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Article

Comparative Analysis of Clinical Outcomes of Jaboulay's Procedure, Sharma and Jhawar Technique and Sivaji's Modified Sharma and Jhawar Technique in The Management of Primary Vaginal Hydrocele

Article History:

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Abstract: **Introduction**: Hydrocele is a common male condition (1 in 1000 incidence), with primary cases being idiopathic and secondary forms due to infection or tumors. Surgery remains the gold standard, most often performed by Jaboulay's procedure, Lord's plication, or the Sharma and Jhawar technique. This study introduces Sivaji's Modified Sharma and Jhawar technique, involving creation of a neo-dartos pouch with single-layer hemostatic closure. Objective: To compare the efficacy of Jaboulay's procedure, Sharma and Jhawar technique, and Sivaji's Modified Sharma and Jhawar technique in managing primary vaginal hydrocele. Methods: In this randomized controlled study of 120 patients with primary vaginal hydrocele, participants were equally assigned to Jaboulay's procedure, Sharma and Jhawar technique, or Sivaji's Modified Sharma and Jhawar technique. Outcomes assessed included operative time, complications, and hospital stay over a 3-month follow-up. Results: In this comparison of three hydrocele surgeries, Sivaji's Modified Sharma and Jhawar technique, Sharma and Jhawar technique and Jaboulay's procedure, the modified technique proved superior with the shortest operative time (8.0 ± 0.5 min vs 18.0 ± 2.5 vs 32.5 ± 4.5 respectively, $p < 0.001$), lowest scrotal edema (2.5% vs 12.5% vs 22.5%, $p = 0.040$), least prolonged pain (5% vs 15% vs 30%, $p = 0.022$), no postoperative fever (0% vs 7.5% vs 17.5%, $p = 0.025$), and shortest hospital stay (2 ± 0.75 vs 4 ± 0.75 vs 7 ± 1.75 days, $p < 0.001$). Conclusion: Sivaji's Modified Sharma and Jhawar technique is a simplified, effective method for primary vaginal hydrocele, using minimal dissection and tissue handling to reduce bleeding, obliterate dead space, lower postoperative complications, and shorten operative time and hospital stay.

Keywords: **Jaboulay's** procedure, Sharma and Jhawar technique, Sivaji's Modified Sharma and Jhawar technique, hydrocoele.

INTRODUCTION

The majority of hydroceles are idiopathic in origin, particularly in adults [1]. Hydrocele is the most common benign condition affecting the scrotum [2]. Primary vaginal hydrocele is defined as the abnormal accumulation of serous fluid within the tunica vaginalis [1]. In tropical regions, filariasis is a common cause [3]. Secondary hydroceles may result from underlying conditions such as trauma, epididymal-orchitis or testicular malignancy [4]. Surgery has been the definitive treatment of choice for hydrocele since antiquity. The surgical procedures commonly employed are Jaboulay's procedure, Lord's plication, and the Sharma and Jhawar technique. The Jaboulay's procedure consists of partial excision and eversion of the hydrocele sac [5,6]. The Sharma and Jhawar technique, incorporates the creation of a scrotal fascial pouch to enclose the testis, aiming to minimize complications after the surgery [7]. However, despite the simplicity of these procedures, hydrocele surgery is associated with a significant morbidity rate. Several complications may arise during or after hydrocele surgery. These include bleeding, hematoma, scrotal edema, testicular pain, infection, and injury to the spermatic cord structures or the epididymis. Another potential complication is post-operative hematoma. This typically results from persistent oozing of blood from small vessels within the surgical site. The scrotum's loose connective tissue makes it particularly susceptible

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to hematoma formation if meticulous hemostasis is not achieved. Continued bleeding into these layers can lead to significant swelling and discomfort post- surgery [8]. Several modifications in hydrocele surgery techniques have been introduced over time, aiming to develop more efficient approaches that significantly reduce complication rates and improve overall patient outcomes. A further modification of the Sharma and Jhawar technique is presented in our study as Sivaji's Modified Sharma and Jhawar technique, which involves the creation of a neo-dartos pouch for testicular placement, followed by single-layer hemostatic closure of the scrotum. In our study, the clinical outcomes of Jaboulay's procedure, Sharma and Jhawar technique and Sivaji's Modified Sharma and Jhawar technique of Hydrocoele Surgery were assessed and evaluated.

METHODOLOGY

Study Design:

The study was a hospital-based randomized control trial to assess the clinical outcomes of Jaboulay's procedure, Sharma and Jhawar technique, and Sivaji's Modified Sharma and Jhawar technique of Hydrocoele Surgery. The study was conducted at Vedanta Institute of Medical Sciences, Palghar, Maharashtra for 18 months. A total of 120 patients with primary vaginal hydrocele, who presented to the surgery department between November 2023 and April 2025 were enrolled in the study after applying the following defined inclusion and exclusion criteria.

Eligibility Criteria:

Inclusion criteria

All bilateral and unilateral primary vaginal hydrocoele.

• Solitary swelling in the scrotum incorporating the testis.

• The swelling should be positive for transillumination.

• Getting above the swelling should be possible at the root of the scrotum.

Exclusion criteria

All Hydroceles other than Primary Vaginal Hydrocele.

• Congenital Hydrocele.

• Secondary Hydrocele.

• Swelling arising from the scrotal skin.

• Scrotal swelling felt separate from the testis.

• Scrotal swelling incorporating the testis but trans-illumination negative.

• Swelling exhibiting cough impulse and reducibility.

The 120 patients were randomly assigned to one of the three groups:

Group A: 40 patients underwent Jaboulay's procedure.

Group B: 40 patients were operated by the Sharma and Jhawar technique.

Group C: 40 patients were operated by Sivaji's Modified Sharma and Jhawar technique.

Data Collection:

Eligible patients were randomly allocated into the three treatment groups using a computer-generated randomization sequence, with a 1:1:1 allocation ratio. Allocation concealment was ensured using sequentially numbered, sealed, opaque envelopes. Baseline data, including preoperative clinical findings, complete physical examination, laboratory investigations, imaging, and intraoperative and postoperative details, were systematically recorded in a master chart. All patients received two doses of intravenous ceftriaxone (1 g), after excluding allergy history. Postoperative pain management was standardized: patients were given intravenous paracetamol (1 g every 12 hours) for two doses, with intravenous diclofenac (100 mg) available as rescue analgesia. Follow-up continued for three months to detect any late complications. Clinical outcomes were assessed across the three surgical groups and included mean operative time, postoperative scrotal edema, pain, infection, hematoma, and mean duration of hospital stay.

Ethical Considerations:

The study protocol was approved by the Institutional Ethics Committee and conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants or, where applicable, their legal guardians. Data confidentiality was ensured through anonymization.

Statistical Analysis:

Categorical variables were expressed as frequencies, and continuous variables as means. Comparisons of categorical variables were performed using the Chi-square test or Fisher's exact test, as appropriate. For continuous variables with normal distribution, comparisons between groups were made using the independent t-test. A p-value < 0.05 was considered statistically significant. Statistical analyses were carried out using the standard statistical software SPSS version 25.

OPERATIVE PROCEDURE

Jaboulay's Procedure [5,6]

The scrotal skin was stretched firmly to ensure adequate exposure. A 6-7 cm incision was taken over the most prominent part of the hydrocele on the anterior scrotal surface, carefully avoiding the testicle, which typically lies posteroinferiorly. The skin, dartos, and cremasteric fascia were incised and reflected as a single layer. Dissection was done until the parietal layer of the tunica vaginalis was visible. The hydrocoele sac was adequately dissected free from the surrounding scrotal tissues by blunt dissection. The spermatic cord and testicle, along with the attached hydrocele sac, were mobilized and delivered into the operative field. The sac was grasped with two mosquito forceps and hydrocele fluid was aspirated using a trocar. The sac was opened completely using electrocautery. The excess hydrocoele fluid was drained. The testis was inspected and palpated thoroughly to rule out any underlying pathology. Redundant portions of the sac wall were excised, leaving approximately a 2cm margin. Hemostasis was meticulously secured. The remaining sac was everted behind the testicle and secured using continuous absorbable sutures. The testis with the everted sac was

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then placed back into the scrotum. The subcutaneous tissue was approximated with simple absorbable sutures and the scrotal skin with Ethilon/Monocryl vertical mattress sutures. A corrugated drain was kept at the base of the scrotum in case of moderate to gross hydrocoele. (Figure 1) .

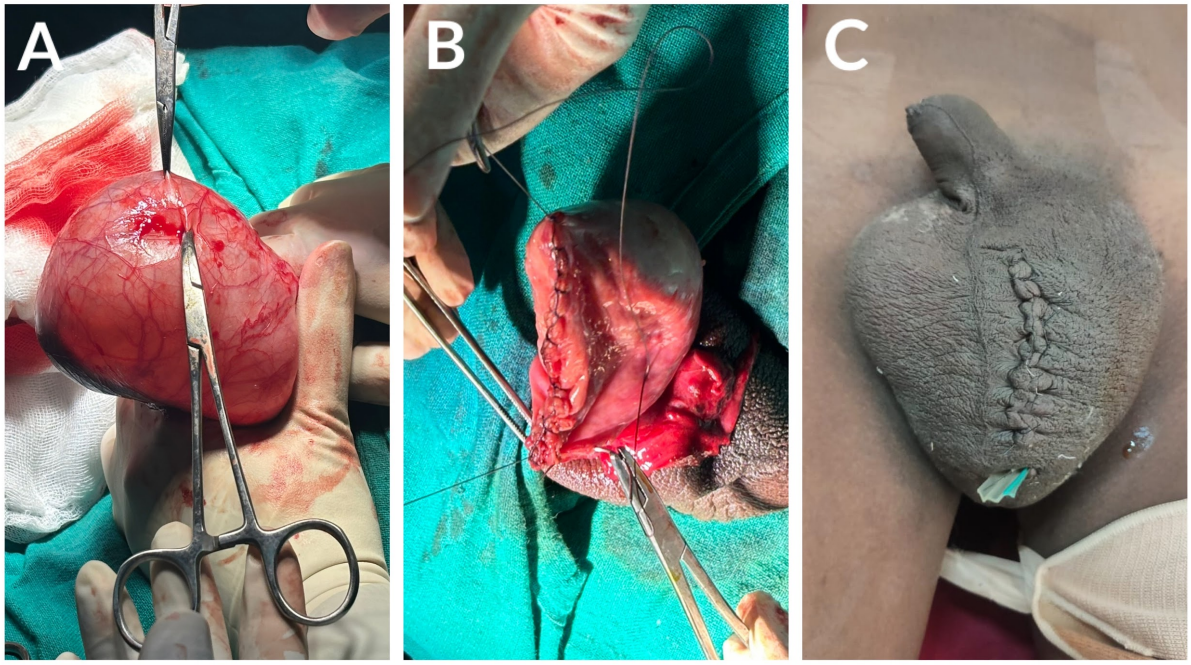

Figure 1. (A) Hydrocoele sac delivered outside into the wound after separating it from surrounding scrotal layers by blunt dissection. (B) Sac everted behind the testis and its two edges approximated with continous absorbable suture. (C) Scrotum with corrugated drain in situ on postoperative day-2 following Jaboulay's procedure for left primary vaginal hydrocele.

Sharma and Jhawar technique [7]

A small scrotal incision (4–6 cm) was made over the most prominent area of the hydrocele avoiding the visible blood vessels. Skin, dartos, and cremasteric fascia were incised as a single layer. These were gently reflected to expose the parietal layer of tunica vaginalis (outer wall of the hydrocele sac). The hydrocele sac was gently lifted using two tissue forceps. A trocar and cannula are used to evacuate the fluid through a small puncture. This same puncture hole was extended on both sides to widen access, avoiding dissection near vessels. A pocket was created within the scrotal fascial layers by blunt dissection maintaining hemostasis. Through the incision, the testis and tunica were carefully delivered outside the scrotum using polar delivery, minimizing trauma. The evacuated tunica sac and testis were placed into a newly created pocket in fascial layers of scrotum. The surgical wound was closed layer by layer with absorbable sutures. (Figure 2)

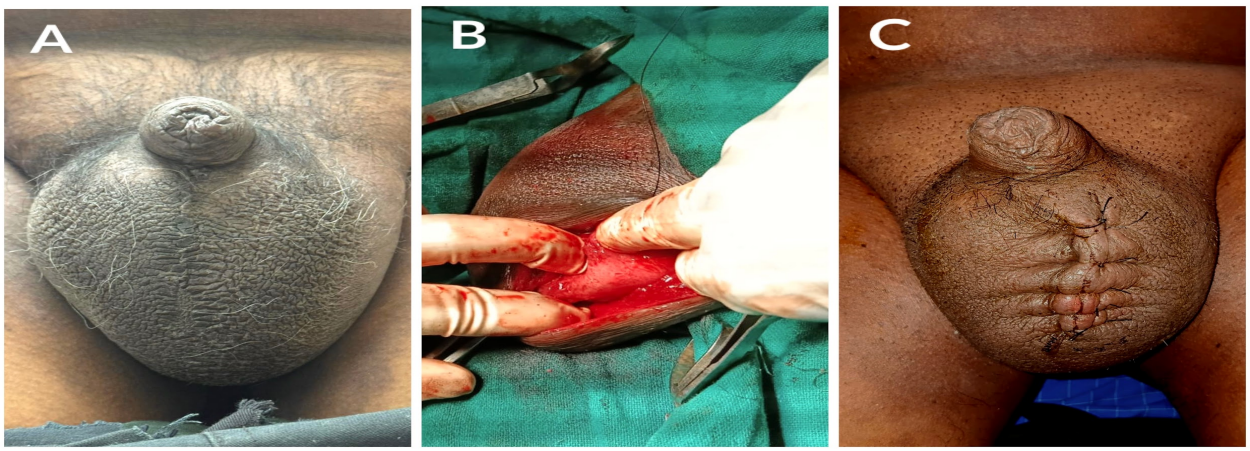

Figure 2. (A) Pre-operative picture of left primary vaginal hydrocoele. (B) A pocket created in the left testicular fascial layers to place the testis. (C) Scrotum on postoperative day-2 following Sharma and Jhawar technique.

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Sivaji's Modified Sharma and Jhawar technique

The scrotal swelling was gently stabilized by grasping opposite poles between the thumb and index fingers of both hands of the assistant surgeon to fix the hydrocele swelling. A 3-4cm vertical incision was made directly over the most prominent part of swelling, taking care to avoid visible subcutaneous blood vessels. The skin, dartos, and fascia were incised en bloc. A stab incision was made at the most prominent part of the tunica vaginalis to drain the hydrocele fluid, taking care not to injure the testis. The cut edges of the tunica vaginalis sac were held using two mosquito forceps. A testis-sized space was developed within the dartos muscle layer. This was achieved by blunt dissection using both index fingers, carefully separating the tissue planes to form an adequate neo-dartos pouch. The initial sac incision was extended vertically below upwards using electrocautery thus preventing any oozing of blood. The testis with its everted tunica vaginalis sac was gently reinserted into the newly created dartos pouch. The scrotal layers with the everted sac wall were closed in a single layer using vertical mattress Ethilon sutures. The sutures were placed approximately 2 cm from the wound edge to ensure proper approximation and healing, thus obliterating any dead space left. (Figure 3).

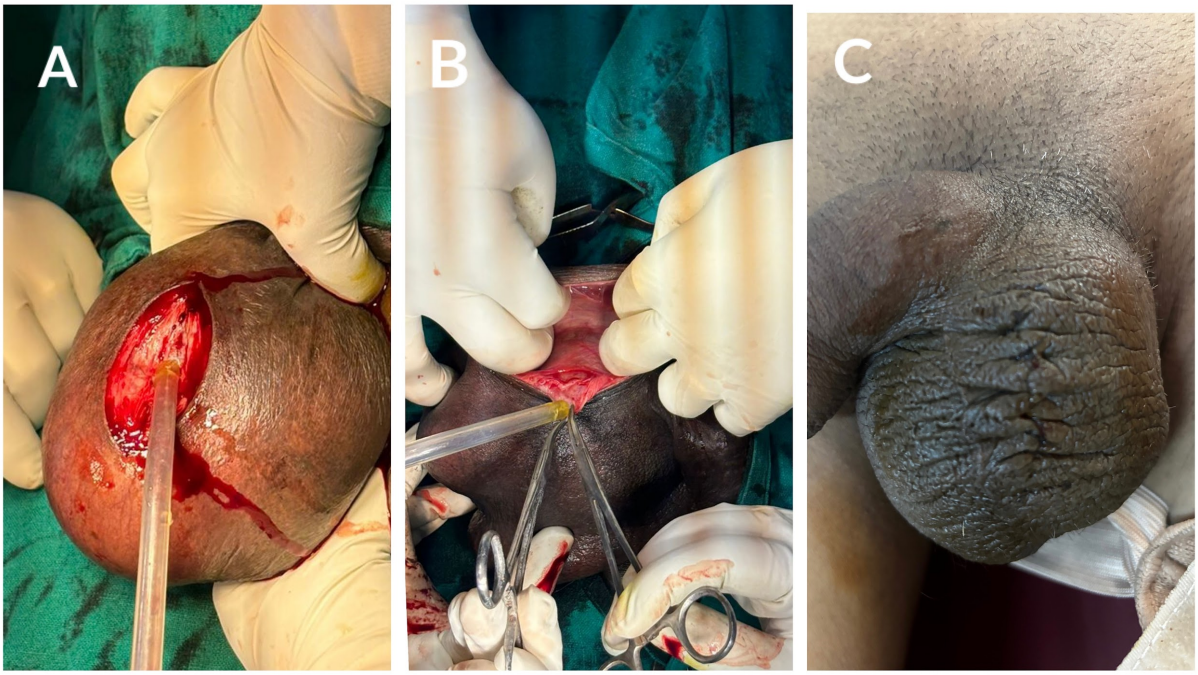

Figure 3: (A) Aspiration of the hydrocoele fluid after deepening the incision without delivering the sac outside. (B) Creation of the neo-dartos pouch for placing the left testis. (C) Scrotum on postoperative day-2 of Sivaji's Modified Sharma and Jhawar technique.

RESULTS

In our study, a hospital-based randomized controlled trial was conducted over 18 months to compare the clinical outcomes of three types of hydrocoele surgeries: Jaboulay's procedure, Sharma and Jhawar technique, and Sivaji's Modified Sharma and Jhawar technique. A total of 120 patients with primary vaginal hydrocele were enrolled based on defined inclusion and exclusion criteria and randomly allocated into three groups of 40 patients each using a computer-generated randomization sequence with allocation concealment through sealed opaque envelopes. Baseline demographic and clinical details, along with preoperative, intraoperative, and postoperative findings, were recorded, and all patients were followed up for three months to identify late complications. The study outcomes assessed across the groups included mean operative time, postoperative scrotal edema, pain, infection, hematoma, and mean duration of hospital stay.

The baseline demographic and clinical characteristics of patients in the three groups were recorded. The majority of patients in the study were between 40 and 60 years of age (65%), followed by those aged 30–40 years (18.3%), 60–70 years (10%), and 20–30 years (6.7%). Hydroceles were more commonly right-sided (61.7%) than left-sided (38.3%). With respect to duration, most patients presented with swelling of less than six months (46.7%), while 32.5% had symptoms for six months to one year,

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and 20.8% had swelling for more than one year. (Table 1)

Table 1: Demographic and clinical profile of participants.

Age Group(years)	**Jaboulay's procedure (n=40) N (%)**	**Sharma and Jhawar technique(n=40) N (%)**	**Sivaji's Modified Sharma and Jhawer (n=40) N (%)**	**p-value**
20-30	3 (7.5)	3 (7.5)	2 (5.0)	0.991
30-40	9 (22.5)	6 (15.0)	7 (17.5)	
40-50	14 (35.0)	18 (45.0)	16 (40.0)	
50-60	10 (25.0)	9 (22.5)	11 (27.5)	
60-70	4 (10.0)	4 (10.0)	4 (10.0)	
Laterality				0.556
Right	24 (60.0)	28 (70.0)	22 (55.0)	
Left	16 (40.0)	14 (30.0)	18 (45.0)	
Duration of scrotal swelling				0.882
< 6 months	18 (45.0)	21 (52.5)	17 (42.5)	
6 months to 1 year	14 (35.0)	12 (30.0)	13 (32.5)	
> 1 year	8 (20.0)	7 (17.5)	10 (25.0)	

In terms of mean operative time, the Jaboulay's procedure required the longest time (32.5 ± 4.5 minutes), followed by the Sharma and Jhawar technique (18.0 ± 2.5 minutes), while the Sivaji's Modified Sharma and Jhawar procedure had the shortest operative duration (8.0 ± 0.5 minutes). The p- value was <0.001. (Table 2)

Table 2: Comparison of Mean Operative time among the treatment groups.

Operative time (minutes)	**Jaboulay's procedure (n=40) N (%)**	**Sharma and Jhawar technique(n=40) N (%)**	**Sivaji's Modified Sharma and Jhawer (n=40) N (%)**	**p-value**
Mean Operative time ± Standard Deviation	32.5 ± 4.5	18.0 ± 2.5	8.00 ± 0.5	**<0.001**
Range	22-40	15-25	7.5-10	

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In this study, postoperative complications were found to be more frequent with Jaboulay's procedure compared to the other techniques. Scrotal edema was observed in 22.5% of patients undergoing Jaboulay's procedure, as opposed to 12.5% in the Sharma and Jhawar group and only 2.5% in the modified technique group (p=0.040). Similarly, scrotal pain lasting more than 3 days was noted in 30.0% patients of Jaboulay's group, compared to 15.0% with Sharma and Jhawar and 5.0% with the modified method (p=0.022). Postoperative fever persisting beyond 3 days occurred in 17.5% of Jaboulay's patients, 7.5% of Sharma and Jhawar cases, and none in the modified group (p=0.025). Scrotal hematoma was also more common after Jaboulay's procedure (12.5%) compared with 2.5% in the Sharma and Jhawar group and 0% in the modified group (p=0.030). (Table 3, Figure 4).

Table 3: Comparison of complication rates in the treatment groups.

Post operative complications	**Jaboulay's procedure (n=40) N (%)**	**Sharma and Jhawar technique(n=40) N (%)**	**Sivaji's Modified Sharma and Jhawer (n=40) N (%)**	**p-value**
Scrotal Edema	9 (22.5)	5 (12.5)	1 (2.5)	**0.040**
Scrotal Pain >3 days	12 (30.0)	6 (15.0)	2 (5.0)	**0.022**
Fever > 3 days	7 (17.5)	3 (7.5)	0 (0)	**0.025**
Scrotal hematoma	5 (12.5)	1 (2.5)	0 (0)	**0.030**

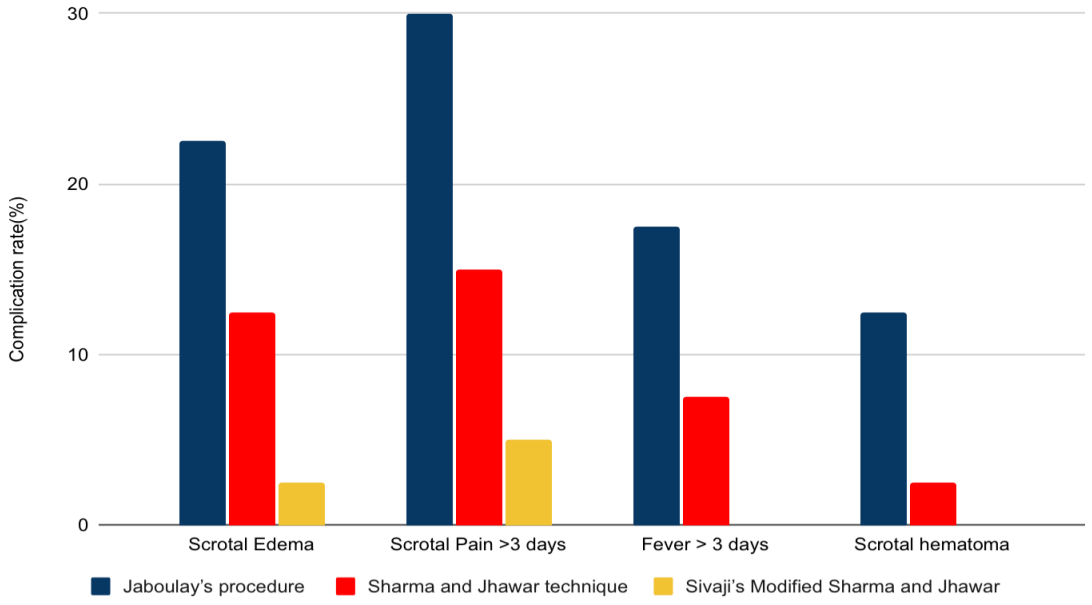

Figure 4: Incidence of complication rates in the treatment groups

In terms of the mean duration of hospital stay among the three surgical techniques: patients undergoing Jaboulay's procedure had the longest stay, with a mean of 7 ± 1.75 days, followed by the Sharma and Jhawar technique at 4 ± 0.75 days. The shortest hospitalization was observed in the Sivaji's Modified Sharma and Jhawar group, with a mean of 2 ± 0.75 days. The p value was < 0.001. (Table 4)

Table 4: Comparison of Mean Duration of Hospital Stay among treatment groups.

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Duration of Hospital Stay (days)	**Jaboulay's procedure (n=40) N (%)**	**Sharma and Jhawar technique(n=40) N (%)**	**Sivaji's Modified Sharma and Jhawer (n=40) N (%)**	**p-value**
Mean Duration of Hospital Stay ± Standard Deviation	7 ± 1.75	4 ± 0.75	2 ± 0.75	**<0.001**
Range	5-12	3-6	1-4	

DISCUSSION

This study demonstrates comparable baseline demographic and clinical characteristics among the three treatment groups Most patients were aged between 40 and 60 years, with 35–45% of patients in this range across all groups, and no statistically significant difference was observed (p = 0.991). In all groups, right-sided hydrocele was more frequent (55–70%), while left-sided cases comprised 30–45%, with no statistically significant difference observed (p = 0.556). These results are consistent with previous literature, which indicates that hydrocele is most common in middle-aged and older men, typically presenting between the fourth and sixth decades of life, with Ku JH et al. (2001) reporting a mean age of 54.36 years.[9] A right-sided predominance of hydrocele has similarly been reported in earlier studies, including the work of Stapleton P. et al. (2024).[10] The duration of scrotal swelling prior to surgery was predominantly less than one year in all groups, and distribution across categories (<6 months, 6 months–1 year, >1 year) did not differ significantly (p = 0.882) which was consistent with the findings of the study, Dagur G et al., (2017).[11]The similarity in the duration of swelling across groups suggests that the timing of presentation did not introduce bias and supports the reliability of comparisons made for operative outcomes and postoperative complications. Overall, the similarity in baseline characteristics across groups strengthens the internal validity of the study.

In this study, operative time differed significantly among the three procedures, with Jaboulay's procedure requiring the longest duration (32.5 ± 4.5 minutes) and the Sharma and Jhawar technique an intermediate time (18.0 ± 2.5 minutes). The Sivaji's Modified Sharma and Jhawar technique demonstrated the shortest operative time of only 8.0 ± 0.5 minutes (p < 0.001), highlighting its efficiency and potential to reduce anesthesia exposure. The significantly shorter operative time with the modified technique translates into quicker postoperative recovery and a reduced duration of hospital stay. Similar observations have been reported by Saber A.(2015), in this study, the mean operative time was 15.1 ± 4.24 minutes for the Sharma and Jhawar technique and 32.5 ± 4.76 minutes for Jaboulay's procedure (P ≤ 0.02), confirming that modifications in hydrocelectomy techniques significantly reduce operative duration compared to conventional methods. This study further demonstrated that streamlined approaches, such as the modified technique, not only minimize operative time but also result in fewer postoperative complications.[12]

In the present study, postoperative complications were significantly lower in Sivaji's Modified Sharma and Jhawar technique compared to the other two procedures. Scrotal edema was observed in just 2.5% of patients in the modified group, compared with 22.5% in Jaboulay's and 12.5% in the Sharma and Jhawar group (p = 0.040). Similarly, in the study by Naga Muneiah S. et al. (2015), scrotal edema was more frequent with Jaboulay's procedure (33.33%) compared to 11.11% with the Sharma and Jhawar technique, findings that are consistent with the results of our study. Prolonged scrotal pain lasting more than 3 days occurred in 5.0% with the modified technique, versus 30.0% in Jaboulay's and 15.0% in the Sharma and Jhawar group (p = 0.022). Fever lasting more than three days was absent in the modified group (0%), while it occurred in 17.5% of Jaboulay's and 7.5% of Sharma and Jhawar patients (p = 0.025). Scrotal hematoma was absent in the modified technique group, whereas it occurred in 12.5% of Jaboulay's cases and 2.5% of Sharma and Jhawar cases (p = 0.030). Similarly, in terms of post- operative scrotal pain, fever and hematoma, study by Naga Muneiah S. et al. (2015) confirms that these complications were significantly higher in the conventional groups than the minimally invasive groups.[13] These findings suggest that the modifications introduced by Sivaji effectively reduce tissue trauma and improve hemostasis, leading to better patient outcomes. Similarly, Saber A. (2015), observed that minimally invasive or modified techniques lead to faster recovery and reduced postoperative complications.[12] Together, these studies support the conclusion that advancements in surgical techniques, such as Sivaji's modification, play a vital role in minimizing postoperative morbidity.

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The mean duration of hospital stay differed significantly among the three procedures (p-value < 0.001). Patients treated with Sivaji's Modified Sharma and Jhawar procedure had the shortest hospital stay (2 ± 0.75 days), compared to 4 ± 0.75 days with the Sharma and Jhawar technique, while Jaboulay's procedure resulted in the longest stay (7 ± 1.75 days). This finding is consistent with the study of Agarwal NK and Sarma S., (2023) who reported that optimized hydrocelectomy techniques are associated with decreased hospitalization and quicker return to daily activities.[14] The shorter hospital stay with the Sivaji's Modified Sharma and Jhawar technique reflects its minimally invasive approach and reduced surgical trauma. Overall, the findings indicate that Sivaji's Modified Sharma and Jhawar technique offers greater efficiency, improved safety, and faster patient recovery than conventional procedures.

Limitations and future research

First, although the study was randomized, it was limited by being conducted at a single center. The relatively small sample size may have reduced the statistical power to detect significant differences between the treatment groups. Therefore, larger multicenter studies are required to validate and confirm these findings.

CONCLUSION

The Sivaji's Modified Sharma and Jhawar technique utilizes minimal dissection, formation of a neo-dartos pouch, and single-layer hemostatic closure of the scrotal layers. It has proven to be an effective surgical approach for the treatment of primary vaginal hydroceles. In comparison to conventional procedures such as Jabou lays and Sharma and Jhawar technique, this method is simpler, easier to perform, and requires a shorter operative time. Importantly, the hydrocele sac is not stripped from the surrounding scrotal tissues thus minimizing the intraoperative bleeding and the deep single layer closure of scrotal layers obliterates the dead space thus minimizing the chances of scrotal edema in the post operative period. Consequently, the risk of post-operative complications—including hematoma, scrotal edema and patient discomfort —is significantly reduced with the additional benefit of shorter hospital stay.

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