transilluminated (14). The most common differential diagnoses for groin masses are inguinal or femoral hernias, enlarged lymph nodes, soft tissue tumors (lipomas, leiomyomas), Bartholin's cysts and endometriosis of the round ligament. Other rare causes of groin masses are arterial and venous aneurysms, ganglion cysts and paraspinal abscesses surfacing in the groin (15,16).

However, the clinical history and imaging findings (ultrasonography and MRI) can help identify the nature of groin mass. High-resolution sonography is a very accurate imaging modality (17). In ultrasounds, the cyst of the canal of Nuck appears as a tubular anechoic mass extending along the course of the round ligament with a circumferential echogenic margin, usually without any internal structures (9,18). However, internal septations are not uncommon and multiloculated cysts are reported in the literature (13,16,19,20). Ultrasonography can be also a therapeutic instrument: US-guided drainage of the cyst has been reported in the literature as an effective procedure to provide immediate symptom relief (9). An MRI can give a conclusive diagnosis but it is more expensive than ultrasonography and can be avoided if the diagnosis can be made by US. The first report of MRI findings in this condition described a cystic, thin-walled structure in the inguinal region with hypointense T1 signal and hyperintense T2 signal characteristics (21). During operation, the macroscopical aspect of the lesion can confirm the clinical and instrumental findings, and histopatological assessment finally defines the exact nature of the cyst. The usual pathological findings consist of the presence of hemorrhagic extravasation and lymphoplasmacytic-histiocytic infiltrate within the cystic wall. On the other hand, only in some cases are lymphatic vessels demonstrated in the wall. It sould be of interest to add immunohistochemical study of the wall specifically to detect lymphatic vessels endothelium. Even if it is possible to consider a conservative treatment (aspiration, sclerotherapy), the optimal therapeutic option is surgical excision of symptomatic cysts of Nuck because of the patency of duct of Nuck that leads to recurrence of the cyst after conserva-

tive treatment alone.

Surgical excision of the cyst was performed using BPV injection distal to the surgical field in order to visualize lymphatic vessels and avoid their injury. Lymphatic complications in the inguinal region after surgery are reported to be 15% (5,6). In our case series, BPV helped to visualize lymphatic vessels running next to the cyst mass during the approach.

CONCLUSIONS

A painless, irreducible groin swelling in an adult female should include a possible cyst of the canal of Nuck among the differential diagnoses. Ultrasonography and MRI are the imaging modalities of choice. Even if patients choose conservative management when their symptoms are tolerable, surgery is the treatment of choice for a cyst of the canal of Nuck. Knowledge of the anatomical features of the lymphatic collectors of this region is fundamental to prevent lymphatic injury during surgery. A proper surgical technique, careful dissection and use of blue dye to identify lymphatic structures, are of great importance to avoid lymphatic complications (3).

This approach is needed to prevent and reduce the recurrence of the CL and the frequency of post-operative lymphatic morbidity that is often long lasting and costly from a socio-healthcare point of view.

CONFLICT OF INTEREST AND DISCLOSURE

The authors declare no competing financial interests exist.

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