

# We Can Predict the Need for Surgery for a Communicating Hydrocele in Neonates?: Prospective Cohort Study

## Komunikan Hidroseli Olan Yenidoğanlarda Cerrahi Gerekliliğini Öngörebilir miyiz?: Prospektif Kohort Çalışma

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**ABSTRACT Objective:** To determine the predictive factors for surgery need, non-resolution and development of hernia, in neonates with communicating hydrocele. **Material and Methods:** All newborn babies were examined. Patients who were diagnosed as having a communicating hydrocele by physical examination and ultrasonography (being able to squeeze or press fluid from the scrotum back into the abdomen) were included in the study. Resolution was accepted as no presence of swelling on physical examination and ultrasonography and on medical history in the last 3 months. Patients whose hydrocele did not disappear until at least one year of age or developed inguinal hernia were operated. Hydroceles were divided into three groups <10, 10-20, and >20 cc according to size. **Results:** Fifty-seven patients and 89 hydroceles were included in the final analysis. Of that 89, 24 (27%) hydroceles were operated, 10 (11.2%) of them due to hernia, and 14 (15.8%) no resolution. The surgical requirement was 2.25 times higher in the unilateral cases than bilateral ones (p=0.017). Surgery need was 2.2 times higher in the right side than left (p=0.04); 12 times higher in the >20 cc and 4.3 times higher in the 10-20 cc than <10 cc (p<0.01). Above 20 cc was found to be a risk factor (adjusted odds ratio: 8.2) for hernia development (p=0.013). **Conclusion:** Unilaterality, right side presence and above 10 cc in size are negative factors for resolution of hydrocele in neonates. Large size (>20 cc) is an important risk factor for hernia development.

**Keywords:** Communicating hydrocele; inguinal hernia; neonates; hydrocele size

**ÖZET Amaç:** Komunikan hidroseli olan yenidoğanlarda, hidroselin gerilememe ve fitik gelişimi öngördürücü faktörlerin belirlenmesi. **Gereç ve Yöntemler:** Tüm yeni doğan bebekler muayene edildi. Fizik muayene (skrotum sıvısı sıkılarak karın içine gönderme) ve ultrasonografi ile komunikan hidrosel tanısı alan hastalar çalışmaya dâhil edildi. Fizik muayene, ultrasonografi ve son 3 aydaki tıbbi öyküsünde şişlik olmaması, rezolüsyon olarak kabul edildi. Bir yaşına kadar hidroseli kaybolmayan veya kasık fitiği gelişen hastalar ameliyat edildi. Hidrosel boyutlarına göre <10, 10-20 ve >20 cc olmak üzere 3 gruba ayrıldı. **Bulgular:** Elli yedi hasta ve 89 hidrosel son analize dâhil edildi. Seksen dokuz hidroselin 24'ü (%27) ameliyat edildi. Ameliyat olanların 10'u (%11,2) fitik, 14'ü (%15,8) gerilememeye bağlı olarak opere oldu. Tek taraflı olgularda, 2 taraflı olgulara göre cerrahi gereksinimi 2,25 kat daha fazlaydı (p=0,017). Ameliyat ihtiyacı sağ tarafta, sola göre 2,2 kat fazlaydı (p=0,04). 10 cc altına göre 20 cc üzeri 12 kat; 10-20 cc arası 4,3 kat daha fazla cerrahi gereksinimi göstermiştir (p<0,01). Fitik gelişimi için 20 cc'nin üzeri risk faktörü olarak saptanmıştır (p=0,013) (düzeltilmiş oran: 8.2). **Sonuç:** Yenidoğanlarda hidroselin tek, sağ taraf ve boyut olarak 10 cc'nin üzerinde olması, gerileme açısından olumsuz faktörlerdir. Büyük boy hidrosel (>20 cc), fitik gelişimi için önemli bir risk faktörüdür.

**Anahtar Kelimeler:** Komunikan hidrosel; inguinal herni; yenidoğan; hidrosel boyutu

The hydrocele is defined as fluid accumulation between the tunica vaginalis parietalis and visceralis leaves around the testis.<sup>1</sup> Communicating or primary hydrocele occurs due to the fluid in the abdomen passes through the patent processus vaginalis and ac-

cumulates between the tunica vaginalis leaves, it is classified as indirect inguinal hernia when omentum and/or bowel passes through a large processus vaginalis.<sup>2</sup> The incidence of communicating hydroceles in neonates is 4.7%.<sup>3</sup>

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About fifteen years ago, the communicating hydrocele was treated as inguinal hernia and most of the patients were used to be operated at the time of diagnosis.<sup>4</sup> However, it has been proposed to follow a period of time for the chance of resolution, because of low rate of progression to hernia and very low rate (about 0%) progression to incarceration.<sup>5</sup>

We aimed to determine the predictive factors for surgery need, non-resolution and development of hernia in neonates with communicating hydrocele.

## MATERIAL AND METHODS

### STUDY POPULATION

All newborn babies were examined within 1-4 weeks of birth during two year (between May 2015 and May 2017) in urology department. Medical history was obtained from all the patients' mothers, afterwards physical examination and scrotal ultrasonography were performed to all patients. Patients who were diagnosed as having a communicating hydrocele by physical examination and ultrasonography (being able to squeeze or press fluid from the scrotum back into the abdomen) were included in the study. Patients with another scrotal pathology requiring surgery with hydrocele (undescended testis, inguinal hernia at admission) were not included in the study and who were lost to follow-up were excluded from the analysis.

### FOLLOW-UP PROTOCOL

Patients' mothers were told to come to control visit every three months. We told the children's mothers that they should check the scrotum of babies every change of diaper and what to look for in terms of possible development of hernia. Medical history was taken, physical examination and ultrasonography were performed to all patients, when they came to visit every 3 months. We waited until at least one year for the resolution.

### SURGERY DECISION

Resolution was accepted as no presence of swelling on physical examination and ultrasonography and on medical history in the last three months. Patients

whose hydrocele until at least one-year age or developed inguinal hernia were operated via the inguinal approach. Processus vaginalis was dissected and the distal part was released and the proximal part was ligated.

### STUDY DESIGN AND OUTCOME ASSESSMENTS

Ultrasonography was performed at the time of first admission to all patients, and hydrocele size, which did not reduce, was measured. Scrotal volume was measured by three different length. Hydroceles were divided into three groups <10, 10-20, and >20 cc according to size of scrotal side volume. First clinical characteristics (side, laterality, size, and estimated gestation age), and indications for operation (persistent hydrocele or development of inguinal hernia) were recorded.

### STATISTICAL ANALYSIS

Pearson chi-square was used for comparison of non-numerical data, and logistic regression test for multivariate analysis. p value of less than 0.05 was considered significant.

### ETHICAL CONSIDERATION

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Approval of the ethics committee for the study was obtained from the ethics committee of the Ankara Training and Research Hospital (Reference number: 0020-217). Informed written consent was taken from parents.

## RESULTS

Totally 1,285 male neonates were examined and communicating hydrocele was determined in 65 (5.06%) patients. However, eight patients were lost to follow-up. Totally, 57 patients and 89 hydroceles were included in the final analysis (Figure 1). Hydrocele was bilateral in 32 (56%), right in 18 (31.6%), and left in 7 (12.4%). The median length of time to resolution in those to do so was 6 (3-12 months) months from presentation.

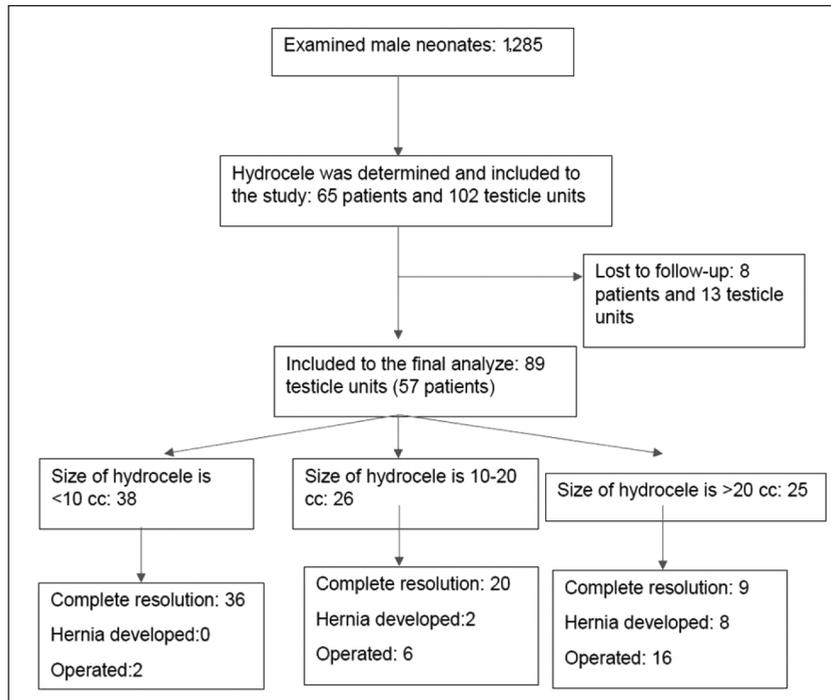


FIGURE 1: The diagram shows the details of patients included in the study.

Twenty-two (38.6%) patients and 24 (27%) hydroceles were operated, and complete resolution was seen in 35 (61.4%) patients and 65 (73%) on all testicular units. Hydrocele or hernia developed in no patient after resolution. The surgical requirement was 2.25 times higher in the unilateral cases than bilateral ones (p=0.017). Totally 8 patients who had bilateral hydrocele were operated; but six of them were operated just one side, two of them were operated two sided, these two patients were operated due to bilateral inguinal hernia development. The estimated gestational week distribution was similar in patients who underwent and did not undergo surgery (p=0.616) (Table 1).

Hernia developed in 2 (6.2%) of 32 patients with bilateral hydrocele and in 6 (24%) of 25 unilateral patients (p=0.056) and no statistical difference was detected, but with more patients this may achieve statistical significance. The estimated age of gestation (p=0.396) were similar in the groups that developed hernia or not.

Of that 89, 24 (27%) hydroceles were operated, 10 (11.2%) of them due to hernia, and 14 (15.8%) due to no resolution. Surgery needing was 2.2 times higher in the right side than left. Surgery need was 12 times higher in the >20 cc and 4.3 times higher in the 10-20 cc than <10 cc (Table 2). In the multivariate

TABLE 1: Comparison of patient data in those who required surgery versus those who had spontaneous resolution.

|                    |            | Surgery performed | Resolved on follow-up | Odds ratio | p value |
|--------------------|------------|-------------------|-----------------------|------------|---------|
| Number of patients |            | 22 (38.6)         | 35 (61.4)             |            |         |
| Laterality         | Bilateral  | 8 (25)            | 24 (75)               | 1          | 0.017*  |
|                    | Unilateral | 14 (56)           | 11 (44)               | 2.25       |         |
| EGA                | >39 weeks  | 12 (54.5)         | 15 (42.9)             |            | 0.616   |
|                    | 37-39      | 4 (18.2)          | 8 (22.8)              |            |         |
|                    | 34-36      | 5 (22.7)          | 7 (20)                |            |         |
|                    | 31-33      | 1 (4.6)           | 5 (14.3)              |            |         |

\*p value is significant is under 0.05; EGA: Estimated gestation age.

**TABLE 2:** Comparison of testicle units that required surgery versus those who had spontaneous resolution.

|   |              | Surgery performed | Resolved on follow-up | Odds ratio | p value |
|---|--------------|-------------------|-----------------------|------------|---------|
| Number of testicle units with hydrocele (%) |              | 24 (27)           | 65 (73)               |            |         |
| Side  | Left (%)     | 6 (15.8)          | 32 (84.2)             | 1          | 0.04*   |
|   | Right (%)    | 18 (35.3)         | 33 (64.7)             | 2.2        |         |
| Size  | <10 cc (%)   | 2 (5.3)           | 36 (94.7)             | 1          | <0.001* |
|   | 10-20 cc (%) | 6 (23)            | 20 (77)               | 4.3        |         |
|   | >20 cc (%)   | 16 (64)           | 9 (36)                | 12         |         |

\*p value is significant is under 0.05.

analysis, the size and side were significantly predictive of the need for surgery (Table 3).

The side was not predictive for hernia development. Large size (>20 cc) were found to be predictive for hernia development (Table 4). In the multivariate analysis, the size (>20 cc vs <10 cc, adjusted odds ratio: 8.2, p=0.013) was found to be the only predictive factor for hernia development.

## DISCUSSION

Until 15 years ago, communicating hydrocele was taken as an indication for operation at the time of diagnosis.<sup>4</sup> In the one article published in 2005, 46% of patients were reported to have been operated at initial diagnosis.<sup>6</sup> Follow-up option are now available instead of surgery via the demonstration that the communicating hydrocele does not cause testicular injury and that most patients undergo resolution until the age of two.<sup>7</sup> There is a consensus on conservative treatment of hydroceles in infants, but is still controversial in older children. Some authors offer surgery after one year of age.<sup>8</sup> Some authors have determined older cut-off age limit for surgery.<sup>7</sup> The others advise observation for 18 months to decide surgery.<sup>3</sup> The European Urological Association's (EAU) Guidelines

**TABLE 3:** Multivariate logistic regression analysis for predicting the need for surgery in terms of testicle units.

|                         | Adjusted odds ratio | Exponential distribution (95% CI) | p value |
|-------------------------|---------------------|-----------------------------------|---------|
| Side (right to left)    | 4                   | 1.1-14.4                          | 0.032*  |
| Size (>20 cc to <10 cc) | 10.9                | 3.4-34.8                          | <0.001* |

\*p value is significant is under 0.05; CI: Confidence interval.

of Pediatric Urology recommends a follow-up of at least one year old, although it is not clear how long it should be waiting.<sup>9</sup> Rowe et al. have shown that the processus vaginalis closes around two years of age via contralateral exploration of the patients who were operated for unilateral hernia, and they offered observation until two years of age in the infants with communicating hydrocele.<sup>10</sup> We followed all of our patients for at least one year of age with reference of EAU Pediatric Urology Guidelines.<sup>9</sup>

The rate of resolution was reported to be 62.7-83.4% in the previous studies.<sup>3,5,8,11</sup> In our study, resolution was occurred in 61.4% of the patients and 73% of the hydroceles. Median resolution interval was 6 months in our study. Osifo and Osaigbovo reported 4-6 months for peak resolution age.<sup>3</sup>

**TABLE 4:** Comparison of testicle units with hydrocele in which a hernia developed or did not develop.

|   |              | Hernia developed | No hernia developed | p value |
|---|--------------|------------------|---------------------|---------|
| Number of testicle units with hydrocele (%) |              | 10 (11.2)        | 79 (88.8)           |         |
| Side  | Left (%)     | 3 (7.9)          | 35 (92.1)           | 0.389   |
|   | Right (%)    | 7 (13.7)         | 44 (86.3)           |         |
| Size  | <10 cc (%)   | 0 (0)            | 38 (100)            | <0.001* |
|   | 10-20 cc (%) | 2 (7.7)          | 24 (92.3)           |         |
|   | >20 cc (%)   | 8 (32)           | 17 (68)             |         |

About 69% of all the patients had bilateral hydrocele in two different studies.<sup>3,5</sup> In our study 56% of patients had bilateral hydrocele. It is more common on the right sided in the unilateral patients.<sup>8,12,13</sup> In our study, the number of right sided number patients was 2.5-fold higher than left sided. Probably, it is due to delayed descensus of the right testis.<sup>14</sup> The rate of resolution is significantly higher in the left side compared to the right side and in the unilateral side than bilateral ones, in our study. In a previous study, it was reported that more resolution developed in the bilateral ones.<sup>5</sup> However, no results were obtained regarding the right or left side.<sup>5,8,11</sup> Hydrocele size was evaluated to predict the resolution and hernia development for the first time in our study. When the hydrocele size was above 20 cc, the surgery need rate was higher than under 10 cc (64% vs 5.3%).

The main concern about the communicating hydrocele was inguinal hernia progression and risk of incarceration. The rate of hernia development was reported as 14.6% in a study and incarceration occurred in no patient.<sup>5</sup> In our study, hernia developed in 14% of patients and 11.2% of hydroceles, incarceration did not occur in any patient. Hernia operation may look simply, but it is not innocent; in one study, 5.8% of children who underwent hernia surgery had long-term testicular growth retardation and 1% atrophy.<sup>15</sup> The risk of developing hernia should not be an immediate operation indication. The hydrocele size of over 20 cc was found to be a serious predictive factor for hernia development, in our study. For this reason, these patients should be closely monitored, be sure that the mother can understand the possible development of hernia and that the emergency service can be reached quickly; otherwise, surgery may be considered immediately in patients with a hydrocele size greater than 20 cc.

The diagnosis of communicating hydrocele can be made with high accuracy with medical history and physical examination. When there is doubt in the diagnosis, scrotal ultrasonography should be performed.<sup>6</sup> Despite the fact that most of the patients in our study were actually diagnosed with medical history and physical examination, scrotal ultrasonogra-

phy was performed, in order to standardize, to all patients at the time of initial diagnosis, and to confirm resolution. We told the mothers to check their babies' testicles when they change diaper, the reason for this, to make early referrals in case of hernia development. Koski et al. have asked mothers to observe swelling and fluctuations for a clear distinction between non-communicating and communicating hydrocele but have reported that they have not achieved a clear outcome, it's mean is that observation of mothers is suggestive, but it is subjective.<sup>5</sup> So, we have diagnosed inguinal hernia via not only mothers' statement but also ultrasound.

The low number of the patients may be a limitation of the study. Stronger statistical results can only be achieved with multicenter studies. However, diagnosis, treatment and follow-up protocol could be more disciplined in single-center studies.

## CONCLUSION

Most of the communicating hydrocele seen in neonates are undergoing resolution. For this reason, instead of performing surgery at the time of diagnosis, it should be followed for at least one year. Unilaterality, right side presence and above 10 cc in size are negative factors for resolution. Large size (>20 cc) is an important risk factor for hernia development.

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*During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.*

### *Conflict of Interest*

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### *Authorship Contributions*

*This study is entirely author's own work and no other author contribution.*

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