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Original Research Article

Comparative analysis of Lord's plication and Jaboulay's eversion in the surgical management of primary vaginal hydrocele

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ABSTRACT

Background: Hydrocele, a common benign cause of scrotal swelling, frequently requires surgical correction. Among available techniques, Lord's plication and Jaboulay's eversion are widely used, yet evidence comparing their outcomes remains inconclusive, particularly in the Indian context. Aim was to compare postoperative outcomes of Lord's plication and Jaboulay's eversion in adult males with primary vaginal hydrocele.
Methods: A prospective comparative observational study was conducted at a tertiary care centre between January 2024 and December 2025, enrolling 100 adult male patients with primary vaginal hydrocele. Based on sac wall thickness and size, 71 patients underwent Jaboulay's eversion and 29 underwent Lord's plication. Primary outcome was the rate of postoperative complications; secondary outcomes included pain on postoperative day (POD) 3 and 7, hospital stay duration, suture removal day, and recurrence at 6 months. Data followed STROBE guidelines; statistical analysis employed Fisher's exact and Kruskal-Wallis tests, with $p<0.05$ considered significant.
Results: Postoperative complications occurred in 33% of patients, significantly lower in the Jaboulay group (17%) compared to Lord's (72%) ($p=0.002$). Mean hospital stay was shorter following Jaboulay's eversion (7.08±1.6 days) versus Lord's plication (8.0±1.75 days; $p<0.001$). Suture removal occurred earlier after Jaboulay's (5.9±0.7 days vs 7.2±1.1 days; $p=0.002$). No recurrence was observed in either group at 6 months.
Conclusions: Both procedures effectively treat primary hydrocele; however, Jaboulay's eversion offers significantly fewer complications, less postoperative pain, and faster recovery. It should be preferred, particularly for large or thick-walled hydroceles.

Keywords: Hydrocele, Lord's plication, Jaboulay's eversion, Hydrocelectomy, Postoperative outcome, Scrotal surgery

INTRODUCTION

Hydrocele, derived from the Greek words hydro (water) and kele (tumor), refers to the abnormal accumulation of serous fluid within the tunica vaginalis surrounding the testis and spermatic cord. It remains one of the most common benign causes of scrotal swelling in adult males, particularly in tropical regions such as India.[1-3] Clinically, hydroceles may be primary or secondary, with primary hydrocele resulting from an imbalance between fluid secretion and absorption and presenting as a painless, progressive scrotal enlargement.[4-6] Although benign, large hydroceles can cause discomfort, impaired mobility, and fertility impairment, necessitating surgical treatment. Lord's plication and Jaboulay's eversion are widely practiced techniques; however, the optimal approach remains debated. Limited region-specific comparative data prompted this study to evaluate and compare postoperative outcomes of these procedures in adult primary vaginal hydrocele.

METHODS

This prospective comparative observational study was conducted in the department of general surgery at JIIU's

Indian institute of medical sciences and research, Noor Hospital, Jalna, Maharashtra, India, over a two-year period from January 2024 to December 2025. Ethical clearance was obtained from the institutional ethics committee prior to study initiation, and all participants provided written informed consent in accordance with the declaration of Helsinki (2013).[15] The study was designed and reported in compliance with the STROBE (Strengthening the reporting of observational studies in epidemiology) guidelines for observational research.

A total of 100 adult male patients presenting with clinically and ultrasonographically confirmed primary vaginal hydrocele were consecutively enrolled. Detailed demographic data, occupational history, and clinical characteristics were recorded using a structured case proforma. Patients with congenital or secondary hydroceles, filarial etiology, scrotal or testicular neoplasms, and systemic illnesses that could interfere with wound healing, such as diabetes mellitus, chronic steroid use, anticoagulant therapy, or immunosuppressive medication, were excluded from the study.

All participants underwent comprehensive preoperative evaluation, including routine hematological and biochemical investigations such as complete blood count, bleeding time, clotting time, and blood glucose levels, along with serological screening for HIV and HBsAg, urine examination, electrocardiogram, and chest X-ray when indicated. Scrotal ultrasonography was performed in every case to confirm the diagnosis, assess sac wall thickness, and exclude other intrascrotal pathologies such as epididymal cysts, hernia, or tumors.

Patients were allocated into two groups based on intraoperative findings, primarily the size and wall thickness of the hydrocele sac. Those with small, thin-walled sacs measuring less than 5 cm in diameter underwent Lord's plication, whereas large or thick-walled sacs exceeding 5 cm were treated with Jaboulay's eversion. All surgeries were performed by experienced consultants under spinal anesthesia in most cases, with general anesthesia reserved for selected patients based on anesthetic assessment.

In the Lord's plication technique, a scrotal incision was made to expose the tunica vaginalis, which was then incised to drain the accumulated fluid. The parietal layer was folded upon itself with multiple interrupted Vicryl 2-0 sutures, ensuring even distribution around the testis to minimize dead space and prevent recurrence. In the Jaboulay's eversion technique, after fluid evacuation, a segment of the tunica vaginalis was excised, and the residual sac was everted posteriorly behind the testis. The margins were then sutured using absorbable material to achieve complete obliteration of the cavity. Hemostasis was meticulously secured in both procedures. A closed suction drain was placed in cases where extensive dissection was performed, and the wound was closed in layers with absorbable sutures followed by light scrotal compression dressing.

Postoperatively, all patients received intravenous antibiotics and analgesics for 48 to 72 hours, followed by oral medication as required. Daily wound inspection and dressing changes were carried out until discharge. The visual analogue scale (VAS) was used to assess postoperative pain on the third and seventh postoperative days (POD 3 and POD 7). Patients were observed for early complications including edema, hematoma, fever, and wound infection. The duration of hospital stay, day of suture removal, and recurrence at six-month follow-up were recorded.

Data were compiled and analyzed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Categorical variables such as the presence of complications were expressed as frequencies and percentages, while continuous variables like hospital stay and suture removal time were represented as mean±standard deviation (SD). The Fisher's exact test was employed to assess associations between categorical variables, and the Kruskal-Wallis test was applied for continuous data. A p value of less than 0.05 was considered statistically significant.

The overall study flow is depicted in Figure 1 (STROBE flowchart).

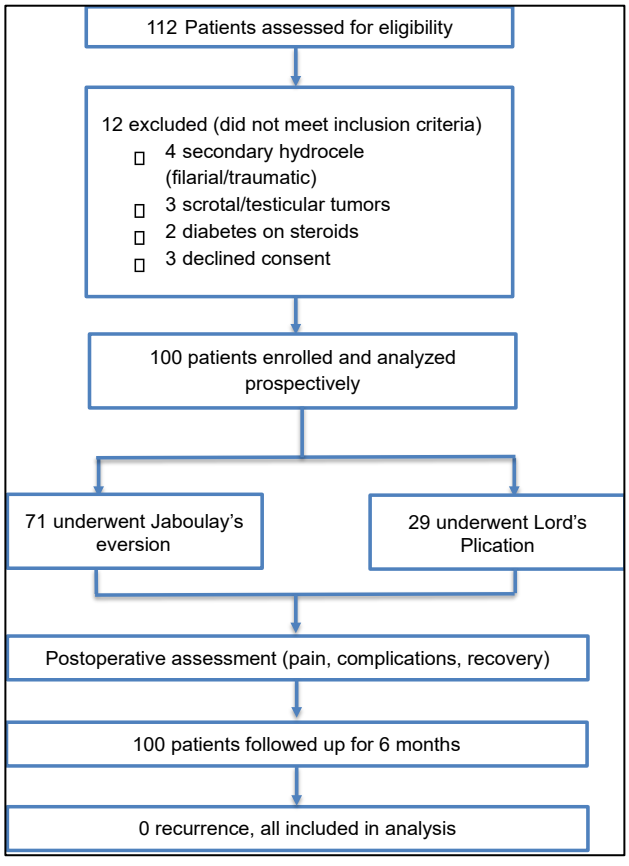

Figure 1: STROBE flowchart for study population.

RESULTS

A total of 100 adult male patients with primary vaginal hydrocele were enrolled and divided into two groups: 71 underwent Jaboulay's eversion and 29 underwent Lord's plication. The mean age of the cohort was 31.2±9.4 years, with nearly half of the patients belonging to the 21-30-year age group (48%), followed by 31-40 years (27%). The youngest participant was 18 years and the oldest 58 years. The disease was most common among manual laborers (48%) and farmers (34%), occupations associated with prolonged standing and strenuous physical activity. Table 1 presents the detailed demographic and clinical characteristics of the study population.

The right side of the scrotum was affected in 58% of cases, the left side in 37%, and bilateral involvement in 5%. The mean duration of swelling was 8.5 months, and all patients presented with a painless, gradually progressive scrotal enlargement. Jaboulay's eversion was more frequently selected for large or thick-walled hydroceles, whereas Lord's plication was performed for smaller, thin-walled sacs.

Postoperative complications occurred in 33% of the total cohort, but were significantly less frequent following Jaboulay's eversion (17%) compared with Lord's plication (72%) (p=0.002). The predominant complication was scrotal edema, observed in 12 cases (17%) in the Jaboulay group and 18 cases (62%) in the Lord group. Minor wound infections occurred in two cases in each group and were managed conservatively. No hematomas, testicular atrophy, or wound dehiscence were recorded. Table 2 summarizes the distribution of postoperative complications between the two procedures.

A corresponding Figure 2, visually compares complication rates, highlighting the lower morbidity after Jaboulay's repair.

Pain assessment on postoperative day (POD) 3 showed that 8.5% of Jaboulay's patients and 27.6% of Lord's patients experienced moderate pain (p=0.07). By POD 7, more than 96% of patients were painfree, irrespective of procedure. The mean duration of hospital stay was significantly shorter after Jaboulay's repair (7.08±1.6 days) compared with Lord's (8.0±1.75 days, p<0.001). Similarly, suture removal occurred earlier in the Jaboulay's group (5.9±0.7 days) than in the Lord's group (7.2±1.1 days, p=0.002). These findings reflect faster wound healing and reduced postoperative discomfort in the Jaboulay's cohort. Table 3 presents the key postoperative recovery parameters. Figure 3, may illustrate the difference in hospital stay and suture removal time between groups.

No cases of recurrence were documented in either group at the 6-month follow-up. All patients reported satisfactory cosmetic outcomes and functional recovery during review visits.

To contextualize these findings, a comparison was drawn between the present study and other contemporary works evaluating the two techniques. Table 4 summarizes outcomes reported by Shirke et al, Ahmed et al, Aly Saber et al and Santhi et al alongside the present results.[9-12] The trend across studies consistently indicates that Jaboulay's eversion yields lower complication rates, shorter hospital stays, and comparable long-term success when compared with Lord's plication.

Overall, Jaboulay's eversion demonstrated superior postoperative outcomes with reduced morbidity and faster recovery, while both procedures remained equally effective in achieving a durable cure without recurrence.

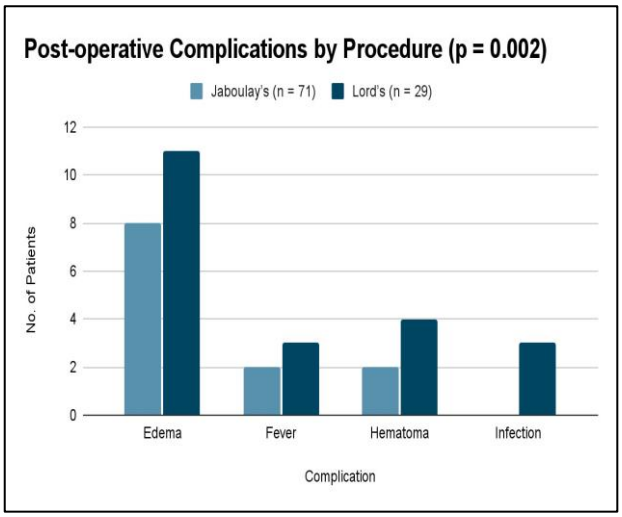

Figure 2: Post-operative complications by procedure, (p=0.002).

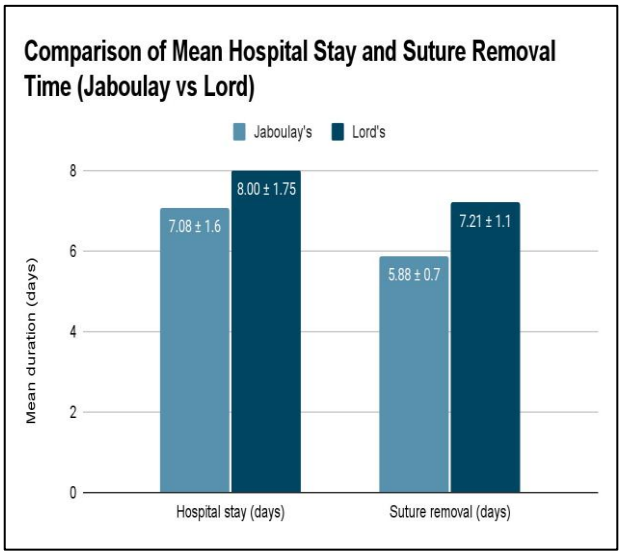

Figure 3: Comparison of mean hospital stay and suture-removal days.

Table 1: Demographic and clinical characteristics of patients (n=100).

Variables	Category	N	Percentages (%)
Age group (in years)	10-20	4	4
	21-30	48	48
	31-40	30	30
	41-50	8	8
	51-60	5	5
	61-70	3	3
	> 70	2	2
Occupations	Laborers	48	48
	Farmers	34	34
	Business	8	8
	Others	10	10
Duration of disease	<6 months	48	48
	6-10 months	2	2
	1-2 years	31	31
	2-3 years	13	13
	4-5 years	5	5
	>10 years	1	1
Site of swelling	Right	48	48
	Left	34	34
	Bilateral	18	18
Presenting symptom	Swelling	68	68
	Dragging sensation	21	21
	Discomfort	11	11

Table 2: Post-operative complications in Lord's and Jaboulay's groups.

Complications	Total, (n=100)	Jaboulay's, (n=71)	Lord's (n=29)	P value
Any complication	33 (33%)	12 (17%)	21 (72%)	0.002 (Highly significant)
Edema	19 (19%)	8 (11%)	11 (38%)	-
Fever	5 (5%)	2 (3%)	3 (10%)	-
Hematoma	6 (6%)	2 (3%)	4 (14%)	-
Infection	3 (3%)	0 (0%)	3 (10%)	-
No complication	67 (67%)	59 (83%)	8 (28%)	-

Table 3: Mean post-operative outcomes in both groups.

Parameters	Overall, (n=100)	Jaboulay's, (n=71)	Lord's, (n=29)	P value
Mean hospital stay (days±SD)	7.36±1.48	7.08±1.60	8.00±1.75	<0.001 (Highly significant)
Mean suture removal (days±SD)	6.27±1.02	5.88±0.70	7.21±1.10	<0.002 (Highly significant)
Pain on POD 3	14 (14%)	6 (8%)	8 (28%)	0.073
Pain on POD 7	4 (4%)	2 (3%)	2 (7%)	0.557

Table 4: Comparison of present study with published literature.

Study	N	Mean hospital stay	Complication rate	Recurrence	Conclusion
Present study	100	Jaboulay: 7.08±1.6, Lord:8.0±1.75	Jaboulay: 17% Lord: 72%	Nil	Jaboulay superior for recovery, fewer complications
Shirke et al[12]	60	Jaboulay: 7.2, Lord: 9.1	Jaboulay: 12%, Lord: 28%	Nil	Jaboulay had lesser pain, faster healing
Ahmed et al[10]	80	Jaboulay: 6.8, Lord: 8.3	Jaboulay: 15% Lord: 30%	2 cases (Lord)	Jaboulay preferred in thick sacs
Saber et al[19]	100	Jaboulay: 7.0, Lord: 7.4	Jaboulay: 10%, Lord: 22%	Nil	Comparable efficacy, Jaboulay less morbidity
Santhi et al[20]	70	Jaboulay: 6.9, Lord: 8.1	Jaboulay: 11%, Lord: 26%	Nil	Jaboulay associated with shorter recovery

DISCUSSION

Hydrocele continues to be one of the most prevalent benign scrotal pathologies encountered in adult males, particularly in tropical regions where physical exertion and climatic factors predispose to the condition[1]. The primary goal of surgical management is to eliminate the fluid-filled tunica vaginalis while minimizing postoperative morbidity, recurrence, and recovery time. In this study, we compared two well-established techniques, Lord's plication and Jaboulay's eversion, to evaluate their relative safety, efficacy, and patient outcomes in the treatment of primary vaginal hydrocele.

The demographic distribution in our cohort aligns with prior literature, showing a predominance among young and middle-aged adults, particularly those engaged in manual or agricultural occupations, reflecting environmental and mechanical etiological influences.[2] The mean age of 31.2 years and right sided predominance are consistent with findings by Shirke et al and Ahmed et al who also reported hydrocele as more frequent in individuals performing strenuous work.[9,10]

The present analysis demonstrates a significant difference in postoperative outcomes between the two techniques. Jaboulay's eversion was associated with a markedly lower incidence of postoperative complications (17%) compared to Lord's plication (72%), a difference that achieved strong statistical significance (p=0.002). The most frequent complication was scrotal edema, observed predominantly in the Lord's group. This difference can be attributed to greater tissue handling and inflammation in plication, as the folded tunica may act as a nidus for localized serous exudation. Jaboulay's approach, by contrast, involves excision and eversion of the sac, eliminating the potential space for fluid reaccumulation and thus minimizing inflammatory sequelae.[5]

Postoperative pain was generally mild in both groups but resolved earlier in the Jaboulay's cohort. The shorter hospital stay (7.08±1.6 vs 8.0±1.75 days) and earlier suture removal (mean 5.9 vs 7.2 days) further support the superior recovery profile associated with Jaboulay's repair. These findings concur with studies by Aly Saber et al and Santhi et al who documented significantly reduced convalescence times and fewer complications with the eversion technique.[11,12]

The absence of recurrence in both groups in the present study reinforces that both Lord's plication and Jaboulay's eversion are reliable and definitive procedures when performed meticulously. Reported recurrence rates in the literature range from 0-3%, typically arising from incomplete excision or inadequate eversion of the tunica vaginalis.[8] The zero-recurrence outcome observed here likely reflects meticulous intraoperative technique, adequate sac management, and strict hemostasis. High levels of patient satisfaction and favourable cosmetic results across both groups further indicate sound surgical execution and minimal postoperative distortion.

The comparative evidence summarized in Table 4 corroborates these findings. Studies by Shirke et al, Ahmed et al, and Aly Saber et al have consistently reported lower complication rates, faster recovery, and shorter hospitalization with Jaboulay's eversion.[9-11] Nevertheless, these authors, along with Santhi et al note that Lord's plication remains a practical alternative for smaller, thin-walled sacs.[12]

The present data align with this consensus, suggesting that the choice of technique should depend primarily on the sac's size and wall thickness rather than patient demographic variables.

The physiological explanation for Jaboulay's superiority lies in its complete obliteration of the tunica cavity, which effectively eliminates potential dead space and reduces postoperative exudation. In contrast, Lord's plication, although less invasive and quicker to perform, relies on plication of the parietal tunica. This may not be effective in fibrotic or thick-walled sacs, which explains the higher complication rate seen with this method. Despite these differences, both operations remain valid options in the surgeon's practice, and procedural selection should be guided by intraoperative findings, surgeon expertise, and patient preference.

The study was limited by its single-center design, uneven sample distribution between the two groups, and a relatively short follow-up duration of 6 months. Future multicentric studies with longer follow-up and standardized postop quality-of-life assessments are recommended to validate and expand upon these results.

CONCLUSION

Hydrocele remains a prevalent benign scrotal disorder among young and middle-aged men, particularly those involved in physically demanding occupations. The present study demonstrates that both Lord's plication and Jaboulay's eversion are effective surgical techniques for the definitive management of primary vaginal hydrocele, providing excellent functional and cosmetic outcomes without recurrence.

However, Jaboulay's eversion was associated with significantly fewer postoperative complications, reduced pain, shorter hospital stays, and faster wound healing compared with Lord's procedure.

These findings suggest that Jaboulay's eversion may be considered the preferred surgical option, particularly for large or thick-walled hydroceles, whereas Lord's plication remains suitable for smaller, thin-walled sacs. Procedure selection should be individualized based on intraoperative findings and surgeon experience.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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