

Laparoscopic Intracorporeal Hydrocelectomy and Posterior Wall Suture Repair of the Hydrocele for the Canal of Nuck

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Abstract

Background: Hydrocele of the canal of Nuck (HCN) causes inguinal swelling in women. This study aimed to evaluate the outcomes of laparoscopic intracorporeal hydrocelectomy and posterior wall suture repair for treating HCN.

Methods: We retrospectively reviewed the charts of 56 adult female patients with HCN at Damsuyu Hospital, Seoul, Republic of Korea, from September 2012 to July 2016.

Results: Of the 56 patients, encysted hydroceles were observed in 43 (76.8%) and communicating hydroceles were observed in 13 (23.2%). Among the 43 patients with encysted hydroceles, 30 (69.8%) had serous hydroceles, 12 (27.9%) had hemorrhagic hydroceles, and one (2.3%) had an inflammatory hydrocele. Fifteen (28.6%) patients, especially those with hemorrhagic hydroceles (11/12) and one with an inflammatory hydrocele (1/1), complained of inguinal pain ($p < 0.001$). No recurrence was observed during the follow-up period.

Conclusion: HCN should be considered during the differential diagnosis of hernia in women with inguinal swelling. The diagnosis was made with preoperative ultrasonography, and laparoscopic intracorporeal hydrocelectomy with posterior wall repair was performed as an effective treatment.

Keywords: Hydrocele of the canal of Nuck; Laparoscopic hydrocelectomy; Female hernia; Female hydrocele; Inguinal hydrocele

Introduction

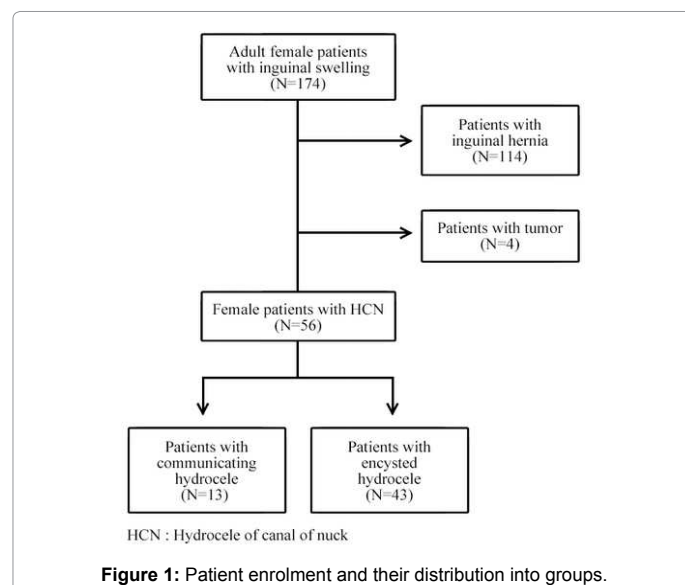
The symptoms of inguinal hydroceles are similar to those of inguinal hernia. The hydrocele of the canal of Nuck (HCN) is one of the many causes of inguinal swelling in women and results from failed obliteration of the canal of Nuck [1]. However, the prevalence of HCN has rarely been reported in research studies, and most incidents have been reported in case reports. HCN is often misdiagnosed as an incarcerated inguinal hernia on physical examination, but diagnosis using sonography is easy because it presents as a hypoechoic round lesion. In 1941, HCN was classified as follows based on its location: communicating, encysted, and hour-glass types [2]. The usefulness of laparoscopic intracorporeal hydrocelectomy for treating cord hydroceles in male children has previously been reported [3]. Also, laparoscopic hydrocelectomy for treating HCN in female children has previously been reported [4]. To the best of our knowledge, few reports on studies involving laparoscopic hydrocelectomy and posterior wall suture repair for treating HCN in female patients are available.

Here we report the treatment of HCN in adult female patients with inguinal swelling. More importantly, we report a novel technique of laparoscopic intracorporeal hydrocelectomy with posterior wall suture repair for treating HCN.

Materials and Methods

A retrospective chart review of female patients with inguinal swelling treated at Damsuyu Hospital, Seoul, Republic of Korea, from September 2012 to July 2016 was conducted (Figure 1). All patients underwent surgery after the procedure was described to them and their informed consent was obtained. In total, 174 women presented with inguinal swelling, of whom 114 with inguinal hernia and four with inguinal tumor were excluded. The remaining 56 patients were diagnosed with HCN after preoperative sonography (Figure 2). Two types of hydroceles were observed in the laparoscopic view: encysted and communicating (Figure 3). Needle aspiration was performed prior to hydrocelectomy to remove large hydroceles. HCNs were classified into serous, hemorrhagic, and inflammatory types according to the components. Patients were

discharged on the same day after laparoscopic surgery. Outpatient follow-ups were performed to check postoperative status after 7 days and 1 month, and telephone interviews were performed annually. This study was approved by Institutional Review Board of Damsuyu Hospital.



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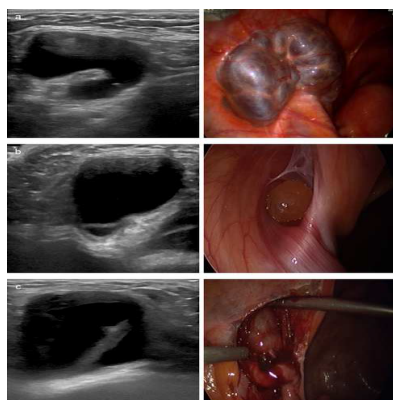


Figure 2: Preoperative sonographic and laparoscopic views of hydroceles of the canal of Nuck. (a) A hemorrhagic hydrocele. (b) A serous hydrocele. (c) An inflammatory hydrocele.

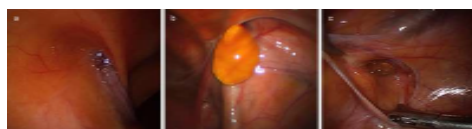


Figure 3: Operative findings of hydroceles. (a) A communicating hydrocele. (b) An encysted hydrocele outside the canal of Nuck: intra-abdominal protruded type. (c) An encysted hydrocele within the canal of Nuck: buried-in-canal type.

Patient characteristics	Communicating hydrocele (N=13)	Encysted hydrocele (N=43)	p-value*
Age (years)	30.6 ± 5.19 (19-37)	34.3 ± 7.40 (21-52)	0.103
Clinical symptoms			
Painless swelling	13 (100.0%)	28 (65.1%)	0.012
Painful swelling	0 (0.0%)	15 (34.9%)	
Laterality			
Right	9 (69.2%)	27 (62.8%)	0.752
Left	4 (30.8%)	16 (37.2%)	
Operation time (min)	19.5 ± 6.13 (12-35)	20.3 ± 7.87 (7-40)	0.730
Hospital stay (Number of postoperative hours)	11.0 ± 6.72 (7-25)	12.2 ± 7.81 (7-33)	0.731
Complication: hematoma, N (%)	0 (0%)	1 (2.3%)	1.000
Recurrence	0	0	-
Follow-up period (months)	39.0 ± 14.8 (10-55)	32.7 ± 15.2 (10-56)	0.240

* Most of the p-values are for comparisons of categorical variables, which were tested using χ^2 test or Fisher's exact test. Continuous variables were tested using t-test or Wilcoxon rank sum test.

Table 1: Patient characteristics.

Characteristics	Painful swelling (N=15)	Painless swelling (N =28)	p-value*
Characteristics of HCN			
Serous	3 (20.0%)	27 (96.4%)	<0.001
Hemorrhagic	11 (73.3%)	1 (3.6%)	
Inflammatory	1 (6.7%)	0 (0.0%)	
Location of HCN			
Inguinal canal	8 (53.3%)	18 (64.3%)	0.709
Intra-abdominal cavity	7 (46.7%)	10 (35.7%)	

* Most of the p-values are for comparisons of categorical variables, which were tested using χ^2 test or Fisher's exact test. HCN: hydrocele of the canal of Nuck

Table 2: Characteristics of encysted hydroceles according to inguinal pain.

Laparoscopic protocols

Procedures were performed with patients under general anesthesia in the supine position. The laparoscopic system comprised a 5.0-mm camera and instruments. A transumbilical incision was used to create a pneumoperitoneum via a trocar. The pneumoperitoneum with CO₂ was maintained at 8-11 mmHg. Two other instruments were inserted through separate 5.0-mm stab incisions in the lateral abdomen. Patients with communicating hydroceles underwent sac removal with myopectineal orifice suture repair using silk 2-0, whereas those with encysted hydroceles underwent intracorporeal hydrocelectomy with posterior wall (myopectineal orifice) suture repair (Figure 4). The removed hydrocele was extracted from the abdominal cavity through the lateral port. A dermal bond was then applied around the scar, and thus, dressing was not required unless any specific problem was noted.

Statistical methods

All statistical analyses were performed using R 3.3.2 (R Development Core Team, Vienna, Austria, <http://www.R-project.org>). Continuous variables were presented as mean and standard deviation and were analyzed using the Wilcoxon rank sum test. Categorical variables were presented as frequencies and percentages. For categorical variables, Fisher's exact test or χ^2 test was used. A p-value of ≤ 0.05 was considered to indicate statistical significance.

Results

All patient characteristics are presented in Table 1. In total, 174 adult women presented with inguinal bulging as the main symptom, of these, 114 patients presenting inguinal hernia and four presenting inguinal tumor were excluded. All 56 patients with HCN were women. The mean age of patients with communicating hydroceles was 30.6 years, and that of patients with encysted hydroceles was 34.3 years. In total, 13 communicating hydroceles and 43 encysted hydroceles were noted. Fifteen (26.8%) patients complained of inguinal pain, all of whom had encysted hydroceles ($p = 0.012$). No difference was observed in laterality between the two groups. The operation times were similar for the communicating (19.5 ± 6.13 min) and encysted (20.3 ± 7.87 min) HCN groups. Most patients with communicating and encysted HCN were discharged on the day of surgery at an average of 11.0 ± 6.72 h and 12.2 ± 7.81 h after the operation, respectively. A postoperative complication was observed in one patient. Postoperative inguinal hematoma occurred in one patient with encysted HCN but subsided spontaneously. No recurrence occurred in either group (mean follow-up period: 39.0 ± 14.8 (range, 10-55) months in patients with communicating HCN, 32.7 ± 15.2 (range, 10-56) months in patients with encysted HCN).

The characteristics of patients with encysted hydroceles are presented in Table 2. All patients with encysted hydroceles underwent intracorporeal hydrocelectomy with posterior wall suture repair. Three components of encysted hydroceles (serous, hemorrhagic, and inflammatory hydroceles) were observed. Among the patients with encysted hydroceles, 30 had serous hydroceles, and of the remaining patients, only one had an inflammatory hydrocele and 12 had hemorrhagic hydroceles. Among the patients experiencing pain, three had large serous hydroceles, one had an inflammatory hydrocele, and 11 had hemorrhagic hydroceles. Patients with complicated (hemorrhagic and inflammatory) hydroceles were more likely to experience pain than those with serous hydroceles ($p < 0.001$). Encysted hydroceles were more frequently located in the inguinal canal (26/43, 60.5%) than in the abdominal cavity (17/43, 39.5%). No difference was noted in the occurrence of pain according to the HCN location.

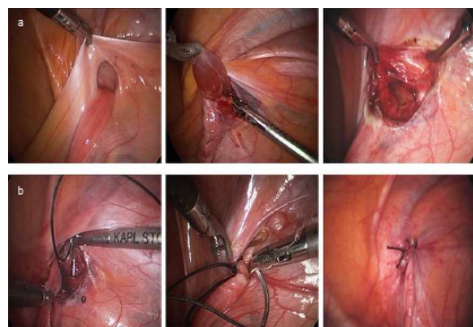


Figure 4: Surgical procedures. (a) Open canal of Nuck. Hydrocele dissection and complete excision were performed. (b) Sequence of suture repair of the myopectineal orifice in the deep inguinal ring.

Discussion

The canal of Nuck is an abnormal open pouch in the peritoneum extending into the female labia majora and was first described by Anton Nuck in 1691. Hydroceles in women are homologous to cord hydroceles in men [5-7]. Some authors have reported that the prevalence of inguinal swelling in pediatric patients is <1% [7]. However, few studies on the prevalence of HCN in adult patients have been reported [8,9]. According to our data, among 174 adult patients with inguinal swelling, 56 (32.2%) had HCN, which is a much higher prevalence than that reported in the current literature [6,8]. Although our study included patients with a definitive diagnosis based on preoperative sonographic, operative, and pathological findings, the prevalence was higher than the reported rates. The discrepancy between our results and those in literature might be because our study had a single-center design rather than a multi-center one.

Clinically, HCN usually presents as a non-reducible, painless inguinal swelling, which is difficult to differentiate from inguinal hernia based on clinical examination. HCN is largely categorized into communicating and encysted types [2]. The communicating type exhibits a repeated pattern of spontaneous bulging and reduction; this pattern is similar to that in indirect inguinal hernias. In the case of encysted-type HCN, the bulging status persists without spontaneous reduction, similar to that in the case of an incarcerated inguinal hernia. Sonography is a useful diagnostic technique because HCN typically appears as a well-defined hypoechoic lesion [10]. The encysted hydroceles in this study were serous, hemorrhagic, and inflammatory types. A few patients (3/30, 10%) with serous HCN had painful swelling, but most patients with hemorrhagic (11/12, 91.7%) and inflammatory (1/1, 100%) hydroceles complained of inguinal pain. Infected HCN has been described in some case reports on pediatric female patients [11,12] but not in adult women. Therefore, complicated hydroceles other than hernia can be distinguished if inguinal pain is the main symptom in adult patients. HCN types can be distinguished according to their clinical aspects, but they could not be distinguished using ultrasonography. In the laparoscopic view, serous hydroceles were found to have a lemon yellow color; hemorrhagic hydroceles, a wine brown color; and inflammatory hydroceles, a turbid yellow color.

The usefulness of laparoscopic operation for treating inguinal hernia has previously been reported. A complete excision of the hydrocele using posterior wall repair is recommended for treating HCN because needle aspiration of cysts can cause recurrence [13-15]. To remove large hydroceles, needle aspiration was performed prior to hydrocelectomy in the present study. No difficulty was encountered in performing hydrocelectomy after size reduction. All operations were

completed without open conversion.

Currently, no guideline exists for treating HCN, and most case reports have not included detailed descriptions of the surgical methods. In this study, a novel technique for treating HCN was employed. The wall repair procedure used in this patient series was similar to Marcy repair used in anterior approach surgery.

In this study, if patients with HCN had a hernia, mesh implantation was considered, and only posterior wall suture repair was performed. However, direct hernia occurrence in the future was a concern. No recurrence has occurred so far. Because the mean follow-up period was 39.0 months in the communicating hydrocele group and 32.7 months in the encysted hydrocele group, long-term follow-up is needed to determine the accurate recurrence rate.

Conclusion

In conclusion, the presence of HCN should be considered, especially when the patient presents with painful inguinal swelling. Preoperative sonographic evaluation is valuable, and all HCNs can be treated by intracorporeal excision with deep inguinal ring suture repair. Because this study was performed in a single center, future multi-center meta-analysis will be necessary.

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