



MINIMAL INVASIVE SURGERY- A COSMETICALLY BETTER AND EQUALLY EFFECTIVE PROCEDURE FOR THE TREATMENT OF MILD TO MODERATE HYDROCELE – A HOSPITAL BASED STUDY

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ABSTRACT **Background-** A hydrocele testis is the accumulation of fluids around a testicle. Surgery is considered to be the gold standard of hydrocele treatment. The commonest surgical procedures for the hydrocele are Lord's plication and Jaboulay's procedure. Eversion of sac is the commonest surgical intervention for hydrocele; however, it may not be appropriate in cases of thick walled, secondary and long-standing hydroceles. Such cases are best managed with minimal invasive procedure. In this study, the complications were slightly higher in patients undergoing eversion of sac as compared to excision of sac. **Aim:** Comparative prospective evaluation of eversion of sac versus minimal invasive surgery in management of small to medium volume of hydrocele in terms of efficacy. **MATERIALS AND METHODS:** This prospective study was conducted in Department of General Surgery, LLR & Associated Hospitals, GSVM Medical College from January 2021 to October 2022. 55 patients treated with eversion of sac (Group A) and 55 patients treated with minimal invasive surgery (Group B). **RESULTS:** Primary hydrocele (PH) (80.0%) was the commonest etiology followed by Filariasis (20.0%). The mean operative time in group A was 26.8±2.7 minutes and in group B was 23.8±4.61 minutes (p=0.001). The duration of hospital stay for Minimal Invasive Hydrocelectomy was significantly lower than Eversion of Sac (p=0.013). The scar size in Minimal Invasive Hydrocelectomy was significantly lower than Eversion of Sac (p=0.007). **CONCLUSION:** The study concluded that minimal invasive hydrocelectomy was better than eversion of sac in terms of operative time, hospital stay and scar size. However, comparative results were seen in terms of major post-op complications and recurrence rates.

KEYWORDS : Eversion of sac, Minimal Invasive Surgery, excision of sac, complications, Hydrocele.

INTRODUCTION

A hydrocele testis is the accumulation of fluids around a testicle. It is often caused by fluid secreted from a remnant piece of peritoneum wrapped around the testicle, called the tunica vaginalis.¹ "Primary vaginal hydrocele is described as abnormal accumulation of the serous fluid in tunica vaginalis."² Secondary hydrocele occur secondary to the disease of testis and epididymis, and its management chiefly comprises of the treatment of underlying causes. Filarial hydrocele (FH) and chylocele account for 80.0% of hydrocele in some humid countries where parasite, Wuchereria bancroftii endemic. Adult man may develop hydrocele because of inflammation or the injury within scrotum. Most patients refuse for the surgical procedure of the hydrocele due to shyness, and fear of development of infertility and impotence.³ A hydrocele generally is not harmful and painful and might disappear without any treatment with in first year of life. Surgical procedures used commonly for treatment of hydrocele is radical operation in which parietal layer of tunica vaginalis is removed completely and its cut-edges are sutured posteriorly.^{4,5} Surgical procedures are associated with complications of the anesthesia and surgery. Furthermore, hospital admission is generally required, therefore affecting health, and economy of patient. The principal modalities in management of primary vaginal hydrocele are Lord's plication, Jaboulay's Procedure, Subtotal excision of sac. The commonest surgical procedures for the hydrocele are Lord's plication and Jaboulay's procedure. These operations are minor surgical procedures and that can be performed in an out-patient setup with the success rate of 80% to 98%.⁶ This study compared new minimally invasive hydrocelectomy versus Jaboulay's procedure.

AIM & OBJECTIVES

Aim: Comparative prospective evaluation of eversion of sac versus minimal invasive surgery in management of small to medium volume of hydrocele in terms of efficacy.

Objectives: The purpose of this study is to evaluate the efficacy of minimal invasive surgery with eversion of sac for management in terms of associated symptoms preceding onset of swelling, Postoperative complications, Loss of working days, Scar size, Recurrence associated with both treatment modalities in small to medium volume of hydrocele.

MATERIAL & METHODS

This study was conducted in Department of General Surgery, LLR & Associated Hospitals, GSVM Medical College from January 2021 to October 2022.

Study Type: Prospective Study
Sample Collection:

Total 110 cases were included in the study from OPD & emergency. 55 patients treated with eversion of sac (Group A) and 55 patients treated with minimal invasive surgery (Group B).
Sample size: n=Z²p(1-p)/D²

Inclusion Criteria:

- Patients giving written informed consent.
- All symptomatic adult males of unilateral and Bilateral hydrocele.
- Volume of hydrocele: Small to medium volume of hydrocele on scrotal ultrasound.
< 200 ml of fluid – Small Hydrocele
200 – 500 ml of fluid – Medium Hydrocele

Exclusion Criteria:

- Not giving consent
- Subjects with acute hydrocele (secondary to trauma, malignancy, or epididymorchitis), communicating hydrocele, infected hydrocele
- Subjects with coexisting hernia or spermatocele, haematocele and pyocele.
- Those below 18 years of age
- Subjects having a positive history of previous intervention (sclerotherapy or operation)
- Subjects with local inguinoscrotal and skin disorder
- Congenital Hydrocele
- Large Hydrocele (> 500 ml of fluid)

Methodology

The history and physical findings of each patient were assessed. The diagnosis was made clinically aided by scrotal ultrasonography. Laboratory investigations like hemoglobin, white blood cell count, coagulation profile, viral markers, filarial antigen, urine routine and

microscopy examination were done in all the cases. The size/volume of all the hydrocele were calculated preoperatively with the help of Ultrasonography of scrotum and were classified as-

Small hydrocele	< 200 ml of fluid
Medium hydrocele	200-500 ml of fluid
Large hydrocele	>500 ml to 2L of fluid

Control Group: Jaboulay's procedure (eversion of tunica without excision of sac) was performed under local anesthesia and blood test was sent for filarial antigen/ antibody and drain was placed.

Case Group: Minimal invasive surgery was performed under local anesthesia and piece of tunica sent for histopathological examination and blood test was sent for filarial antigen/ antibody and drain was placed.

Procedure: A small scrotal incision 2 cm long was done and incision of Dartos muscles in the same line. The Parietal Tunica Vaginalis (PTV) was grasped and minimal blunt dissection was made by the aid of the index finger and a small hole was made for aspiration of hydrocele fluid. Then a disc of tissue was excised of the PTV about double of the skin incision dimension. The edge of the visceral surface tunica vaginalis was sutured to the parietal layer of the tunica vaginalis and then to the Dartos and all were sutured to scrotal skin in an everted manner aiming to expose the visceral tunica toward scrotal skin. Then this everted structure is sutured to the scrotal skin, it put in contact the sac with lymph-rich subcutaneous tissues. A drain was left in place.

Post-operative: The aspirated fluid was sent for culture and sensitivity and microscopic examination. After the intervention, dry dressing with scrotal support was applied for 24 hours and oral NSAIDs (tablet combination of Paracetamol 325 mg and Ibuprofen 400 mg) was prescribed eight hourly for 48 hours, then after only on demand basis.

Follow up: Patients were followed up at 48 h (T1), 1 week (T2), 1 month (T3), 3 months (T4) and 6 months (T5), when the incidence of fever, pain, scrotal edema, infection, ulceration, hematoma, and recurrence of the swelling was noted.

Fever was defined as oral temperature more the 98.6F. Pain will be assessed using visual analogue scale (VAS) of 10 ('0' meaning no pain at all and '10' meaning worst possible pain), and patient scoring 2-3 will be considered to have pain.

Infection was defined as the presence of either positive microbial culture from wound discharge, or a combination of fever, pain, local erythema and discharge at the incision site. Infection was managed with oral antibiotics and daily dressings till the wound healed. The outcomes were assessed in terms of incidence of complications, total cost involved, and loss of working days, recurrence and satisfaction of the patients.

Outcomes

- Cured
- Recurrence
- Post-operative complications: pain, wound infection, hematoma
- Loss of Working Days
- Converted to Jaboulay's procedure

Statistical analysis:

The data was expressed as mean and standard deviation (SD) or median, range and percentage as appropriate. All the categorical data was compared by using chi square test. More than two variables were analyzed by one way ANOVA. The p-value <0.05 was considered as significant. The statistical analysis was done using SPSS 29.0 version (Chicago, Inc., USA) windows software.

OBSERVATIONS/ RESULTS

This study was conducted in Department of General Surgery, LLR & Associated Hospitals, GSVM Medical College from January 2021 to October 2022 and total 110 patients were taken for this study in which 55 patients treated with eversion of sac and 55 patients treated with minimal invasive surgery.

DISCUSSION

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55 patients treated with eversion of sac and 55 patients treated with minimal invasive surgery.

Age Distribution

In the present study the mean age of the participants in the study population was 39.16±11.7 years with a minimum of 18 years to a maximum of 65 years. The majority of the studied patients were in the age 18-30 years (32.7%) followed by 31-40 years (27.3%) and 41-50 years (16.4%). This age distribution was almost close to the **Saber A⁸** study which was included participants from 18 to 56 years with a mean of 37 ± 11.4 years. The mean age of the participants in the study conducted by Alli M and Santhi A⁹ was 47.7 ± 14.15 years with a minimum of 21 years to a maximum of 80 years. According to Kemparaj T, Mathew J¹⁰ the majority of cases (28%) were observed between 41-50 years (mean age 43.9 years). Ranjan P et al¹¹ studied 78 cases of primary vaginal hydrocele and found that the majority of cases were in the age group of 31-40 years (33.3%). Majority of the patients in both the study groups belonged to the 2nd to 4th decade of life.

Involved Side

In the present study when the studied patients were distributed on the basis of hydrocele involved side then it was found that the majority of the patients were having unilateral hydrocele (82.7%) followed by bilateral hydrocele (17.3%). Our findings were in accordance with Shirke OM et al¹² who reported that hydrocele occurred more in right as compared to left side (53.3% vs. 26.7%). Bilateral hydrocele was seen in 20.0% patients. Also, Muneiah N et al¹³ stated that the hydrocele is predominant on right side (45.0%) in case of their study.

Type of procedure

In our study the distribution of the patients was done on the basis of type of procedure performed and it was found that 50.0% cases were of eversion of sac and 50.0% were of minimal invasive method. Similarly, Saber A⁸ did a study on minimally access versus conventional hydrocelectomy. Sharma A and Kumar D¹⁴ studied the patients Profile and Treatment Outcome in Primary Vaginal Hydrocele 85% of the patients underwent eversion of sac and rest 15% underwent excision of sac. Shirke OM et al¹² reported that Jaboulay's operation was performed on 61.7% patients of which 8 patients had bilateral hydrocele. Lord's plication was performed on 18.3% patients of which 1 patient had bilateral hydrocele while Subtotal excision of sac was performed in 20.0% patients. Ranjan P et al¹¹ shows that Jaboulay procedure was done in 67.9% and Lord's procedure in 32.1%. Jaboulay repair was performed in 80.0% patients and Lord's plication was performed in 20% patients by Ahmed MHS et al.¹⁵

Duration of surgery

In the present study the duration of surgery for Eversion of Sac was 26.8±2.7 minutes and for minimal invasive procedure it is 23.8±4.61 minutes and the difference were found statistically significant (p<0.05). Our findings echo with Awan NA et al¹⁶ who reported the duration of surgery was between 15-25 minutes in Minimal Separation Hydrocelectomy with a mean duration of surgery of 18.7 minutes compared to Jaboulay's Operation wherein the duration of surgery ranged between with 30-40 minutes with a mean of 32.8 minutes with a statistically significant difference (p<0.05). Similar observations were made by Saber A⁸ wherein the operative time in Minimal Separation Hydrocelectomy ranged between 12-18 minutes and the mean was 15.1±4.24 minutes and in Jaboulay's Operation ranged between 25-40 minutes with mean value 32.5±4.76 minutes with significant distribution (p=0.02). The operating time of hydrocelectomy was around 13 minutes significantly lesser in minimal access hydrocelectomy (17.93±1.28 minutes) compared to conventional hydrocelectomy (30.83±2.9 minutes) in a study conducted by Alli M and Santhi A.⁹ Nadeem R et al¹⁷ conducted a study in which mean operative time was 11 minutes in Minimal Separation Hydrocelectomy and 27 minutes in Jaboulay's Operation. The time required for the operation was 10-20 minutes for Mini-Hydrocelectomy in a study conducted by Al-Salman AR et al.¹⁸ This could be attributed to the geographical differences in the protocol management of the cases in the hospital. The differences may be due to available resources and sufficient health care providers.

Post-Operative Hospital Stay

In the present study the duration of surgery for Eversion of Sac was 4.2±1.4 days and for minimal invasive procedure it is 3.6±1.2 days and the difference were found statistically significant (p<0.05). Awan NA et al¹⁶ reported that the duration of hospital stays in Minimal Separation

Hydrocelectomy significantly lower compared to Jaboulay's Operation patients. The difference observed was statistically significant difference ($p < 0.001$). According to Alli M and Santhi A⁷ the hospital stays among the patients who underwent conventional hydrocelectomy was significantly higher than those who underwent Minimal access hydrocelectomy ($p < 0.05$). In Saber A⁸ study, the mean time of hospital stay for conventional hydrocelectomy was higher with mean of 21.19 ± 11.65 hours with a range of 12 to 48 hours and the mean time of hospital stay for minimal access hydrocelectomy was lower with mean of 13.48 ± 6.38 hours with a range of 10 to 30 hours ($p < 0.05$). Post op hospital stay is consistent with the study by Usman L et al¹⁹ where the average hospital stay was 3 as compared to 3.6 days in our study.

Complications

In the present study the complications observed for eversion of sac and minimal invasive procedure were hematoma 11 and 9 out of 55 respectively followed by wound infection 11 and 9 out of 55 respectively and scrotal edema 5/55 (eversion of sac) and 4/55 (minimal invasive). Our findings were in accordance with the findings of Sharma A and Kumar D¹⁴ who reported that 9 patients (12%) had fever on Post op day 1. 2 patients (2.6%) had hematoma in the post-op period and underwent re-exploration and evacuation of hematoma for the same. 6 patients (8.0%) had surgical site infection in the post op period and was managed with daily dressing and targeted antibiotics. Postoperative hematoma and scrotal edema and hardening were observed with higher incidence in group A (conventional surgical hydrocelectomy) patients where there was more tissue dissection than those in group B (minimal access hydrocelectomy). Excision- -eversion technique invites edema and hematoma due excessive handling and wide dissection of the hydrocele sac.¹ Awan NA et al¹⁶ reported that the postoperative hardening and edema was observed in 6.0% patients in Minimal Separation Hydrocelectomy compared to 38.0% patients in Jaboulay's Operation. Postoperative hardening and edema were compared between the two study groups with a statistically significant difference ($p = 0.003$). Formation of postoperative hematoma was observed in none of the patients in Minimal Separation Hydrocelectomy compared to 30.0% of the patients in Jaboulay's Operation. Statistically significant difference was observed when postoperative hematoma was observed in two study groups. In a study by Nadeem R et al¹⁷, post-operative hematoma was seen in one patient in Minimal Separation Hydrocelectomy whereas in Jaboulay's Operation hematoma occurred in 4 patients, requiring re-exploration and evacuation. In Minimal Separation Hydrocelectomy, there was no occurrence of wound dehiscence whereas in Jaboulay's Operation Wound dehiscence requiring secondary suturing was needed in 3 patients. The low complication rate among the minimal separation group was supported by the Saber A⁸ study which states an overall complication rate among patients underwent minimal access hydrocelectomy was 12.7% and also showed a statistically significant difference from the complication rate among patients underwent conventional hydrocelectomy (37.0%). According to Ku JH et al²⁰ the incidence of hematoma in was 18.1% ($n = 2$) of the total 11 patients who underwent excision of sac. The study reveals that the maximum incidence of complications like edema, wound infection and hematoma occurred in the excision group corroborating with our study.

Post-operative pain and recurrence rate and scar size

In the present study the difference in the pain status at post operative day 3 and 7 was statistically insignificant ($p > 0.05$) and there were no case of recurrence in both the studied procedures. In the present study it was found that the scar size in Minimal Invasive Hydrocelectomy was significantly smaller than Eversion of Sac ($p < 0.05$)

Shirke OM et al¹² reported that on post-operative Day 3, pain was present in 54.5% and 66.7% patients that underwent Lord's plication and Subtotal excision of sac respectively. On post-operative Day 7, pain was present in 18.2% and 16.7% patients that underwent Lord's plication and Subtotal excision of sac respectively. The number of patients having pain was significantly lesser in Jaboulay's operation group as compared to Lord's placcation and Subtotal excision of sac.

According to Awan NA et al¹⁶ less postoperative pain was observed in minimal access hydrocelectomy compared to Jaboulay's operation (2.3% versus 3.4%). The difference was statistically insignificant. All patients were monitored closely for the postoperative complications and pain score was calculated using Visual Analogue Scale (VAS) in a

study done by Nadeem R et al.¹⁷ In minimal access hydrocelectomy, average pain score on first and seventh post- operative day was 7 and 5 respectively whereas in Jaboulay's operation average pain score on first and seventh post-operative days was 8.

Figure 1 :Age Distribution

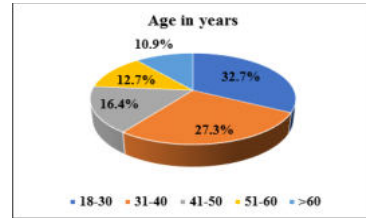


Figure 2: Involved Side

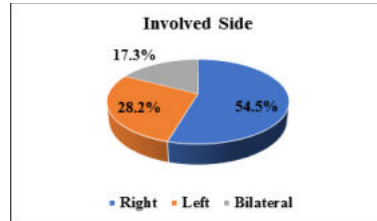


Figure 3: Aetiology

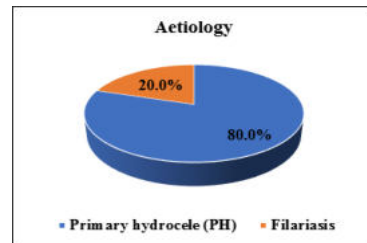


Figure 4: Type of procedure

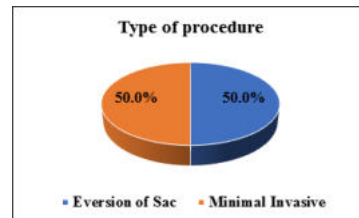


Table 1: Comparison of duration of surgery

Procedure	Mean duration of surgery (min)	p-value
Eversion of Sac	26.8±2.7	<0.001
Minimal Invasive	23.8±4.61	

Table 2: Comparison of Post-Operative Hospital Stay

Procedure	Mean Hospital Stay (Hours)	p-value
Eversion of Sac	4.2±1.4	0.013
Minimal Invasive	3.6±1.2	

Table 3: Distribution of patients according to Post-Operative Complications

Complications	Eversion of Sac (n=55)	Minimal Invasive (n=55)	p-value
Hematoma	11 (18.3)	9 (15.0)	0.801
Scrotal Edema	5 (8.3)	4 (6.7)	0.727
Wound Infection	11 (18.3)	9 (15.0)	0.621

Table 4: post-operative pain

Pain	Pain		p-value
	Eversion of Sac (n=55)	Minimal Invasive (n=55)	
POD 3	3.3±1.1	2.9±0.97	0.067
POD 7	1.83±0.71	1.6±0.73	0.083

Table 5: Comparison of scar size

Procedure	Scar Size (cms)	p-value
Eversion of Sac	3.5-5.0 cm	0.007
Minimal Invasive	2.0-2.5 cm	

**Comparison between Scar size of A- Eversion of sac & B- Minimal Invasive surgery****CONCLUSION**

- The majority of the studied patients were in the young adult age 18-30 years (32.7%) followed by 31-40 years (27.3%) and 41-50 years (16.4%) and the mean age of the studied patients was 39.16±11.7 years.
- Unilateral hydrocele was present in 82.7% followed by bilateral hydrocele only in 17.3% patients. In unilateral hydrocele Right side (54.5%) was more common than left side (28.2%).
- Scrotal Swelling (87.3%) was the most common symptom followed by dragging type of pain (27.3%) and Mechanical discomfort due to swelling (17.3%)
- Primary hydrocele (PH) (80.0%) was the commonest aetiology followed by Filariasis (20.0%).
- The duration of surgery for Minimal Invasive Hydrocelectomy was significantly lower than Eversion of Sac ($p < 0.05$)
- The duration of hospital stay for Minimal Invasive Surgery was significantly lower than Eversion of Sac ($p < 0.05$)
- Hematoma, wound infection and scrotal edema were the major complications occurring in both the studied groups
- Post operative pain at POD 3 and POD 7 was statistically insignificant between the groups ($p > 0.05$) and no recurrence occurs in both the groups
- It was found that the scar size in Minimal Invasive Hydrocelectomy was significantly lower than Eversion of Sac ($p < 0.05$). Minimal Invasive Hydrocelectomy is cosmetically better due to smaller scar size.

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