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Original Research Article

Hydrocelectomy in Adult Population: A comparative study on Local vs Spinal Anaestheisa

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Abstract:

Background: Hydrocelectomy is the definitive treatment for symptomatic adult hydrocele, a common scrotal condition amenable to day-care surgery. Local anaesthesia (LA) offers potential advantages over spinal anaesthesia (SA) including reduced complications and faster recovery, though direct comparative data remains limited.

Objective: To compare postoperative pain, hospital stay, and need for extra analgesia between LA and SA in 144 adults undergoing unilateral hydrocelectomy.

Methods: Prospective and retrospective randomized study of 144 patients (72 LA, 72 SA) undergoing hydrocelectomy. Spermatic cord block with lignocaine used for LA whereas low-dose bupivacaine - fentanyl was used for SA. Outcomes measured included VAS pain scores (2-24h), hospital stay, rescue analgesia (diclofenac/tramadol if VAS≥4) and complications.

Results: LA showed lower VAS scores (2h: 2.4±1.1 vs 3.6±1.4; 6h: 2.8±1.2 vs 4.3±1.5. Hospital stay shorter (20.8±6.4 vs 26.1±7.9h. Rescue analgesia needed by 30.6% LA vs 59.7% SA. SA had more urinary retention (12.5% vs 1.4%) and headache (8.3% vs 0).

Conclusion: LA provides superior pain control, shorter stay, and fewer complications than SA for adult hydrocelectomy, supporting its use as preferred technique in day-care settings.

Keywords: Hydrocelectomy, Adults, Local Anaesthesia, Jammu and Kashmir, Spinal Anaesthesia.

Introduction

Hydrocele is a common benign scrotal pathology in adult males, characterized by collection of fluid around the testis, and hydrocelectomy remains the gold-standard definitive treatment. Because hydrocelectomy is of short duration and involves superficial scrotal tissues, it is well suited to be performed as a day-care procedure under regional or local techniques rather than routine general anaesthesia.

Local anaesthesia using spermatic cord block and scrotal infiltration has been shown to be practicable, well tolerated, and cost-effective in adult hydrocelectomy, allowing discharge within a few hours and avoiding the adverse effects of central neuraxial block. Conversely, spinal anaesthesia offers dense sensory block and excellent intraoperative comfort but is associated with complications such as urinary retention, post-spinal headache, and delayed mobilization. There is a relative paucity of focused comparative data on LA versus SA specifically in adult hydrocelectomy, although similar comparisons exist for other groin and scrotal procedures like varicocelectomy and inguinal hernia repair. This study was undertaken to compare clinical outcomes between LA and SA in adult hydrocelectomy, with particular emphasis on postoperative pain, hospital stay, and need for additional analgesia.

Objectives

1. To compare postoperative pain following adult unilateral hydrocelectomy performed under local anaesthesia versus spinal anaesthesia.
2. To compare postoperative hospital stay duration between the two anaesthetic techniques.
3. To evaluate and compare the need for additional postoperative analgesia (rescue analgesia) in both groups.
4. To observe anaesthetic-related complications and overall patient tolerance of the two techniques, taking reference from prior data on scrotal and groin surgeries.

Materials and Methods

This was a prospective as well as retrospective randomized comparative study conducted in the Department of General Surgery of Government District Hospital, Kishtwar over a period of 6 years ranging from October 2019 to October 2025. The retrospective data was obtained from the medical records of the hospital.

Sample size and allocation: A total of 144 adult male patients (age ≥18 years) with uncomplicated unilateral vaginal hydrocele scheduled for elective hydrocelectomy were included. Patients were randomized into two equal groups of 72 each using a computer-generated randomization table:

Group LA: Hydrocelectomy under local anesthesia.

Group SA: Hydrocelectomy under spinal anesthesia.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Adult males (18–70 years)
- Unilateral, primary vaginal hydrocele confirmed clinically and by ultrasonography
- ASA physical status I–III

Exclusion Criteria:

- Recurrent hydrocele
- Giant hydrocele comparable to the size of the patient's head (requiring general or spinal anaesthesia preferentially)
- Associated inguinal hernia or other scrotal pathology needing additional procedures
- Known coagulopathy, local infection at puncture site, or contraindication to neuraxial block
- Allergy to local anaesthetic agents or opioids.

Anaesthetic Technique

Local Anaesthesia Group (Group LA)

- Spermatic cord block at the level of the external inguinal ring using 10–15 ml of 0.5% lignocaine with or without adrenaline after negative aspiration.
- Scrotal skin and subcutaneous infiltration at the proposed incision site using additional 5–10 ml of 0.5% lignocaine.
- Maximum total dose of lignocaine kept within recommended safety limits.

Spinal Anaesthesia Group (Group SA)

- Subarachnoid block in sitting position using 25- or 27-gauge spinal needle at L3–L4 or L4–L5 interspace.
- Injection of low-dose hyperbaric bupivacaine (e.g., 1.5–2.0 ml of 0.5%) with opioid adjuvant (e.g., fentanyl 25 mcg), following techniques used in low-dose spinal protocols for scrotal surgery.
- Desired sensory level up to T10 before incision.

Intraoperative monitoring (NIBP, pulse oximetry, ECG) was continuous in both groups, with supplemental oxygen by nasal cannula as required.

Surgical Technique: All patients underwent standard unilateral hydrocelectom (Jaboulay's/Lord's procedure with eversion/excision) through a transverse or longitudinal scrotal incision, as per surgeon preference and consistent with contemporary hydrocelectomy practice. Hemostasis was secured, a closed suction drain was placed selectively, and scrotal support was applied postoperatively.

Postoperative Management and Outcome Measures

- Pain was assessed using a 10-point visual analog scale (VAS: 0 = no pain, 10 = worst pain) at 2, 6, 12, and 24 hours postoperatively.
- All patients received a standard baseline analgesic regimen: oral NSAID (e.g., diclofenac 50 mg) 8-hourly for first 24 hours unless contraindicated.
- Rescue analgesia (extra analgesia) in the form of intramuscular diclofenac 75 mg or intravenous tramadol 50–100 mg was administered if VAS ≥4 or on patient request, consistent with similar scrotal and groin surgery protocols.
- Hospital stay was calculated from end of surgery to actual discharge (hours). Patients were discharged once ambulatory, pain controlled on oral medication, voiding spontaneously, and hemodynamically stable, in line with day-care criteria used for scrotal surgery.
- Anaesthesia related complications (hypotension, bradycardia, urinary retention, post-spinal headache, backache, nausea/vomiting, local hematoma, local anesthetic toxicity) were recorded.

Statistical Analysis: Data was analyzed using standard statistical software. Continuous variables were expressed as mean ± standard deviation and compared using Student t-test. Categorical variables were expressed as percentages and compared using chi-square test or Fisher's exact test as appropriate.

A p-value <0.05 was taken as statistically significant, following conventions in similar comparative anesthesia studies.

Results

A total of 144 adult male patients with unilateral primary vaginal hydrocele were enrolled and randomized into two equal groups of 72 patients each: local anaesthesia (LA) group and spinal

anaesthesia (SA) group. Both groups were comparable with respect to baseline demographic and clinical variables, including age, side of hydrocele, and ASA physical status distribution. The mean age was 43.6 ± 11.2 years in the LA group and 44.8 ± 10.7 years in the SA group, with no statistically significant difference. The proportion of right-sided hydroceles was 56.9% in the LA group and 59.7% in the SA group. The distribution of ASA I/II/III status (61.1%/31.9%/6.9% in LA vs 58.3%/33.3%/8.3% in SA) was also similar between groups.

Postoperative pain scores assessed using the visual analog scale (VAS) were consistently lower in the LA group at all recorded time points. At 2 hours postoperatively, the mean VAS score was 2.4 ± 1.1 in the LA group compared to 3.6 ± 1.4 in the SA group. At 6 hours, VAS scores were 2.8 ± 1.2 in the LA group versus 4.3 ± 1.5 in the SA group, representing the largest observed difference. At 12 hours, the mean VAS was 2.1 ± 1.0 in LA and 3.2 ± 1.3 in SA. By 24 hours, pain scores had decreased in both groups, but remained significantly lower in the LA group (1.4 ± 0.8 vs 1.9 ± 0.9). Thus, LA was associated with significantly better early postoperative pain control throughout the first postoperative day.

Hospital stay and functional recovery parameters favored the LA group. The mean time to ambulation was 3.1 ± 1.2 hours in the LA group, significantly shorter than 6.4 ± 2.1 hours in the SA group. Time to spontaneous voiding was also reduced with LA (4.0 ± 1.5 hours) compared to SA (7.2 ± 2.7 hours). Overall postoperative hospital stay was 20.8 ± 6.4 hours in the LA group, whereas patients in the SA group stayed for a mean of 26.1 ± 7.9 hours. A larger proportion of patients in the LA group could be discharged within 24 hours, while a significant number of SA patients required observation beyond 24 hours due to delayed voiding, residual motor block, or post-spinal complaints. The requirement for additional (rescue) analgesia was significantly lower among patients receiving LA. Only 22 of 72 patients (30.6%) in the LA group required extra analgesia compared to 43 of 72 patients (59.7%) in the SA group. The mean number of rescue doses per patient was 0.6 ± 0.8 in the LA group versus 1.4 ± 1.0 in the SA group. Correspondingly, the total mean dose of diclofenac/tramadol administered as rescue analgesia was 65 ± 32 mg in the LA group and 118 ± 47 mg in the SA group. These findings indicate that breakthrough pain was more frequent and more intense after SA than after LA once the initial block effect regressed.

Anaesthesia-related complications were more frequent in the SA group. Urinary retention requiring catheterization occurred in 1 patient (1.4%) in the LA group compared to 9 patients (12.5%) in the SA group. Post-spinal headache was not observed in the LA group but occurred in 6 patients (8.3%) in the SA group. Transient intraoperative or immediate postoperative hypotension/bradycardia was noted only in SA patients (5 cases, 6.9%), whereas no such events occurred in the LA group. In contrast, complications specifically related to LA were minor: 2 patients (2.8%) developed small local injection-site hematomas that resolved with conservative management. No systemic local anesthetic toxicity was observed in either group.

Overall patient satisfaction, assessed at first follow-up (postoperative day 7) on a 4-point scale, was high in both groups but slightly higher in the LA arm. In the LA group, 93.1% of patients rated their experience as “very satisfied” or “satisfied,” compared to 86.1% in the SA group.

A greater proportion of LA patients also expressed willingness to undergo similar surgery under the same anesthetic technique in the future, if required.

In summary, in this study of 144 adults undergoing unilateral hydrocelectomy, local anaesthesia was associated with significantly lower postoperative pain scores, shorter time to ambulation and spontaneous voiding, reduced hospital stay, lower need for rescue analgesia, fewer anaesthesia-related complications, and marginally higher patient satisfaction than spinal anaesthesia.

Baseline Characteristics

Both groups were comparable in terms of age, side of hydrocele, and ASA status. This similarity mirrors other prospective series in adult hydrocelectomy and scrotal surgery where demographic variables did not differ significantly between anesthetic groups.

Table 1: Baseline Characteristics of the study population

Parameter	Local Anaesthesia (n=72)	Spinal Anaesthesia (n=72)
Mean Age (years)	43.6 +- 11.2	44.8 +- 10.7
Right sided Hydrocele (%)	56.9	59.7
ASA I/II/III (%)	61.1/31.9/6.9	58.3/33.⅜.3

Postoperative Pain: Patients in the LA group reported significantly lower VAS scores in the early postoperative period. Prior scrotal and groin surgery studies have also shown that appropriately performed local or regional techniques can reduce

postoperative pain intensity compared to central neuraxial blockade or general anaesthesia.

Table 2: Mean VAS Pain Scores (0-10) at different time points

Time After Surgery	LA Group (mean+-SD)	SA Group (mean +-SD)
2 hours	2.4 +-1.1	3.6 +- 1.4
6 hours	2.8 +- 1.2	4.3 +- 1.5
12 hours	2.1 +- 1.0	3.2 +- 1.3
24 hours	1.4 +- 0.8	1.9 +- 0.9

At all measured intervals, LA provided superior pain control compared with SA, with the largest difference observed at 6 hours postoperatively. These findings support the use of well-executed local techniques for day-care scrotal surgery.

Hospital Stay: Mean postoperative hospital stay was significantly shorter in the LA group. Shorter stay with local anaesthesia has been reported in adult hydrocelectomy series and in other ambulatory scrotal surgeries.

Table 3: Hospital Stay and Time to Ambulate

Parameter	LA Group (mean+-SD)	SA Group (mean +-SD)
Time to Ambulation (hours)	3.1 +- 1.2	6.4 +- 2.1
Time to Spontaneous Void (hours)	4.0 +- 1.5	7.2 +- 2.7
Hospital Stay (hours)	20.8 +- 6.4	26.1 +- 7.9

Most LA patients could be discharged within 24 hours, while a significant proportion of SA patients required observation due to delayed voiding or post-spinal complaints, similar to patterns seen in varicocelectomy and hernia surgery studies.

Need for extra Analgesia: The requirement for rescue analgesia was markedly lower in the LA group.

Earlier trials of local versus spinal/infiltration techniques for scrotal procedures also report lower additional analgesic consumption when effective local anaesthesia is used.

Table 4: Additional Analgesia Requirements

Parameter	LA Group (n=72)	SA Group (n=72)
Patient needing extra analgesia (%)	22 (30.6%)	43 (59.7%)
Mean number of rescue doses per patient (mean +- SD)	0.6 +- 0.8	1.4 +- 1.0
Total Diclofenac/Tramadol doses (mean +- SD)	65 +- 32	118 +- 47

Patients under SA experienced more breakthrough pain after regression of the block and required more frequent and higher doses of rescue analgesics, increasing nursing workload and drug-related side effects.

Anaesthesia Related Complications and Patient Satisfaction: Complications such as urinary retention, post-spinal headache, and backache were observed predominantly in the SA group, consistent with known side-effect profiles of neuraxial anaesthesia. Local complications such as transient discomfort at injection site or minor hematoma were infrequent and self-limiting in the LA group, aligning with previous hydrocelectomy under local anaesthesia reports. Overall patient satisfaction, assessed on a 4-point scale at first follow-up (day 7), was high in both groups but slightly higher in the LA group, similar to prior data where almost all patients expressed willingness to undergo future scrotal surgery under local anaesthesia.

Table 5: Selected Complications and Satisfaction

Variable	LA Group (n=72)	SA Group (n=72)
Urinary Retention requiring catheter	1 (1.4%)	9 (12.5%)
Post Spinal Headache	0	6 (8.3%)
Transient Hypotension/bradycardia	0	5 (6.9%)
LA Site Hematoma	2 (2.8%)	-
Very Satisfied/Safisfied (%)	93.1	86.1

Discussion: The present comparative study of 144 adults undergoing unilateral hydrocelectomy demonstrates that local anaesthesia (LA) using spermatic cord block and scrotal infiltration is not only feasible but also offers several clinically relevant advantages over spinal anaesthesia (SA) with respect to postoperative pain, hospital stay, and need for additional analgesia. These findings are consistent with existing literature on hydrocelectomy and other inguinal/scrotal procedures, which have repeatedly shown that well-performed LA protocols can safely replace

more invasive anaesthetic techniques in appropriately selected patients. In this study, early postoperative pain scores at 2, 6, and 12 hours were significantly lower in the LA group compared with the SA group, with the largest difference observed around the 6-hour mark. This pattern is in line with comparative studies of LA versus SA in inguinal hernia repair, where pain intensity in the first 12 postoperative hours was significantly lower in patients receiving LA and where LA was associated with decreased analgesic consumption. The likely explanation is that the duration of effective analgesia from peripheral local infiltration and cord block can be tailored using appropriate volumes and agents to cover the immediate postoperative period, whereas the regression of spinal block can be followed by rebound pain once neuraxial anaesthesia wears off. Additionally, LA allows targeted blockade of somatic afferents from the scrotal tissues without the broader sympathetic and motor blockade produced by SA, potentially reducing central sensitization and postoperative discomfort.

The need for rescue analgesia in the present study was significantly lower in the LA group, both in terms of the proportion of patients requiring additional drugs and in total dose administered. Beyond patient comfort, reduced analgesic requirements translate into lower risk of NSAID- or opioid-related adverse effects, decreased nursing workload, and potential cost savings at the institutional level. The combination of lower pain scores and reduced need for rescue analgesia strongly supports LA as an analgesically superior option for straightforward adult hydrocelectomy when performed correctly.

Hospital stay in the LA group was shorter, and time to ambulation and spontaneous voiding was significantly improved compared with SA. In contrast, SA is intrinsically associated with delayed mobilization and voiding due to transient motor and autonomic blockade of the lower limbs and bladder, contributing to longer observation periods or overnight admissions.

The complication profile seen in this study also favors LA. Classic complications of SA, including urinary retention, post-spinal headache, and transient hypotension or bradycardia, were largely confined to the SA group, echoing observations from hernia and scrotal surgery comparisons where neuraxial techniques carried higher rates of these adverse events. In contrast, complications associated with LA—such as minor injection site hematoma or transient discomfort—were infrequent and easily manageable. Patient satisfaction in this study was high in both groups but numerically higher in the LA group, which is congruent with earlier hydrocelectomy and ambulatory surgery reports where the vast majority of patients indicated willingness to undergo similar procedures under LA in future if required. Contributing factors likely include rapid recovery, early oral intake, minimal restrictions, and avoidance of the characteristic side effects of SA or general anaesthesia, as well as the psychological reassurance of remaining awake yet comfortable during surgery.

Conclusion

Local anaesthesia using spermatic cord block and scrotal infiltration is a safe, effective, and well-accepted technique for adult unilateral hydrocelectomy, offering superior early postoperative pain control, shorter time to ambulation, and reduced hospital stay compared with spinal anesthesia. The need for extra postoperative analgesia was significantly lower with LA, and anaesthetic-related complications were fewer and less severe than those associated with spinal anaesthesia, which carried risks of urinary retention and post-spinal headache.

In resource-limited and high-volume settings, hydrocelectomy under local anaesthesia facilitates true day-care surgery, decreases costs, without compromising safety or satisfaction. For adult patients with uncomplicated unilateral hydrocele, local anaesthesia should be considered the preferred anaesthetic technique, reserving spinal anaesthesia for selected cases based on patient, surgeon, or anaesthetist considerations.

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