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# Outcomes after eversion of sac and subtotal excision of sac in cases of primary hydrocele

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**Ethics Committee Approval**
This study was approved by the Research Ethics Committee of AFMC affiliated to MUHS India (Number-13, May 2016).
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

**Conflict of Interest**
No conflict of interest was declared by the authors.

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## Abstract

**Background/Aim:** Hydrocele is a common disease worldwide, and an effective treatment for it is surgery. The commonly performed procedures for its treatment are a) excisional technique — subtotal excision of the sac and b) Jaboulay's procedure — eversion of the hydrocele sac. This study aimed to evaluate the merits and demerits of eversion of the sac versus subtotal excision in terms of complications, postoperative hospital stays, and recurrence rate.

**Methods:** This prospective study was conducted at a large surgical center. Patients who presented with scrotal swelling and were diagnosed as primary hydrocele cases constituted the study population (100 in all). Subtotal excisions or eversions of the sac were performed depending on the type of hydrocele encountered preoperatively. Follow-up was done at 1week, 1 month, 3 months, and 6 months postoperatively.

**Results:** Eversion of the sac was done in 70 cases, and subtotal excision was done in 30 cases. Incidence of edema, intense pain, and hematoma formation was higher in the group undergoing excision of the sac compared to those undergoing eversion of the sac. The average postoperative hospital stay was 3–5 days in the eversion group. The average postoperative hospital stay was 7–9 days in the subtotal excision group. No recurrence was noted in either of the study groups during the stays study period.

**Conclusion:** Eversion of the sac was associated with fewer postoperative complications, minimal tissue handling, and good hemostatic control compared to subtotal excision of the sac. Patients who underwent eversion of the sac received earlier discharge than those undergoing a subtotal excision of the sac for primary vaginal hydrocele.

**Keywords:** Hydrocele, Eversion of sac, Subtotal excision of sac

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## Introduction

Hydrocele is one of the most common diseases worldwide. Since the olden days, surgical procedures have been applied to treat hydrocele. The surgical procedure commonly used for the treatment of hydrocele is a radical operation in which the parietal layer of the tunica vaginalis is completely removed, and its cut edges are sutured posteriorly [1].

Vaginal hydrocele is the most common morbidity in men due to Wuchereria bancrofti infection. Diagnosis is straightforward on clinical examination most of the time, but when in doubt, ultrasound is a useful tool to differentiate these swellings from other causes of swelling in the scrotum. The only effective treatment for hydrocele is surgery, i.e., hydrocelectomy (subtotal excision of the sac) [2]. Two of the commonly performed surgeries are:

*Excisional Method (Hydrocelectomy):* If the sac wall (tunica) is thick or the hydrocele is multi-loculated or very large, the excisional method is preferred. This reduces the chances of recurrence and avoids strangulation of the cord. However, although it seems to result in the lowest recurrence rate, the procedure has the highest complication rate [3]. Great care must be taken to stop bleeding after subtotal excision of the wall (hydrocelectomy) because hemorrhage from the cut edge can cause a large scrotal hematoma even if the wound is drained. In excision of the sac (hydrocelectomy), the whole of the sac is excised, and the remaining edge is sutured by continuous catgut or electro-cauterized to prevent hemorrhage. This procedure is preferred in a hydrocele with thickened sac, as in filariasis [4].

*Eversion of the sac (Jaboulay's procedure)*—This is most useful for recent-onset hydrocele with thin sac tissue, in which placement of the testis in a pouch is an alternative carrying a lesser risk of hemorrhage [5]. The sac is opened, everted, and the edges sutured behind the testis. This procedure is associated with a reduced risk of recurrence but may have an increased risk of hematoma [6].

Minimal access hydrocelectomy is done through a 2 cm incision, and the outcome in terms of morbidity reduction and recurrence rate has been found to be satisfactory. This procedure requires minor dissection and minimal manipulation during treatment. It also has been found to result in virtually no recurrence and minimal complications and requires a short operative time [7].

Various options and benefits are available for tackling primary hydrocele; this study was designed to evaluate the merits and demerits of eversion of the sac versus subtotal excision of the sac, with the objective of comparing the complication rate, hospital stay and recurrence rate.

## Materials and methods

**Type of study:** This was a hospital-based prospective observational study of 100 patients who presented with scrotal swellings at a large surgical center. Informed consent was obtained from all patients before the study, and the steps of both operative procedures were explained. The total duration of the study was two years.

**Inclusion criteria:** This study included all patients with hydrocele, scrotal swelling incorporating the testis, who tested positive for trans-illumination, and where it was possible to get above the swelling at the base of the scrotum.

**Exclusion criteria:** Those hydrocele cases that had an accompanying hernia or varicocele were excluded. The provisional diagnosis made in all cases was hydrocele of tunica vaginalis–primary variety (idiopathic).

**Preoperative workup:** The diagnosis was confirmed by scrotal ultrasonography after the scrotal examination. Preoperative laboratory investigations (complete blood counts, blood sugar, viral markers) were done and were within normal limits. In doubtful cases, filarial etiology was ruled out by repeated night peripheral blood smear for microfilaria. A preoperative anesthesia checkup was done; after receiving fitness from the anesthesiologist, informed consent for surgery was also obtained.

The indications of hydrocele surgery were as follows: a) Medically ineligible for employment due to untreated hydrocele; b) Interference with work; c) Interference with sexual function; d) Interference with micturition due to the penis getting buried in the scrotal sac; e) Negative impact on the patient's family; f) Dragging pain; g) Liability to trauma given the nature of the patient's work or mode of transport such as cycling; h) Possible effect on the testis of long-standing hydroceles. All patients were subjected to operative treatment under spinal anesthesia. Surgical procedure depended upon what type of hydrocele was encountered preoperatively. Postoperatively, cases were kept in the wards for at least 24 hours. Cases were followed up at 1 week, 1 month, 3 months, and 6 months.

**Statistical analysis**

Data were entered into a Microsoft Excel sheet for analysis. Continuous variables were presented as categorical data, as numbers, percentages, pie charts, and bar diagrams, and Fisher's exact test was used. This study was approved by the Research Ethics Committee of the Armed Forces Medical College (AFMC), affiliated with the Maharashtra University of Health Sciences (MUHS) India (Number-13, May 2016.

## Results

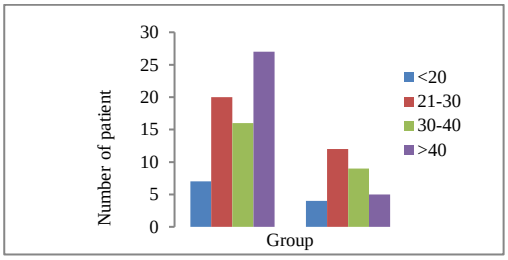
A total of 100 patients who satisfied the inclusion criteria were included in the study. Most of them were from socioeconomically depressed classes. In terms of occupation, the maximum number were manual laborers, followed by farmers and soldiers.

**Age:** The patients' age varied from 12 to 75 years. The mean (SD) was 39.51 (17) years in the eversion of sac group and 30.07 (7.9) years in the excision of sac group. The maximum incidence was in the age groups between 21 and 30 years and over 40 years, as presented in Table 1 and Figure 1.

Table 1: Age group wise distribution

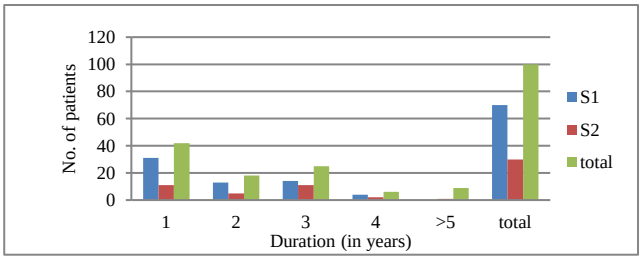
| Age group (Years) | S1(Eversion of sac) | S2(Subtotal excision of sac) | Total |
|---|---|---|---|
| ≤ 20 | 7(10%) | 4(13.3%) | 11 |
| 21 – 30 | 20(28.5%) | 12(40%) | 32 |
| 31 – 40 | 16(22.8%) | 9(30%) | 25 |
| > 40 | 27(38.5%) | 5(16.6%) | 32 |
| Total | 70 | 30 | 100 |

Figure 1: Age group wise distribution




**Presenting complaints:** All patients complained of scrotal swelling, with gradual onset and slowly increasing in size, which started from the bottom of the scrotum. Only 53 patients complained of mechanical discomfort due to swelling. There was no history suggestive of filariasis, tuberculosis, or syphilis in any patient, whereas 22 patients had a history of mild trauma. The duration of the swelling was less than 1 year in 46 cases (46%), followed by 3 years in 16 cases (16%), 2 years in 15 cases (15%), and 33 cases with a duration of 4 years and above. The majority of the patients presented within 1 year of onset of symptoms (Figure 2).

Figure 2: Duration of scrotal swelling



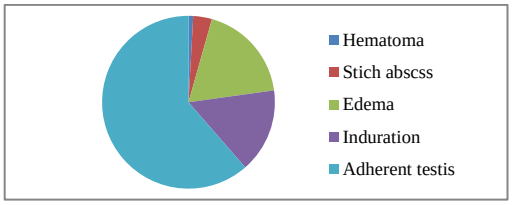

**Physical examination:** Eighty-eight patients had unilateral scrotal swelling (right side in 59% of cases and left side in 29%). Twelve patients had bilateral scrotal swellings. The size of the swelling varied from 7 x 4 cm to 13 x 8 cm. It was purely scrotal in all cases, either oval or pyriform in shape, and it was possible to get above the swelling. Three hydroceles had a protruding appearance. The surface was smooth, except in eight cases that had a constricting ring in the center. The skin was normal in all cases except for the loss of scrotal rugosities. There was no associated hernia. The penis was deviated to the opposite side in eighteen cases. The hydrocele was non-tender. In 30 cases, the swelling was tense and cystic, whereas all other cases were uniformly fluctuant. Testis could not be felt separately in any of the patients. Epididymis could be felt separately in a few cases. Trans-illumination was positive in all cases. There was no significant regional lymphadenopathy. All hydroceles were of the tunica vaginalis type, and the sac was unilocular and thin in all except 18 cases where it was slightly thickened. Testis and epididymis were normal. Small hydroceles were treated by drugs and in cases of moderate-sized hydroceles partial excision and eversion of the sac was performed.

Eversion of the sac was done in 70 cases, where the patients had a small swelling and a thin sac. The procedure was simple, and the operation could be performed rapidly. No tissue dissection was performed, no reactionary edema occurred, bleeding was minimal, and recurrence was unlikely as the tunica cannot surround the testis again. No drainage tube was inserted in these cases. There was mild hematoma in one case, which subsided completely within two weeks' time. Four patients developed stitch abscesses, which were controlled with antibiotics. None of them developed scrotal abscesses. Mild induration of the wound was present in 18 cases. Two of these cases resulted after stitch abscess formation. Induration subsided completely when they were followed up at the end of 4 weeks. At the time of discharge, the testis were adherent to the anterior wall of the scrotum in all cases. The size of the testis was slightly bigger than normal in 12 cases due to a pre-existing thick sac, as presented in Table 2 and Figure 3. The average postoperative hospital stay was 3.5 days. There have been no recurrences so far.

Table 2: Complications of eversion of sac

| Complications | No of cases | Percentage |
|---|---|---|
| Hematoma | 1 | 1.4 |
| Stitch abscess | 4 | 20 |
| Edema | 21 | 30 |
| Induration of scrotum | 18 | 25.7 |
| Adherent testis | 70 | 100 |

Figure 3: Complication in eversion of sac

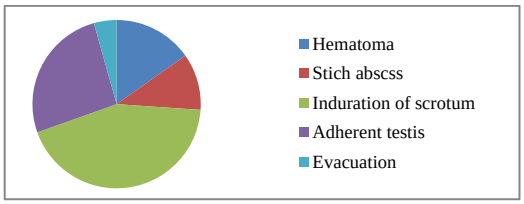



Subtotal excision of the sac was done for moderate and large-sized hydroceles. The sac was partially excised and everted, and sutured with continuous Monocryl™ sutures. Dependent drainage was maintained in all cases. Of the total 30 cases, seven developed a hematoma. Five of them were mild and subsided within a few days. Other patients were asymptomatic at the end of four weeks. Two patients required a surgical evacuation of the hematoma. Five patients developed stitch abscesses, and two developed minimal gaping of wounds. None developed a scrotal abscess. Induration of the wound was present in 20 cases. All patients had mild pain for approximately two days. The testis was adherent in 12 cases. Patients who complained of postoperative pain for a longer duration are presented in Table 3 and shown in Figure 4. The average postoperative hospital stay was 7.2 days. There have been no recurrences during the study period.

Table 3: Complications of subtotal excision of sac

| Complications | No of cases | Percentage |
|---|---|---|
| Hematoma | 7 | 23.3 |
| Stitch abscess | 5 | 16.6 |
| Induration of scrotum | 20 | 66.6 |
| Adherent testis | 12 | 40.0 |
| Evacuation | 2 | 6.66 |

Figure 4: Complication of subtotal excision of sac




**Comparison of the eversion of sac (S1) and excision of sac (S2) groups:** The wound complications occurring in S1 and S2 were as follows: a) Edema. Of the 100 patients, 49 in the sac eversion group had no edema, whereas four patients in the sac excision group and 21 in the sac eversion group had mild edemas. Thirteen patients in the sac excision group and one patient in the sac eversion group had severe edemas (Figure 5). It is statistically significant using Fisher's exact test ($P < 0.001$). b) Hematoma: Of the 100 patients, no hematomas developed in 69 patients of the sac eversion group and 23 patients in the sac

excision group. One patient (1.4%) developed a hematoma after eversion of the sac and seven patients (23.3%) following excision of the sac (Figure 6). It is statistically significant using Fisher's exact test ($P$ = 0.001). c) Pain was another complication: Among the 100 patients, mild pain was experienced by 52 patients after eversion of the sacand 18 patients after excision of the sac; furthermore, moderate pain was experienced by 18 patients following eversion of the sac and by seven patients after excision of the sac; five patients had severe pain (Figure 7). It is statistically significant using Fisher's exact test ($P$ < 0.001). Complications and the average hospital stay in eversion of the sac (S1) and for subtotal excision of the sac (S2) are presented in Table 4.

Figure 5: Wound edema in S1 and S2 group

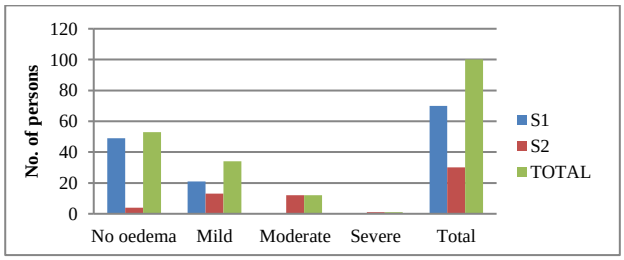



Figure 6: Hematoma formation in S1 and S2 group

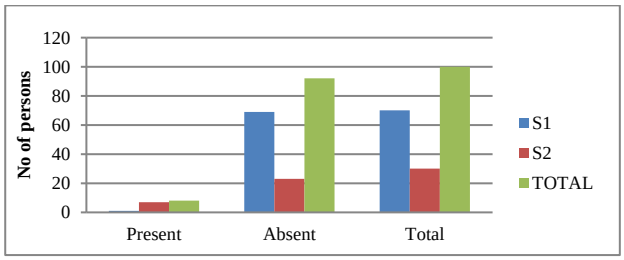



Figure 7: Intensity of pain in S1 and S2 group

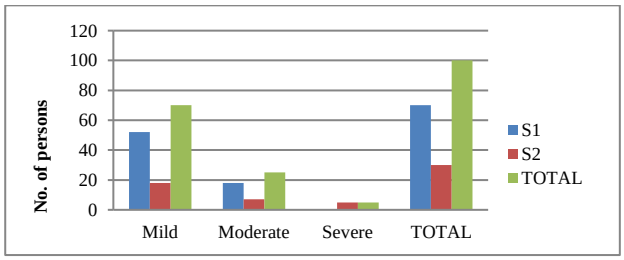



Table 4: Complications and average hospital stay in S1 and S2

| | Eversion of sac (n = 70) | Subtotal excision of sac (n = 30) |
|---|---|---|
| Hematoma | 1.4% | 23.3% |
| Stitch abscess | 11.6% | 16.6% |
| Induration of scrotal wound | 25.7% | 66.6% |
| Adherent testis | 100.0% | 40.0% |
| Average post-operative hospital stay (days) | 3.5 days | 7.2 days |

## Discussion

Radical operative treatment for vaginal hydrocele has been practiced since the time of Volkmann (1876). The standard treatment for hydrocele is surgical and is widely accepted. The disadvantage of surgical treatment is a high incidence of complications, such as hematoma and infection, although these complications can be minimized with careful surgery. The main postoperative complication appears to be the formation of scrotal hematoma, which predisposes to other complications such as infections and scrotal abscesses, among others. Hydrocele affects all age groups; the age group maximally affected in the present series is between 20 and 40 years (57%). In the study by Undre et al. [8], 66.1% of patients belonged to this age group, and 26.7% of patients had bilateral scrotal swelling, whereas, in 38.1%, the swelling was on the left side. In Jachhowski's study [9], bilateral scrotal swellings were present in 41.2% of patients, with 35.3% of cases having swellings on the left side. In the present study, 88% of cases had unilateral swelling, and 12% had bilateral swelling. General examination revealed no abnormalities. On clinical examination, most of the swellings were oval in shape or globular. Swellings of the scrotum were more common on the right side (59%) than the left side (29%), which is comparable to the study reports of Agbakwuru et al. [10]. Bilateral swellings were found in 12% of cases, and the scrotal examination revealed a vaginal hydrocele. In most cases, scrotal rugosities were lost in the hydrocele. It was possible to get above the swelling. Fluctuation and trans-illumination were positive in all cases. The preoperative blood examination revealed neither leukocytosis nor high eosinophil count. Erythrocyte sedimentation rate was within normal limits. The routine urine examination was also within normal limits. The diagnosis was confirmed by scrotal ultrasonography after scrotal examinations.

All cases were subjected to operative treatment under spinal anesthesia. The sac was thin in most cases, thick in some cases, and there was no underlying demonstrable pathology in the testis, epididymis, or spermatic cord. The fluid was clear and amber-colored, with 12 patients having more than 200 ml of fluid. A corrugated rubber drainage tube was used in cases treated by subtotal excision of the sac, which was removed after 48 hours. All patients had mild to moderate severity of pain postoperatively for 24–48 hours. The pain lasted longer in patients who had some complaints such as hematoma and infection, and nine patients (9%) developed a fever postoperatively. However, five patients (5%) had a fever for only one day, which was considered a reactionary fever. In the four patients whose fever lasted more than 48 hours, a local examination of the wound revealed induration, hematoma, and stitch abscess in these cases. None developed a scrotal abscess. A pus culture revealed staphylococcus aureus coagulase positivity, with three cases resistant to the drugs amoxicillin and clavulanate potassium combination and one case to streptococcus. Patients were discharged on the third or fourth postoperative day, and sutures were removed between the sixth and seventh postoperative day in the outpatient department.

At the time of discharge, in all patients except those who had hematomas, the size of the scrotum on the operated side had reduced considerably. Those who developed hematomas (8%) were kept in the hospital until the disappearance of pain and fever and the control of infection. They were followed up at intervals of 15 days. In all these cases, the swelling disappeared by the end of 6 weeks. The eversion of the sac was performed for small-sized hydroceles [11]. Hydroceles 6 cm x 9 cm size or less were operated by this method. This method is simple and can be performed rapidly, avoiding mobilization of the sac from the surrounding scrotal layers, and thus the postoperative hematoma is eliminated. The only difficulty we encountered during the operation was the replacement of the testis into the scrotum, in a few cases. This was easily overcome by extending the skin incision slightly. No drainage tube was used in these cases. This is an added advantage in preventing infection. Recurrence is also

unlikely as the tunica cannot surround the testis. On the other hand, Reddy and Srinivas [12] separated tissues from the sac for a distance of 1 cm around, to facilitate the easy return of the testis into the scrotum. Of the 100 patients, 70 were treated by eversion of the sac, and one of them (1.4%) developed a mild hematoma postoperatively. This may have been due to the blood going in from the cut edges of the skin or from accidental injury to the vessels by the needle while plicating the sac; the hematoma subsided completely at the end of 2 weeks. None required evacuation. Only four patients developed an infection in the form of a stitch abscess. None developed a scrotal abscess. Mild induration of the scrotal wound was evident in 18 cases. At the time of discharge, the testis was adherent to the anterior wall of the scrotum in all cases. This adherence really hinders the protective mechanism of the testis to trauma. However, so far, no cases have been reported with any complaints. In six cases that had slightly thicker and bigger sacs intraoperatively, the size of the testis was bigger than its fellow counterpart. Lord [13], in his original work, treated 22 cases by this method. The incidence of hematoma, infection, and recurrence was nil. Efron et al. [14], in his series of 29 cases, had the same results, except for one patient who had a large testicular mass at the time of discharge due to plication of the sac; preoperatively, this patient had chronic epididymitis and a thick-walled hydrocele. In the present study, we noticed similar findings in six cases. The diameter of the testis did not regress during the three months of follow-up. Reddy's study [12] of 675 cases where Lord's technique was employed led to the conclusion that the complications such as hematoma and infection were negligible, although three cases had a recurrence. There has been no recurrence in the present study. The average postoperative hospital stay was 3 to 5 days. The civilian cases were discharged home, and the soldiers were discharged to their respective units with the recommendation of light duties for 15 days. From the third week onwards, the soldiers were able to resume their normal duties without any discomfort.

The subtotal excision of the sac is also a simple technique. However, complications like hematomas are very common due to the separation of the sac from the surrounding tissues despite meticulous hemostasis and the use of a dependent corrugated rubber drainage tube. This is due to oozing from the small blood vessels during the separation of the sac. Oozing may continue into the layers of loose scrotal tissue, giving rise to a hematoma. The use of monopolar diathermy is relatively contraindicated, as there is a theoretical risk of damage to the testicular artery because the entire current has to pass between the body and the scrotum through a narrow isthmus consisting of the neck of the scrotum and the spermatic cord on each side [13]. After the subtotal excision of the sac, 23.3% of cases developed a mild to moderate-size hematoma, whereas in the study by Efron [14], 30% of cases had developed a hematoma. Two patients required evacuation; moderate-sized hematoma took nearly a month to regress completely. Associated pain and weight of the scrotum added more to the discomfort. The other complications, such as stitch abscess and induration, were also proportionately high when compared with the eversion of sac technique, although no patient developed a scrotal abscess. The incidence of hematomas was high in larger-sized hydrocele (12%) containing more than 200 ml of hydrocele fluid. These patients usually stayed more than 7 days in the hospital postoperatively. The incidence of stitch abscesses was also high in large-sized hydroceles. The average postoperative hospital stay was 4.6 days, whereas, in the series by Efron et al. [14], the average hospital stay was 14 days. In that study, patients took at least 15 days to resume their normal duties, and this delay was mainly due to pain and swelling of the scrotum. In the present study, the hospital stay after eversion of the sac was slightly lower than in the other studies. In other studies, patients went home on the sixth or seventh postoperative day, whereas in the present study, most of the patients went home on the third or fifth postoperative day.

**Limitations**

The most important limitation of this study is the small sample size of patients undergoing subtotal excision of the sac compared to those undergoing eversion of the sac, as it has an inherent selection bias for the surgical patient. Even so, the current study presents a unique evaluation of outcomes after eversion of the sac and subtotal excision of the sac in cases of primary hydrocele.

**Conclusion**

A radical operation for hydrocele of the tunica vaginalis constitutes a fair percentage of operations carried out in any general hospital in India. Operation on hydrocele is regarded as a minor operation and is usually done by junior doctors, the common complication being hematoma, which increases the postoperative morbidity. Hence a truly effective operation should be such that it gives the best result even when performed by junior doctors. Eversion of the sac is therefore advocated because of its simplicity, effectiveness, and rapidity, which, due to minimal tissue handling and good hemostatic control, virtually eliminates postoperative complications such as hematomas and infections, while not requiring a drainage tube. The only limitation of this technique is that it can be employed only for small hydroceles with thin sacs. Subtotal excision of the sac, which has stood the test of time, still holds good and is indicated for larger hydroceles. To conclude, in the present study, the primary vaginal hydrocele was the most common cystic swelling of the scrotum and, when treated surgically, showed good results.

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