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ASPIRATION AND SCLEROTHERAPY VERSUS HYDROCELECTOMY FOR TREATMENT OF HYDROCELES

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ABSTRACT

Objectives. To compare aspiration and sclerotherapy using sodium tetradecylsulfate (STDS) with open hydrocelectomy in the treatment of hydroceles with regard to safety, efficacy, and cost-effectiveness.

Methods. Patients with symptomatic hydroceles were prospectively enrolled in an aspiration and sclerotherapy protocol between October 1998 and June 2000. Patients in this group underwent percutaneous aspiration followed by sclerotherapy with an STDS-based solution. This group was compared with a group of patients chosen consecutively who underwent hydrocelectomy between December 1996 and August 1999. Primary outcome measures included patient satisfaction and procedural success. Secondary outcome measures included complications and comparative costs.

Results. A total of 27 patients with 28 hydroceles were enrolled in the aspiration and sclerotherapy protocol and compared with 24 patients with 25 hydroceles in the hydrocelectomy group. Mean follow-up for the aspiration and sclerotherapy group and hydrocelectomy group was 8.9 and 16.4 months, respectively. Patient satisfaction was 75% for aspiration and sclerotherapy and 88% for hydrocelectomy. The overall success rate for aspiration and sclerotherapy was 76% compared with 84% for hydrocelectomy. The complication rate was only 8% in the aspiration and sclerotherapy group, but 40% in the hydrocelectomy group. Comparative costs per procedure demonstrated that hydrocelectomy was almost ninefold more expensive than aspiration and sclerotherapy.

Conclusions. In the treatment of hydroceles, aspiration and sclerotherapy with STDS represents a minimally invasive approach that is simple, inexpensive, and safe but less effective than hydrocelectomy. Aspiration and sclerotherapy is a viable first-line therapeutic option in the management of hydroceles. UROLOGY **61:** 708–712, 2003. © 2003, Elsevier Science Inc.

Hydroceles are very common cystic scrotal masses that can occur in any age group, ranging from neonates to the elderly.[1] Most hydroceles do not require therapeutic intervention and can be safely left alone. However, when treatment is indicated, they have often been managed by open hydrocelectomy, which is considered their therapeutic standard.[1,2] Surprisingly, there have been very few published studies documenting cure rates and complications after hydrocelectomy.[3] Another form of therapy that has been used is percutaneous aspiration, with or without sclerotherapy. Aspiration alone, without sclerotherapy, usually results in recurrence of the hydrocele.[4] Sclerotherapy involves instillation of a sclerosing solution into the hydrocele sac, which results in coaptation of the walls of the hydrocele. Many different sclerosants have been studied including antazoline,[4] talc,[5] ethanolamine oleate,[6] tetracycline,[7] fibrin glue,[8] blood,[9] rifampin,[9] polidocanol,[10] phenol,[11] OK-432,[12] and sodium tetradecylsulfate (STDS).[13,14] Furthermore, various techniques have been used, resulting in variable and inconsistent results. Consequently, the search for the ideal sclerosing solution continues. STDS is a sclerosant that is readily available and has been used safely and extensively in humans.[15] To date, there have been very few published studies comparing hydrocelectomy with aspiration and sclerotherapy for the treatment of hydroceles.[4,16] The purpose of our study was to compare aspiration and sclerotherapy with open hydrocelectomy in the treatment of hydroceles with respect to safety, efficacy, and cost-effectiveness.

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TABLE I. *Patient demographics and hydrocele data*

	Aspiration and Sclerotherapy	Open Hydrocelectomy
No. of patients	27	24
Mean patient age (yr)	64.6	55.2
No. of hydroceles treated	28	25
Left-sided	13	15
Right-sided	13	8
Bilateral	1	1
Mean hydrocele volume (mL)	289	NA

KEY: NA = not available.

TABLE II. *Results*

	Aspiration and Sclerotherapy [No. of Cases (%)]	Open Hydrocelectomy [No. of Cases (%)]
Overall successful treatment	19 (76)	21 (84)
Cure	9 (36)	21 (84)
Success	4 (16)	NA
Partial success	6 (24)	NA
Failure of treatment	6 (24)	4 (16)
Patient satisfaction	18 (75)	21 (87.5)

KEY: NA = not available.

MATERIAL AND METHODS

ASPIRATION AND SCLEROTHERAPY GROUP

Men with symptomatic hydroceles were prospectively enrolled in our aspiration and sclerotherapy protocol between October 1998 and June 2000. The study protocol was reviewed and approved by the ethics review board of Queen's University. Informed consent was obtained from each patient and all patients were informed of the unknown effects of the sclerosing agent on fertility. Patients were excluded if they were still interested in reproduction or had current ipsilateral inguinal hernia or coexisting scrotal pathology. Clinical assessment included history and physical examination with scrotal transillumination that was followed by scrotal ultrasonography to confirm the diagnosis of hydrocele and to rule out any other underlying scrotal pathology.

All procedures were performed in an outpatient clinic setting. The unshaven scrotal skin was thoroughly prepared with chlorhexidine and draped in standard fashion. The hydrocele was transilluminated with a powerful fiber-optic light source while an assistant maintained the cystic lesion under pressure. A sterile technique was used throughout the procedure. All procedures were performed by one of the investigators (D.T.B. or A.M.) to maintain consistency of the technique.

Aspiration and sclerotherapy was performed exactly as described previously.[17] Briefly, aspiration of the hydrocele was performed using a 19-gauge butterfly needle attached to a three-way stopcock, with a 60-mL Luer-Lok syringe at the end port. The volume of aspirated hydrocele fluid was recorded and samples were sent to the laboratory for culture, cytologic, and microscopic assessment to rule out infection, malignancy, and spermatocele, respectively. The butterfly needle was left in place and sclerotherapy was then performed using a sclerosing solution. The sclerosing solution consisted of a mixture of 4 mL of 3% STDS, 6 mL of 2% lidocaine hydrochloride, and 140 mL of 5% dextrose in .45% normal saline. The volume instilled amounted to 25% of the aspirated hydrocele volume, to a maximum of 150 mL. The butterfly needle was removed, gentle pressure was applied, and a dry dressing was kept in place for 24 hours using an elastic mesh undergarment. All patients received prophylactic oral antibiotics. Follow-up consisted of a clinic appointment and scrotal ultrasound at 12 weeks, and thereafter on an as-needed basis.

The outcome criteria were as follows: cure was indicated by complete clinical and ultrasonographic disappearance of hydrocele together with complete patient satisfaction; success included complete patient satisfaction and decrease in maximum diameter of greater than 50%, as determined by scrotal ultrasound; and partial success was defined as complete patient satisfaction but ultrasonographic evidence of a decrease of less than 50% of hydrocele maximum diameter before treatment. All others were considered failures. A patient was considered satisfied if the following criteria were met: decrease in pain; decrease in size of hydrocele; relief of any hydrocele-related disability; and satisfaction with overall experience and results. Patients were offered a second aspiration and sclerotherapy procedure; however, if both were unsuccessful and the patient desired further treatment, hydrocelectomy was advised.

OPEN HYDROCELECTOMY GROUP

A group of patients having previously undergone open hydrocelectomy was selected consecutively for comparison purposes. All patients who underwent hydrocelectomy at our institution between December 1996 and August 1999, and who had not previously failed a trial of aspiration and sclerotherapy, were included in our open hydrocelectomy group. Hydrocelectomies were performed by five staff urologists, using either the Jaboulay method[1] or the Lord technique.[1,18] Data were collected in a retrospective manner from the patients' hospital and clinic charts. These data included patient satisfaction, operative procedures, postoperative course, recur-

TABLE III. *Complications*

	Aspiration and Sclerotherapy [No. of Cases (%)]	Open Hydrocelectomy [No. of Cases (%)]
Edema	1 (4)	2 (8)
Hematoma	1 (4)	5 (20)*
Wound infection	0 (0)	2 (8)*
Cellulitis	0 (0)	1 (4)
Total complications	2 (8)	10 (4)

**One patient had both hematoma and wound infection.*

TABLE IV. *Comparative costs per procedure*

	Aspiration and Sclerotherapy	Open Hydrocelectomy
Facility cost	$50.00	$600.00
Supplies	$18.00	Included
Nursing	$13.00	Included
Urologist fee	$23.00	$163.00
Anesthesiologist fee	NA	$142.00
Total cost	$104.00	$905.00

KEY: NA = not available.

rence, and complications. A telephone interview was conducted if the data regarding patient satisfaction were incomplete on the basis of chart review.

RESULTS

ASPIRATION AND SCLEROTHERAPY GROUP

Aspiration and sclerotherapy using STDS was performed on 27 patients, including 1 patient with bilateral hydroceles, for a total of 28 hydroceles. Mean patient age at the time of the procedure was 64.6 years (range 33 to 81). Mean volume of aspirated hydrocele fluid was 289 mL (range 27 to 1400), and the median volume of aspirated hydrocele was 145 mL. All procedures were performed in less than 10 minutes. Patient demographics and hydrocele data are shown in Table I. Three patients, each with unilateral hydroceles, were lost to follow-up. Therefore, follow-up was available for 24 patients with a total of 25 hydroceles. Mean duration of follow-up was 8.9 months (range 3 to 27). Results and complications are shown in Tables II and III, respectively. Two patients were dissatisfied with their initial aspiration and sclerotherapy and chose hydrocelectomy over a second aspiration and sclerotherapy procedure. Of the 8 patients who underwent a second aspiration and sclerotherapy procedure, there were 2 cures, 2 partial successes, and 4 failures. Five of 6 failures were salvaged with hydrocelectomy. Comparative costs per procedure are shown in Table IV.

OPEN HYDROCELECTOMY GROUP

Twenty-four patients underwent open hydrocelectomy during the study period, including 1 patient with bilateral hydroceles, for a total of 25 hydroceles. Mean patient age at the time of surgery was 55.2 years (range 28 to 71). Patient demographics and hydrocele data are shown in Table I. General anesthesia and spinal anesthesia were used in 17 and 7 patients, respectively, and mean operating time was 34.2 minutes. Follow-up was available for all 24 patients, with a mean duration of follow-up of 16.4 months (range 1 to 49). Results and complications are shown in Tables II and III, respectively. One of the 4 hydrocele recurrences required reoperation. Comparative costs per procedure are shown in Table IV.

COMMENT

In all surgical specialties, there is a shift toward minimally invasive approaches to treatment of essentially all disease processes. Aspiration and sclerotherapy represents a minimally invasive approach to the treatment of hydroceles. When considering the treatment of hydroceles, we should be guided primarily by goals such as patient satisfaction and convenience, low morbidity, reduced costs to the patient (eg, with respect to time taken off work), and reduced costs to the healthcare system, rather than goals of decreasing mortality or long-term survival.

Reported success of aspiration of hydroceles with STDS sclerotherapy ranges from 44% to 100%.[1] However, the definitions of success have been inconsistent, as have the number of procedures employed by different investigators. For example, some studies have reported success rates based on one treatment, whereas others have utilized as many as five procedures before deciding whether the treatment was successful. Rencken *et al.*[19] reported an overall cure rate of 96% using STDS and rolitetracycline, but 15% of their patients treated required three or more aspiration and sclerotherapy procedures. In their study, 64% of the cures were established after a single treatment. In our study, 15 of 20 (75%) patients successfully treated with aspiration and sclerotherapy re-

quired only one treatment. In light of this finding, perhaps only a marginal improvement in success rates would have been achieved by increasing the number of treatments offered to patients before surgical options were explored. Alternatively, if a patient tolerates the procedure well and is willing and perhaps finds aspiration and sclerotherapy more acceptable than open surgery with all its attendant risks, then it may be worth attempting on three to five occasions, as described by other investigators who performed multiple repeated aspiration and sclerotherapy procedures. One must also consider whether the cost and inconvenience of undergoing up to five aspiration and sclerotherapy procedures is appropriate, although there are currently no clear guidelines for the maximum number of treatments.

Overall, 18 of 24 (75%) patients treated with aspiration and sclerotherapy were completely satisfied with their treatment, and this is the most pertinent finding of our study. The only significant complication in this group of patients was a scrotal hematoma, which was managed conservatively and resolved spontaneously. There was only one other minor complication that involved persistent swelling secondary to mild scrotal-wall edema. Although our absolute cure rate of 36% was low compared with the 84% result achieved with open hydrocelectomy, it is evident that our criteria for cure in the aspiration and sclerotherapy group were very strict. The cure rate may have been higher if more than two aspiration and sclerotherapy procedures were offered. Nevertheless, the satisfaction rate is high and comparable to hydrocelectomy.

We believe that the sclerosing agent may have been excessively diluted in our study. Perhaps a higher concentration of STDS may have yielded better results. Furthermore, we believe that instillation of such large amounts of sclerosant (25% of original hydrocele volume, to a maximum of 150 mL) may have reduced the efficacy of aspiration and sclerotherapy by preventing good coaptation of the tunica vaginalis, which is required for adequate sclerosis to take place. We advocate the use of smaller volumes of a more concentrated STDS solution for aspiration and sclerotherapy.

We acknowledge certain limitations to our study. Although the aspiration and sclerotherapy patients were identified and enrolled in our protocol in a prospective manner, the hydrocelectomy patients were identified retrospectively. Therefore, a true comparison is not possible. Furthermore, they did not undergo a standardized protocol of preoperative testing and timely postoperative follow-up that would normally be performed as part of a well-designed prospective clinical trial. For example, scrotal ultrasonography was not routinely performed before the operation and the volume of hydrocele sac fluid drained during the procedure was not normally measured. Thus, some data, such as hydrocele volume, were unavailable for the hydrocelectomy group. It would have been useful to have determined the hydrocele sizes for both groups to demonstrate similar characteristics among the study patients. Despite this problem in study design, we did find the retrospective hydrocelectomy group useful in illustrating that aspiration and sclerotherapy is associated with a lower complication rate, albeit at the cost of reduced efficacy. The minimum follow-up time of 3 months for the aspiration and sclerotherapy group was sufficient for capturing essentially all significant early postoperative complications. In addition, the mean follow-up time of 8.9 months was adequate for capturing most hydrocele recurrences. However, we must acknowledge that long-term follow-up was lacking in our study, and therefore some hydrocele regrowths may have been missed.

We have previously shown that the cost of open spermatocelectomy is almost ninefold greater than the cost of aspiration and sclerotherapy of spermatocele.[17] The costs of aspiration and sclerotherapy of spermatocele and hydrocele were identical at our institution, as were the costs of spermatocelectomy and hydrocelectomy. Therefore, it follows that the cost per hydrocele aspiration and sclerotherapy procedure is almost ninefold lower than that of hydrocelectomy. With ever-increasing scrutiny over the growing costs of healthcare throughout North America, and with the development of newer and perhaps more efficacious sclerosants and protocols, there may be a resurgence of the simple and established technique of aspiration and sclerotherapy.

CONCLUSIONS

Aspiration and sclerotherapy using STDS represents a minimally invasive approach to the treatment of hydroceles that is simple, safe, and reasonably effective. Furthermore, aspiration and sclerotherapy is considerably less expensive than open hydrocelectomy. Given its safety, cost, and efficacy, aspiration and sclerotherapy is a reasonable first-line therapeutic option in the management of hydroceles.

REFERENCES

1. Epstein A, and Novicki DE: Management of hydroceles. AUA Update Series VII Lesson **19:** 145–149, 1988.

2. Moloney GE: Comparison of results of treatment of hydrocele and epididymal cysts by surgery and injection. Br Med J **3:** 478–479, 1975.

3. Rodriguez WC, Rodriguez DD, and Fortuno RF: The operative treatment of hydrocele: a comparison of 4 basic techniques. J Urol **125:** 804–805, 1981.

4. Roosen JU, Larsen T, Iverson E, *et al:* A comparison of aspiration, antazoline sclerotherapy and surgery in the treatment of hydrocele. Br J Urol **68:** 404–406, 1991.

5. Yilmaz U, Tatlisen A, and Ekmekcioglu O: Talc sclerotherapy for hydroceles. Br J Urol **82:** 440–441, 1998.

6. Tammela TLJ, Hellström PA, Mattila SI, *et al:* Ethanolamine oleate sclerotherapy for hydroceles and spermatoceles: a survey of 158 patients with ultrasound followup. J Urol **147:** 1551–1553, 1992.

7. Levine LA, and DeWolf WC: Aspiration and tetracycline sclerotherapy of hydroceles. J Urol **139:** 959–960, 1988.

8. Sirpa A, and Martti AO: Results of fibrin glue application therapy in testicular hydrocele. Eur Urol **33:** 497–499, 1998.

9. Yilmaz U, Ekmekcioglu O, Tatlisen A, *et al:* Does pleurodesis for pleural effusions give bright ideas about the agents for hydrocele sclerotherapy? Int Urol Nephrol **32:** 89–92, 2000.

10. Sigurdsson T, Johansson JE, Jahnson S, *et al:* Polidocanol sclerotherapy for hydroceles and epididymal cysts. J Urol **151:** 898–901, 1994.

11. Savion M, Wolloch Y, and Savir A: Phenol sclerotherapy for hydrocele: a study in 55 patients. J Urol **142:** 1500–1501, 1989.

12. Yamamoto M, Hibi H, and Miyake K: A new sclerosant therapy for testicular hydrocele with aspiration and injection of OK-432. Int Urol Nephrol **26:** 205–208, 1994.

13. Stattin P, Karlberg L, and Damber JE: Long-term outcome of patients treated for hydrocele with the sclerosant agent sodium tetradecyl sulphate. Scand J Urol Nephrol **30:** 109–113, 1996.

14. Fracchia JA, Armenakas NA, and Kohan AD: Cost-effective hydrocele ablation. J Urol **159:** 864–867, 1998.

15. Tretbar LL: Injection sclerotherapy for spider telangiectasias: a 20-year experience with sodium tetradecyl sulfate. J Dermatol Surg Oncol **15:** 223–225, 1989.

16. Musa MT, Fahal AH, and el Arabi YE: Aspiration sclerotherapy for hydroceles in the tropics. Br J Urol **76:** 488–490, 1995.

17. Beiko DT, and Morales A: Percutaneous aspiration and sclerotherapy for treatment of spermatoceles. J Urol **166:** 137–139, 2001.

18. Haas JA, Carrion HM, Sharkey J, *et al:* Operative treatment of hydrocele. Another look at Lord's procedure. Urology **12:** 578–579, 1978.

19. Rencken RK, Bornman MS, Reif S, *et al:* Sclerotherapy for hydroceles. J Urol **143:** 940–943, 1990.