Cyst of Nuck: The Importance of Histopathological Evaluation

Abstract
A cyst of Nuck or hydrocele of Nuck, also called the forgotten diagnosis, [1] is a rare anatomical anomaly in women. Because of its rarity it is often misdiagnosed and due to the treatment pitfalls it is important to properly diagnose this tumour. Clinical examination and imaging must be performed to differentiate and diagnose the cyst correctly. However, even these modalities are not specific enough as we present in this case of a 28 year old woman with a suspected abscess of Nuck that was shown to be a cyst of Bartholin by histopathological examination. Furthermore, we reviewed the literature on this subject.

Introduction
The canal of Nuck was first described in 1691 by Anton Nuck, a Dutch anatomist [2]. During the embryological development the gubernaculum is responsible for the descent of the ovary from high in the abdomen to the inguinal canal. Eventually the gubernaculum attaches to the labium major. Inferior and superior remnants of the gubernaculum develop respectively into ligament teres uteri, also called the round ligament and ligamentum proprium (Figure 1).

As the teres ligament evaginates out of the abdominal cavity into the inguinal canal it is covered by parietal peritoneum. This structure of peritoneum in the inguinal canal is called the canal of Nuck. The canal of Nuck also holds the ilio-inguinal nerve and the genital branch of the genitofemoral nerve. In most cases, the canal of Nuck obliterates before birth. The cause of this obliteration is unknown, but some studies show that the calcitonin-gene related peptide (CGRP), that is being released from the genitofemoral nerve, plays a role [3]. However, in some cases there is incomplete obliteration or even no obliteration at all. This can cause cases a non-communicating cyst or even a communicating hernia in guinalis. The fluid inside the cyst of this canal of Nuck is a result of disbalance between production and absorption of fluid produced by the parietal peritoneum [4].

A cyst of Nuck is a rare entity. The incidence is not exactly known but literature estimates an incidence of 1% in young girls [5]. However, this might be an underestimation, since the cyst might be misdiagnosed.

Case Report
A 25 year old null gravida with no medical history presented with a painful vulvar swelling superior lateral of the right major labium of approximate four centimetres in diameter. The swelling fluctuated and was red. This swelling was present since one month, however the intense pain was present since three days. There was no history of fever. On examination an indurated, red frontal part of the labium with swelling of the tissue between the top of the labium and the inguinal canal was seen. No enlarged inguinal lymph nodes were palpable. The Valsalva manoeuvre was negative, further gynaecologic examination was impossible due to intense pain. Ultra sonography showed a fluid filled cyst of five centimetres in diameter in the upper part of the labium up to the inguinal canal, without positive Doppler flow.

The initial differential diagnosis consisted of an infected cyst of Bartholin, an infected cyst of Nuck, an infected lipoma, leiomyoma or a sarcoma. Since Bartholin glands are located slightly posterior and to the left and right of the opening of the vagina, an infected cyst of Nuck was our working diagnosis. Marsupialisation of the complete cyst wall was performed under general anaesthesia. The cyst wall was located in the upper part of the labium and ended in the direction of the right inguinal canal. Afterwards a redon-drain was placed and the wound was closed. Post-operative there were no complications except for pain. This was treated with tramadol,
ibuprofen and pantoprazol. One day postoperatively, the patient was discharged. The drain remained for two days. On follow up after one week, the wound was closed and healing properly. Microbiological investigation of the pus showed no chlamydia, Neisseria gonorrhoea, mycoplasma genitalium or trichomonas vaginalis. Histological examination revealed fragments of a cystic lesion adjacent to normal Bartholin’s gland acini. The cyst wall was partially lined by a stratified squamous, transitional and columnar epithelium. There was a moderately to heavy active inflammatory component causing erosion and abscess formation (Figure 2).

**Figure 2:**
A. Heavily inflamed cyst wall with columnar, transitional and stratified squamous epithelium. (HE, 10x magnification)
B. Erosive part of the cystic wall. (HE, 10x magnification)
C. Active inflammation with abscess formation. (HE, 20x magnification)
D. Lobules of Bartholin’s gland acini adjacent to the cyst. (HE, 2,5x magnification)

**Literature Search**

A pubmed search was performed with mesh term: “nuck” until June 2016. A total number of 72 studies are mentioned in literature. Forty-six cases are on a hydrocele of Nuck / infected cyst of Nuck [5,9-51]. Thirteen cases on endometriosis in a cyst of Nuck [52-61]. One case of an ectopic pregnancy [62] as well as six cases on herniation of Nucks’ duct are described [63-68]. Furthermore, one case of angiofibroblastoma [69] and one case of angiomyofibroma [70], two cases of adenocarcinoma [71,72] and two cases of haematocele of Nucks’ duct [73,74] are described. All articles were analysed for complaints at presentation, whether histopathological investigation was done and which radiological investigation was done (Table 1). This information was available in 32 of the studies. In only Fifty-six percent (18 studies) histopathological investigation was performed.
Table 1: Results of the literature review with data on complaints at presentation, whether histopathological evaluation was performed and what imaging modality was used.

| Authors | Complaint | Histopathology | Imaging modality |
|---------|-----------|----------------|-----------------|
| Sarkar S. et al. [8] | Tender right in guino-labial swelling | Yes | surgical exploration |
| Patnam V et al. [9] | Swelling was non-tender, cystic and irreducible. No cough impulse. | No | CECT, MRI |
| Heer J et al. [11] | Painless “boil” to the right groin | No | CT |
| Kono R et al. [12] | Swelling in the right inguinal region | YES | MRI |
| Mazzeo C et al. [54] | Unknown | No | MRI |
| Husaric E et al. [13] | Left sided groin swelling | No | surgical exploration |
| Hensgens RL et al. [14] | Painful swelling in right groin | No | surgical exploration |
| Matsumoto T et al. [22] | Painless and reducible swelling in left groin | Yes | US and MRI |
| Uno Y et al. [55] | Lump in right inguinal region | Yes | MRI |
| Qureshi NJ et al. [15] | Pain and swelling in left inguinal region | Yes | US |
| Noguchi D et al. [67] | Painful swelling in right groin | Yes | US, MRI |
| Mandhan P et al. [17] | Tender swelling in guino-labial swelling left | Yes | US, MRI |
| Jagdale R et al. [16] | Painful swelling in right groin | Yes | US |
| Choi YM et al. [19] | Inguinal groin with (case 1) and without (case 2) tenderness | Case 1: No, Case 2: Yes | US and MRI |
| Authors                | Complaint                                      | Histopathology | Imaging modality                  |
|-----------------------|------------------------------------------------|----------------|-----------------------------------|
| Manjunatha Y et al.   | Palpable mass in right inguinal region with occasionally pain | Yes            | MRI and US                        |
| Bagul A et al. [56]   | Swelling in right groin with mild discomfort    | Yes            | Surgical examination              |
| Ozel A et al. [25]    | Inguinal groin right                            | Yes            | MRI                              |
| Hernández Monge A et al. [75] | Unknown                                   | Yes            | Unknown                           |
| Bhattacharjee PK et al. [27] | Swelling in left groin swelling            | No             | Ultrasound                        |
| Cervini P et al. [59] | Mass overlying right pubis                    | Yes            | Ultrasound                        |
| Ameh EA et al. [29]   | Right groin swelling                           | Yes            | Surgery                           |
| Huang CS et al. [30]  | Asymptomatic palpable movable mass             | No             | Ultrasound                        |
| Turpin F et al. [61]  | Unknown                                       | Yes            | US and MRI                        |
| Hernández-Monge A et al. [75] | Unknown                                   | Yes            | Unknown                           |
| Laskin WB et al. [74] | Painless mass Vulvar Region (15 cases)         | Yes            | Unknown                           |
| Josefsson ML et al. [69] | Pelvic pain                                | No             | Ultrasound                        |
| Caviezel A et al. [38] | Unknown                                       | Yes            | MRI and Ultrasound                |
| Wang CJ et al. [63]   | Tender mass in left groin                     | No             | Ultrasound                        |
| Jedrzejewski G et al. [71] | Palpable movable mass in right inguinal region | No             | Ultrasound                        |
Khanna PC et al. [39]  
**Complaint:** Right inguinal pain and discomfort  
**Histopathology:** No  
**Imaging modality:** Ultra sonography

De Meulder F et al. [40]  
**Complaint:** Bulge in right groin  
**Histopathology:** Yes  
**Imaging modality:** Ultra sonography

Miklos JR et al. [44]  
**Complaint:** Painful vulvar mass  
**Histopathology:** No  
**Imaging modality:** Ultra sonography

**Discussion**

In the differentiation of causes of a vulvar swelling, imaging is of importance. In this case ultra sonography was used. This technique is seen as the golden standard for assessing swellings in the vulvar area. This technique is simple, non-invasive and radiation free. Figure 3 shows examples from different patients from our population of MRI and ultrasound images from a cyst of Nuck and Bartholin. However, in this case the vulvar swelling was mistakenly taken for a cyst of Nuck, because of the anatomical location and the relation with the inguinal canal. It was only by histopathological examination that a cyst of Bartholin was diagnosed. We therefore urge histopathological examination of all removed vulvar swellings, because a cyst of Nuck might be even more rare, since most case reports in our literature search did not mention the results of the histopathological examination.

**Figure 3:** A. example of an MRI image of a cyst of Nuck.  
B. example of an ultrasound image of a cyst of Nuck.  
C. example of an MRI image of a cyst of Bartholin.
In all cases it is important to exclude vascularisation of the cyst, which can easily be done by ultra sonography. This can be a sign of a true inguinal hernia or a malignancy [7]. Most prevalent malignancies in the vulvar area that have a similar presentation as a cyst of Bartholin or Nuck are liposarcoma, leiomyosarcoma, fibro sarcoma and undifferentiated sarcoma [6]. An inguinal hernia is characterized by an hypo-echo genic mass usually containing intestines, omentum or other structures.

**Conclusion**

Ultra sonography has a place in the differential diagnosis of a vulvar swelling. However, as shown in the case report histopathological examination is always warranted when assessing cysts in the vulvar area.

**References**

1. Riquard L, Hensgens en Jan-Kees Breek (2016) Een vrouw met een pijnlijke zwelling in de lies. De cyste van Nuck een vergeten diagnose. Ned. Tijdschrift Geneeskd 160: A9746.
2. De peritonaeidiverticulinenovis “the new peritone diverticulitis” adenomaria curiosa et uteri foemelineanatome nova. Leiden. pp. 130-138.
3. Pediatr chir, Andre Hebra, MD et al. (2015) Surgery and Pediatrics, Medical University of South Carolina College of Medicine, USA.
4. SJ Park, HK Lee, HS Hong, HC Kim, DH Kim (2004) Hydrocele of the canal of Nuck in a girl: ultrasound and MR appearance. The British Institute of Radiology 77(915).
5. Sarkar S, Panja S, Kumar S (2016) Hydrocele of the Canal of Nuck (Female Hydrocele): A Rare Differential for Inguino-Labial Swelling. J Clin Diagn Res 10(2): PD21- PD22.
6. Rathaus V, Konen O, Shapiro M, Lazar L, Grunebaum M, et al. (2001) Ultrasonic features of spermatic cord hydroceles in children. Br J Radiol 74(885): 818-820.
7. Walter H. Stickel, Martin Manner (2004) Female Hydrocele (Cyst of the Canal of Nuck) Sonographic Appearance of a Rare and Little-Known Disorder: J Ultrasound Med 23: 429-432.
8. Patnam V, Nanyanan R, Kudva A (2016) A cautionary approach to adult female groin swelling; hydrocele of the canal of Nuck with a review of the literature. BMJ Case Reports.
9. Heer J, McPheeters R, Atwell AE, Aguiniga P, Blake J (2015) Hydrocele of the Canal of Nuck. West J Emerg Med 16(5): 786-787.
10. Kono R, Terasaki H, Murakami N, Tanaka M, Takada J, et al. (2015) Hydrocele of the Canal of Nuck: a case report with magnetic resonance hydrography findings. Surg Case Rep 22(1): 86.
11. Husaric E, Hotic N, Hallibasic A, Husaric S, Rahmanovic E, et al. (2014) Cyst of the canal of nuck in a two year old girl. Husaric Med Arch 68(4): 289-290.
12. Hensgens RL, Breek JC (2015) [A woman with a painful swelling in the groin: the cyst of Nuck, a forgotten diagnosis]. Ned Tijdschr Geneesk 160: A9476.
13. Qureshi NJ, Lakshman K (2014) Laparoscopic excision of cyst of canal of nuck. J Minim Access Surg 10(2): 87-89.
14. Jagdale R, Agrawal S, Chhabra S, Jeevan SY (2012) Hydrocele of the canal of Nuck: value of radiological diagnosis. J Radiol Case Rep 6(6): 18-22.
15. Mandhan P, Raouf Z, Bhatti K (2013) Infected hydrocele of the canal of nuck. Case Rep Urol 2013: 275257.
16. Akkoyun I, Kucukosmanoglu I, Yalnkilinc E (2013) Cyst of the canal of nuck in pediatric patients. N Am J Med Sci (6): 353-356.
17. Choi YM, Lee GM, Yi JR, Yoon KL, Shin KS, et al. (2012) Two cases of female hydrocele of the canal of nuck. Korean J Pediatr 55(4): 143-146.
18. Janssen K, Klinkner D, Kumar T (2011) Encysted hydrocele of canal of nuck: a case report with review of literature. J Surg Tech Case Rep 3(2): 97-98.
19. Manjunatha V, Beeregowda Y, Bhaskaran A (2012) Hydrocele of the canal of Nuck: imaging findings. Acta Radiol Short Rep 1(3): pii: arsr.2012.
20. Matsumoto T, Hara T, Hiroshi T, Kako N, Hiroshige S (2014) Laparoscopic diagnosis and treatment of a hydrocele of the canal of Nuck extending in the retroperitoneal space: A case report. Int J Surg Case Rep 5(1): 861-864.
21. Pérez-Colon L, Mejia-Berrios D, Cruz-Correa J, Rivera-Pedrero J, Laboy-Torres J (2010) Female hydrocele of the canal of Nuck: a case report. Bol Asoc Med P R 102(4): 59-61.
22. Deusoul-P, Michel M, Lenz F, Wessel L (2012) [First case of an antenatally diagnosed cyst of Nuck]. Ultraschall Med 33(2): 185-186.
23. Ozal A, Kindar O, Halefoglu AM, Erurtuk SM, Karpat Z, et al. (2009) Cysts of the canal of Nuck: ultrasound and magnetic resonance imaging findings. J Ultrasound 12(3):125-127.
24. Hammond I (2007) Cyst of the canal of Nuck. J Ultrasound Med 26(1): 147.
25. Bhattacharjee PK, Ghosh G (2006) Hydrocele of the canal of Nuck. J Indian Med Assoc 104(3): 150-151.
26. Yuksel KZ, Senoglu M, Yuksel M, Ozkan KU (2006) Hydrocele of the canal of Nuck as a result of a rare ventriculo peritoneal shunt complication. Pediatr Neurosurg 42(3): 193-196.
27. Amei EA, Garba ES (2003) Infected hydrocele of the canal of Nuck in a neonate. Urol Int 71(2): 226-227.
28. Huang CS, Luoc CC, Chao HC, Chu SM, Yu YJ, et al. (2003) The presentation of asymptomatic palpable movable mass in female inguinal hernia, Eur J Pediatr 162(7-8): 493-495.
29. Schneider CA, Festa S, Spiller CR, Bruce C, Lazaro EJ (1994) Hydrocele of the canal of Nuck. N J Med 91(1): 37-38.
30. Kucera PR, Glazer J (1985) Hydrocele of the canal of Nuck. A report of four cases. J Reprod Med 30(5): 439-442.
31. Kolke H, Mori N (1983) Hydrocele of the canal of Nuck in a girl. Nihon Sanka Fujinka Gakai Zasshi 35(11): 2031-2033.
32. Chiappa A, Tanfera M, Panazzolo A, Fontoni A, Julitta R, et al. (1982) Description of bilateral hydrocele of the canal of Nuck. Clinical case. Arch Sci Med (Torino) 139(4): 549-551.
33. Block RE (1975) Hydrocele of the canal of nuck. A report of five cases. Obstet Gynecol 46(3): 466-466.
34. Cleary RE, Spadoni LR, Herrmann WL (1968) Unilateral labial swelling: patent Canal of Nuck and ascites. Gynaecologia 166(6): 461-465.
35. Beltrán Marín M, MayayoSinués E, Angulo Hervias E (2010) Solution to case 18: Hydrocele of the canal of Nuck. Radiologia 52(3): 270-272.
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36. Caviezel A, Montet X, Schwartz J, Egger J, Iselin CE (2009) Female hydrocele: the cyst of Nuck. Urol Int 82(2): 242-245.
37. Khanna PC, Ponskey T, Zagol B, Lukish JR, Markle BM (2007) Sonographic appearance of canal of Nuck hydrocele. Pediatric Radiology 37(6): 603-606.
38. De Meulder F, Wojciechowski M, Hubens G, Ramet J (2006) Female hydrocele of the canal of Nuck: a case report. Eur J Pediatr 165(3): 193-194.
39. Yigit H, Tunçbilek I, Fitz S, Yigit N, Kosar U, et al. (2006) Cyst of the canal of Nuck with demonstration of the proximal canal: the role of the compression technique in sonographic diagnosis. J Ultrasound Med 25(1): 123-125.
40. Stickel WH, Manner M (2004) Female hydrocele of the canal of Nuck: ultrasonographic appearance of a rare and little-known disorder. J Ultrasound Med 23(3): 429-432.
41. Dawam D, Kanu P (1998) Giant hydrocele of the canal of Nuck. British Journal of Urology 81(4): 636.
42. Miklos JR, Karram MM, Silver E, Reid R (1995) Ultrasound and hookwire needle placement for localization of the canal of Nuck. Obstet Gynecol 85(5 Pt 2): 884-886.
43. Ballas S, Gitstein S, Peyer MR, Toaff R (1978) Hydrocele of the canal of Nuck. Harefuah 95(10): 349-351.
44. McElfatrick RA (1973) Hydrocele of the canal of Nuck: A report of two adult cases. Condon WB Rocky Mt Med J 1975 72(3): 112-113. No abstract available. Hydrocele of the canal of Nuck. Ariyan S J Urol 110(2): 172-175.
45. Kapsinow R (1959) Hydrocele of the Canal of Nuck: report of case. J La State Med Soc 111(1): 25-26.
46. J Richard Thistlethwaite (1951) Hydrocele of Canal of Nuck With Report of a Case. Can Med Assoc J 29(3): 295-302.
47. Ellis JT, Windham SW, Latilolais SG (1949) Hydrocele of the canal of Nuck. South Surg 15(9): 718-722.
48. David R, Lunski I, Laor D, Mizrahi S (1987) Nuck canal cyst simulating inguinal hernia. Harefuah 113(7-8): 163.
49. William S, MC Cune (1948) Hydrocele of the Canal of Nuck with Large Cystic Retroperitoneal Extension. Annals of Surgery 127(4): 750-753.
50. Counseller VS, Black BM (1941) Hydrocele of the Canal of Nuck: Report of Seventeen Cases. Ann Surg 113(4): 625-630.
51. Koike H, Mori N (1983) Hydrocele of the canal of Nuck in a girl. Nihon Sanka Fujinka Gakkai Zasshi 135(11): 2031-2033.
52. Mazzeo C, Gammeri E, Foti A, Rossitto M, Cucinotta E (2014) Vulvar endometriosis and Nuck canal. Ann Ital Chir 85(ePub).
53. Yoshiho Uno, Shintam Nakajima, Fumiaki Yano, Ken Bto, Nobuo Omura, et al. (2014) Mesothelial cyst with endometriosis mimicking a Nuck cyst. Surg Case Rep 10.15406/osc.2014.05.00152.
54. Bagul A, Jones S, Dundas S, Ay EH (2011) Endometriosis in the canal of Nuck hydrocele: An unusual presentation. International Journal of Surgery Case Reports 2(8): 280-289.
55. Gaeta M, Minutoli F, Mileto A, Racchiussa S, Donato R, et al. (2010) Nuck canal endometriosis: MR imaging findings and clinical features. Abdom Imaging 35(6): 737-741.
56. Kirkpatrick A, Reed CM, Bui-Mansfield LT, Russell MJ, Whitford W (2006) Radiologic病理ologic conference of Brooke Army Medical Center: endometriosis of the canal of Nuck. AJR Am J Roentgenol 186(1): 56-57.
57. Cervini P, Mahoney J, Wu L (2005) Endometriosis in the canal of Nuck: atypical manifestations in an unusual location. AJR Am J Roentgenol 185(1): 284-285.
58. Cervini P, Wu L, Shenker R, D Blenes C, Mahoney J (2004) Endometriosis in the canal of Nuck: Atypical manifestations in an unusual location. Can J Plast Surg 12(2): 73-75.
59. Turpin F, Daclin PY, Karam R, Mény R, Salanon AP, et al. (2001) A case of muscular and canal of nuck involve endometriosis. Journal de Radiologie 82(8): 933-935.
60. Scaglione V, Granieri A (1981) [Bilateral endometriosis of the canal of Nuck simulating strangulated hernia]. Ann Ostet Ginecol Med Perinat 102(1): 55-61.
61. Wang CJ, Chao AS, Wang TH, Wu CT, Chao A, et al. (2009) Challenge in the management of endometriosis in the canal of Nuck. Fertility and Sterility 91(3): 936.e9-936.e11.
62. Noguchi D, Matsumoto N, Kamata S, Kameko K (2014) Ectopic pregnancy developing in a cyst of the canal of Nuck. Obstet Gynecol 123(2 Pt 2 Suppl 2): 472-476.
63. Garteiz Martinez D, Nieto Gonzalez SE, Bravo Torreblanca C, Weber Sanchez A (2013) Cyst of Nucks canal associated with recurrent inguinal hernia. Ginecol Obstet Mex 81(1): 52-56.
64. Joseffson ML, Mitra S, Gupta S (2013) Inguinal ovary in adult women-case report and literature review. Springer plus 2: 545.
65. Yang DM, Kim HC, Kim SW, Lim SJ, Park SJ, et al. (2014) Ultrasonographic diagnosis of ovary-containing hernias of the canal of Nuck. Ultrasonography 33(3): 178-183.
66. Jedrzejewski G, Stankiewicz A, Wieczorek AP (2008) Uterus and ovary hernia of the canal of Nuck. Pediatr Radiol (11):1257-1258.
67. Tubbs RS, Loukas M, Shoja MM, Salter EG, Oakes WJ (2007) Indirect inguinal hernia of the urinary bladder through a persistent canal of Nuck: case report. Hernia 11(3): 287-288.
68. Harbeson AE (1933) Congenital Hernia of the Ovary and Tube into the Canal of Nuck With Report of a Case. Can Med Assoc J 29(3): 295-297.
69. Laskin WB, Fetsch JE, Tavassoli FA (1997) Angiomyofibroblastoma of the female genital tract: analysis of 17 cases including a lipomatous variant. Hum Pathol 28(9): 1046-1055.
70. Hernández Monge A, Estrada Moscoso I, Márquez-Pribe P, Alanis Fuentes J, Pacheco Pineda R (2006) Vulvar cellular angiofibroma. A report of a case and bibliographic review. Gineco1Obstet Mex 74(9): 499-502.
71. Mesko JD, Gates H, McDonald TW, Youmans J, Lewis J (1988) Clear cell (“mesonephroid”) adenocarcinoma of the vulva arising in the female genital tract: analysis of 17 cases including a lipomatous variant. Hum Pathol 28(9): 1046-1055.
72. Sun OC, Toker C, Mao JD, Elias EG (1979) Indirect inguinal hernia of the urinary bladder through a persistent canal of Nuck: a case report and literature review. Springer plus 2: 545.
73. Mesko JD, Gates H, McDonald TW, Youmans J, Lewis J (1988) Clear cell (“mesonephroid”) adenocarcinoma of the vulva arising in endometriosis: a case report. Gynecol Oncol 29(3): 385-391.
74. Forsyth JA (1912) Haematocele of the Canal of Nuck. Proc R Soc Med 5(Obstet Gynaecol Sect): 334-335.
75. Ryan JD, Joyce MR, Pierce C, Brannigan A, O’Connell PR (2009) Haematocele in a hydrocele of the canal of Nuck mimicking a Richter’s hernia. Hernia 13(6): 643-645.