

# Aspiration and Sclerotherapy: a Nonsurgical Treatment Option for Hydroceles

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**Purpose:** We demonstrated that hydrocele aspiration and sclerotherapy with doxycycline is an effective and safe nonsurgical treatment option for hydrocele correction.

**Materials and Methods:** The medical records of patients who underwent hydrocele aspiration and sclerotherapy were analyzed in a retrospective cohort study for success rates as well as improvement in scrotal size and discomfort after a single hydrocele aspiration and sclerotherapy treatment. Patients who reported decreased scrotal size, improved physical symptoms and satisfaction with the procedure were considered as having success with hydrocele aspiration and sclerotherapy.

**Results:** A total of 29 patients (mean age 52.8 years) presenting with 32 nonseptated hydroceles underwent hydrocele aspiration and sclerotherapy with doxycycline between 2005 and 2012. Of the hydroceles 27 (84%) were successfully treated with a single aspiration and sclerotherapy procedure. Overall mean followup was 20.8 months. Three patients reported moderate pain which resolved in 2 to 3 days. Of those patients in whom hydrocele aspiration and sclerotherapy failed, 1 had hydrocele successfully resolved with a second aspiration and sclerotherapy treatment, 3 did not have success with a second procedure and underwent hydrocelectomy, and 1 wanted immediate surgical correction.

**Conclusions:** Hydrocele aspiration and sclerotherapy was successful in correcting 84% of simple nonseptated hydroceles with a single treatment. This result is an increase from previously reported success rates involving a single hydrocele aspiration and sclerotherapy procedure with tetracycline (75%). The success rate of a single hydrocele aspiration and sclerotherapy procedure is similar to the reported success rates involving hydrocelectomy while avoiding the hospital expense and many other complications. We conclude that the hydrocele aspiration and sclerotherapy procedure is a reasonable, nonsurgical and underused treatment option for nonseptated simple hydroceles.

**Key Words:** suction, sclerotherapy, testicular hydrocele

A change in scrotal size can be a disturbing physical change for any adult male. Scrotal pain during intercourse or physical activity, discomfort related to the enlarged scrotum, cosmetic appearance of the scrotum, concerns of damage to the reproductive organs or possible malignancy are reasons why

men seek evaluation for an increase in scrotal size. Acquired hydrocele is a common cause of increased scrotal size in the adult male which affects approximately 1% of men and is mostly seen after age 40 years.<sup>1</sup> The conventional treatment of a symptomatic hydrocele is surgical<sup>2</sup> and hydrocelectomy contin-

## Abbreviations and Acronyms

AS = hydrocele aspiration and sclerotherapy

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ues to be the most common method of treatment. Complications of scrotal surgery for this benign condition include prolonged pain, recurrence, hematoma, infection and injury to the scrotal contents including the testicle, epididymis and/or vas deferens.<sup>3</sup> Furthermore, surgical management is associated with substantial costs including absence from work for recovery and the use of hospital resources.

Hydrocele aspiration and sclerotherapy was first reported in 1975 as a nonsurgical outpatient treatment for hydroceles.<sup>4</sup> Numerous chemical and pharmacological agents have been used as sclerotherapy agents with varied success, including 99.5% alcohol,<sup>5</sup> ethanolamine oleate,<sup>6</sup> polidocanol,<sup>7-9</sup> sodium tetradecylsulfate<sup>10,11</sup> and tetracycline (see supplementary table at <http://jurology.com/>).<sup>9,12-15</sup> Doxycycline is an inexpensive tetracycline derivative proven to be an effective sclerosing agent in studies involving pleurodesis for malignant pleural effusion.<sup>16</sup> Currently to our knowledge there are no published reports on AS for hydroceles using doxycycline as a sclerosing agent. Therefore, in this retrospective analysis we demonstrated that AS with doxycycline is an effective and safe nonsurgical treatment option for the nonseptated hydrocele.

## METHODS AND MATERIALS

AS was performed in an outpatient, in-office setting in all patients in this study. Before undergoing AS all patients were evaluated with a history, thorough genital examination, and scrotal ultrasound to determine the nature of the hydrocele and to rule out other scrotal abnormalities including testicular malignancy. Men who presented with a nonseptated hydrocele and were interested in nonsurgical correction were eligible for AS. Exclusion criteria were presentation with a multiseptated hydrocele or other structural problems in the scrotum including tumor, spermatocele, infection or hernia. Participants were made aware of the risks and benefits of AS, as well as the option for surgical management, and all patients underwent an informed consent process.

The AS procedure has been described elsewhere. The side of the affected scrotum was cleansed and prepped with betadine. Unilateral spermatic cord block was achieved with 10 cc 0.5% bupivacaine. A 16 gauge angiocatheter was inserted into the hydrocele sac percutaneously on the anterior superior or lateral side of the scrotum. The hydrocele fluid was aspirated using a 60 cc syringe with extension tubing and stopcock. The amount aspirated and the appearance of the fluid were recorded. Typically the fluid was clear yellow in appearance but occasionally opaque. A pale opaque fluid typically contained sperm consistent with a spermatocele.

An injection of 200 to 400 mg doxycycline diluted in 10 cc 0.5% bupivacaine without epinephrine was then administered through the angiocatheter into the empty hydrocele space. The 400 mg dose was generally reserved for patients presenting with hydroceles larger than 500 cc in volume. The scrotum was massaged for approximately 1

minute to expose the lining of the hydrocele sac to the sclerosing agent. The procedure typically took 10 to 20 minutes to complete. Patients were given hydrocodone/acetaminophen for postoperative pain and no antibiotics were issued. Patients were instructed to follow up in the office between 6 and 8 weeks after the procedure for reassessment. Subsequent followup was made in the office or with a telephone call for those coming from a distance to determine long-term success or recurrence. Patients were asked to note normalization of scrotal size and any improvements in pain or discomfort.

Study data were collected in a noncontrolled, retrospective cohort fashion by review of participant medical records. At the initial followup, patients were stratified into success and failure groups based on subjective and objective measures of treatment outcome. Patient reported outcomes were gathered using a nonvalidated questionnaire addressing posttreatment pain, resolution or persistence of the hydrocele, other symptoms associated with the hydrocele and satisfaction with the procedure. The complete questionnaire is listed in the supplementary addendum (<http://jurology.com/>). A successful AS procedure was defined as complete to minimal persistence of the hydrocele (less than 30 cc), improvement in symptoms of pain or discomfort and satisfaction with the procedure. Criteria for failure included recurrence of the hydrocele, and no improvement in pain, discomfort, activities of daily living or presentation for hydrocelectomy. At initial followup patients in whom a single AS procedure failed were presented with the 3 options of repeat AS, surgical hydrocelectomy or observation.

## RESULTS

There were 29 patients with a mean age of 52.8 years who presented with 32 nonseptated hydroceles between 2005 and 2012. Overall mean followup was 20.8 months. Of these hydroceles 27 (84%) were successfully treated with a single AS procedure (table 1). In the group reporting success 21 patients presented with a unilateral hydrocele and 3 presented with a bilateral hydrocele. Patients requesting correction of bilateral hydroceles had hydroceles treated in series scheduled after the first followup appointment. Mean, median and range of fluid aspirated from the successful treatment group were 179 cc (SD 113.2), 170 cc and 30 cc to 500 cc,

**Table 1.** Comparison of study data

	Success		Failure	
No. hydroceles (%)	27	(84)	5	(16)
Mean age (range)	54.2	(24-85)	45.8	(25-55)
No. unilat hydrocele	21		5	
No. bilat hydrocele	3		0	
No. less than 100 cc aspirate (%)	9	(28.1)	1	(20)
No. 100-299 cc aspirate (%)	13	(48.1)	2	(40)
No. 300 cc aspirate or greater (%)	5	(15.6)	2	(40)
Mean cc aspirated (range)	179	(30-500)	386	(60-800)
Mean mos followup (range)	19	(0.93-82.8)	30.8	(1.7-77.6)

respectively. Mean followup in the successful treatment group was 19 months.

Five hydroceles (16%) did not respond to the first AS procedure. In this group all 5 patients presented with unilateral hydroceles. Mean, median and range of fluid aspirated in the group in which a single AS treatment failed was 386 cc (SD 359), 200 cc and 60 to 800 cc, respectively. The large discrepancy in mean and median amounts of fluid aspirated can be attributed to 2 outliers who presented with large hydroceles consisting of 750 and 800 cc aspirated fluid. Mean followup for the group in whom a single AS procedure failed was 30.8 months. The origin of the hydrocele was believed to be idiopathic in 3 of these 5 patients. The other 2 patients reported that hydroceles occurred after varicocelectomy. Of those 5 first time AS failures 1 had a second AS and reported a successful outcome, a second AS failed in 3 patients who underwent hydrocelectomy, and 1 declined a second AS and requested surgical correction. Two patients in the failure group reported that hydroceles recurred almost immediately after the first AS procedure and 3 reported a more gradual recurrence of the hydrocele. Four patients underwent hydrocelectomy, with 1 reporting complications of pain and postoperative hydrocele recurrence.

The main side effects with the AS procedure included a moderate amount of postoperative pain, reported after 3 (9.4%) of the 32 AS procedures, which resolved in 2 to 3 days. Two patients reported experiencing a pulling sensation in the scrotum that eventually resolved by the time of initial followup. One patient reported severe transient epigastric pain and another had a vasovagal reaction during the procedure. No patient required hospital admission. The time with which the scrotum was reported to return to near normal size varied among successfully treated patients. Of these patients 19 (70%) had near normal or normal scrotal size at 6 to 8 weeks after the procedure. Eight (30%) successfully treated patients reported that scrotal size resolved gradually to normal or near normal size during 4 to 6 months after the procedure. All of the patients who reported success with a single AS procedure reported that they were moderately satisfied or very satisfied with the procedure and would undergo the treatment again.

## DISCUSSION

An acquired hydrocele affects approximately 1% of men and is mostly seen after age 40 years.<sup>1</sup> Acquired hydroceles may form as a reaction to tumors, infection or trauma, but most are idiopathic in origin. The pathophysiology of an acquired hydrocele is unclear, but may result from increased serous fluid

secretion, lack of efferent lymphatics or failure of lymphatics in the mesothelial lining to reabsorb fluid.<sup>17</sup> The hydrostatic pressure of a hydrocele has been demonstrated to be greater than the pressure of the blood vessels in the scrotum, which may create stasis in venous and lymphatic flow which results in an accumulation of fluid with an increase in scrotal size.<sup>18</sup> Aspiration serves to remove the fluid from the hydrocele sac.

In a previous study by Yilmaz et al comparing hydrocele therapy with aspiration alone vs aspiration and sclerotherapy, the hydrocele recurred in all patients treated with aspiration alone.<sup>19</sup> A retrospective cohort analysis of patients presenting to our office who were treated with aspiration alone also demonstrates a high rate of recurrence. Between 2003 and 2011 recurrence was noted in 18 of 22 (82%) hydroceles treated with aspiration alone with a mean followup of 6.2 weeks. Comparing the recurrence rate after aspiration alone to aspiration and sclerotherapy with doxycycline may serve as an active control in a future trial, and provide insight into the efficacy of the sclerotherapy component of the procedure. It appears that sclerotherapy is necessary after aspiration to create the inflammatory response and subsequent fibrosis which impede the flow of fluid into the hydrocele sac, thereby more effectively preventing recurrence. Tetracycline was previously used as a sclerosing agent for AS but has been replaced by doxycycline because the injectable formulation of tetracycline is no longer available in the United States. The proposed mechanism of action of doxycycline involves the promotion of fibrin and collagen deposition from mesothelial cells and fibroblasts, which is necessary for the desired sclerosis.<sup>20</sup>

In our study 84% of patients reported a successful outcome after a single AS procedure. This is an increase from the previously reported success in 21 of 28 patients (75%) after a single AS treatment with tetracycline.<sup>14</sup> Beiko et al analyzed the success rates of hydrocelectomy compared to aspiration and sclerotherapy for symptomatic hydrocele.<sup>10</sup> The authors observed that surgical hydrocelectomy was successful in 21 of 25 (84%) cases while a single AS with sodium tetradecylsulfate was successful in 15 of 25 (60%). The reported success rate for surgical hydrocelectomy was identical to our success rate for a single AS procedure. Interestingly 40% of the patients undergoing hydrocelectomy experienced postoperative complications including edema, hematoma, infection and cellulitis.

Our small study shows that a single AS with doxycycline is as effective as hydrocelectomy while avoiding many of the complications of surgery such as surgical anesthesia or hospitalization, posttreatment pain, incision related problems and infection.

In our study temporary pain was reported in 3 cases (9.4%), including an intrascrotal pulling sensation reported by 2 men (6.9%), and a vasovagal reaction and epigastric pain in 1. It appears that posttreatment pain is limited in duration, severity and prevalence, but a longer acting local anesthetic mixed with doxycycline may further decrease posttreatment pain. We found no reliable indicators to predict the rate at which the scrotum will return to normal size. Patients presenting with concerns of mild fluid reaccumulation and no additional complaints are best managed with reassurance and watchful waiting as most reported a return to normal scrotal size within 4 to 6 months.

Currently there are few variables that predict whether a single AS procedure will be successful or fail. Generally a single AS procedure is more likely to fail in patients presenting with a multiseptated hydrocele. This study was limited to patients with nonseptated hydroceles. Hydrocele size appears to be a factor that may impact single treatment success. The volume of aspirate was found to be a significant predictor of treatment outcome ( $p = 0.02$ ). It was observed that single AS therapy was not successful in 2 patients presenting with hydroceles larger than 750 cc. However, when removing these 2 patients from analysis, aspirate volume was not a significant predictor of treatment outcome ( $p = 0.44$ ). Patients presenting with hydroceles of this size should be counseled that they have an increased likelihood of needing multiple AS procedures or that they should consider surgical correction. In those men in whom sclerotherapy failed and who underwent hydrocelectomy at least 3 months after sclerotherapy, there was no additional difficulty in completing this procedure. This demonstrates that failed sclerotherapy is not a contraindication to surgical correction.

AS with doxycycline is a less costly method of treating nonseptated hydroceles. In a comparison of AS and surgical hydrocelectomy we found that the total noninsurance adjusted cost of AS was \$459.13 vs \$12,322.34 for a unilateral hydrocelectomy (table 2). AS is performed in an outpatient office setting and

**Table 2.** Comparison of fees charged

	Aspiration	Sclerotherapy	Hydrocelectomy
Urologist fee	\$425.00		\$1,200.00
Materials	\$34.13		Not applicable
Operating room services	Not applicable		\$4,958.50
Anesthesia fee	Not applicable		\$2,923.84
Recovery room fee	Not applicable		\$3,240.00
Totals	\$459.13		\$12,322.34

Data collected from Rush University Medical Center, June 2012. Insurance reimbursement not considered. All currency in US Dollars.

can be completed in 10 to 20 minutes, whereas surgical hydrocelectomy is most often performed in an operating room with the patient under regional or general anesthesia, requiring postoperative recovery and variable time to heal at home. AS is also an option for patients with multiple comorbid health issues that make them poor surgical candidates, and for those who do not want to undergo surgery.

The limitations of this study include its noncontrolled and retrospective study design. Furthermore, patient reported outcome data in this study were gathered using a nonvalidated, investigator generated questionnaire. During a 7-year span only 29 patients underwent the AS procedure. Clearly a controlled trial would further clarify the value of AS but could take many years to complete. If we consider the high recurrence rates after aspiration alone (82% to 100%) in our study and in others, it does appear that AS has value as a minimally invasive procedure.

## CONCLUSIONS

AS appears to be a safe, quick, far less costly and reasonably effective in-office procedure for the treatment of nonseptated simple hydroceles. Our findings demonstrate that success rates with AS are similar to those with surgical management while avoiding many of the complications and expenses associated with surgery. For patients in whom AS fails, surgical hydrocelectomy remains a viable treatment option.

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