Total extra peritoneal Repair of Inguinal Hernia under General Anesthesia Versus Spinal Anesthesia

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ABSTRACT

Background: Total extra peritoneal inguinal hernia repair is established approach to inguinal hernia repair usually performed under general anesthesia. Aim of the study was to compare Total extra peritoneal inguinal hernia repair outcome when operated under spinal anesthesia and general anesthesia.

Methods: A prospective cross-sectional study was conducted at Bir hospital on patients undergoing Total extra peritoneal inguinal hernia repair under either spinal anesthesia or general anesthesia for inguinal hernia from September 2022 to August 2023. Operative time, postoperative hospitalization time, postoperative pain, postoperative adverse effects, level of satisfaction and recurrence rate at one year was compared.

Results: Fifty-eight patients were included, divided into two groups TEP-GA and TEP-SA, 29 in each arm. All procedures were completed by allocated method of anesthesia. Though pain score was low in TEP-SA in initial four hours, 2.79±1.08 (GA) and 1.99±0.97 (SA) and 2.28±1.09 (GA) and 1.80±0.80 (SA) at one and four hours post-operative respectively, no statistical difference was noted between two groups regarding surgery time, pain score complications, hospital stay, recovery or recurrence.

Conclusions: Spinal anesthesia is at par with general anesthesia for total extra peritoneal inguinal hernia repair, if not better. It may be appropriate anesthetic modality in patients considered high risk for general anaesthesia.

Keywords: general anesthesia; inguinal hernia; spinal anesthesia; total extra peritoneal inguinal hernia repair.

INTRODUCTION

Inguinal hernia accounts for 75% of abdominal wall hernia making its repair one of the commonest surgical procedure.[1,2] Minimally invasive techniques are favored for inguinal hernia because of less pain, early work return, less infection, better cosmesis, and patient satisfaction.[3] Most popular laparoscopic techniques for inguinal hernia repair are transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair. TEP is gaining popularity as abdominal cavity is not entered, hence avoiding organ injury and paralytic ileus. However, TEP may be associated with more technical challenges and has a stiff learning curve and outcome depends upon surgeon's expertise and experience.[4] General anesthesia (GA) is preferred in TEP because it provides complete muscle relaxation making surgery comfortable.[2,5] However, successful use of regional anesthesia like spinal anesthesia (SA), epidural or local in TEP repair has been reported.[6] This study aimed to study the efficacy of SA in TEP compared to GA.

METHODS

A prospective comparative (analytical) observational study was conducted at Bir hospital. The patients undergoing TEP under either GA or SA for inguinal hernia from September 2022 to August 2023 fulfilling study criteria were enrolled in the study by convenience sampling technique. The sample size calculated was 23 in each arm, based on incidence of inguinal hernia in Nepal (1.5%).[7] Ethical clearance was obtained from Institutional review board (Ref. 877/2076/77) and written informed consent was obtained from all patients. The sample size

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was 58. The patients randomized to either the GA or the SA groups by an independent computer programmer using www.randomization.com.

All the patients of age 18 years and above undergoing elective unilateral, uncomplicated inguinal hernia were included while those with history of spinal surgery or spinal deformity, pregnancy, complicated hernia- strangulated, recurrent, irreducible hernia, those with additional auxiliary procedures and those who had conversion of anesthesia or surgery procedure midway were excluded. Detailed history, clinical examination and relevant investigation reports of all patients were recorded in the data collection sheet preoperatively. TEP were performed by two surgeons (both with five years of experience in laparoscopic surgery) under either GA or SA.

Induction of general anesthesia was performed using 2-2.5 mg/kg of Propofol and 1 µg/kg of fentanyl intravenously followed by 0.6 mg/kg of Rocuronium injection to achieve muscle relaxation necessary for intubation. All patients were given 0.25 mg clonazepam per oral, a night before surgery to alleviate anxiety. Mechanical ventilations were performed for all patients by using an automated anesthesia device (Dräger Primus®; Dräger Medical Systems, Inc., Danvers, MA, USA) on volume control ventilation (VCV) mode. In VCV mode, tidal volume was set to 6-8 mL/kg, and respiration frequency was set to PetCO2 32-36 mmHg. Anesthesia was maintained with sevoflurane (1.5%-2%), an oxygen-air mixture (FiO2 = 0.4), and repetitive rocuronium doses (0.015 mg/kg). Additional injection paracetamol 1 gm and ketoral 30 mg was given intravenously in either group for analgesia. At the end of the surgery, neostigmine (2-2.5 mg) and atropine (1 mg) were given IV to antagonize residual neuromuscular block. GA group routinely received injection ondansetron 4mg at the end of surgery to avoid postoperative nausea and vomiting.

For spinal anesthesia, the patients were placed in a sitting position. The lower back was scrubbed with povidone-iodine solution and draped in a sterile manner. Xylocaine (1%) was infiltrated subcutaneously, followed by an 18-gauge introducer needle. A 25-gauge Whitacre needle was advanced until cerebrospinal fluid appeared. The patients randomly received either the hyperbaric bupivacaine (0.5%, 15 mg). Then, the patients were placed in a supine position till the completion of the procedure and sensorial block was examined by using the pinprick test at 1 min intervals. The surgery was begun after the sensorial block reached level T4. Additional support with other drugs, such as fentanyl, was available, if needed.

Surgical procedures were performed in supine position. A Foley catheter was introduced. A 10-mm incision was made in the skin below the umbilicus. The anterior rectus fascia was thereby rendered visible, and a horizontal 10 mm incision was made through it. After the rectus muscle was exposed, the preperitoneal area behind the muscle was dissected bluntly by using a Kelly clamp. The preperitoneal area was insufflated by using carbon dioxide gas at a pressure of 10 mmHg. A zero-degree videoscope was inserted through the port, a 5 mm trocar port was placed 3 cm above the symphysis pubis, and another 5 mm trocar was placed between the camera port and the suprapubic port. The inferior epigastric vessels were identified along the lower portion of the rectus muscle and protected. The anterior superior iliac spine was laterally dissected. The preperitoneal space was dissected, and the herniated sac was retracted by using atraumatic forceps. A 10 cm × 15 cm prosthetic graft was inserted through the camera port and placed on the anterior abdominal wall covering the Hesselbach's triangle, the internal inguinal ring. The graft was fixed to the pubic tubercle with a Tacker™ fixation device in all the patients. Surgery was performed by the same surgical team in both the groups. Surgery time was measured as the duration between beginning of the skin incision and skin closure.

All the patients were closely monitored with continuous electrocardiography, noninvasive arterial blood pressure, heart rate (HR), and peripheric oxygen saturation (SpO2). These parameters were recorded while inducing anesthesia for Group I and after the anesthesia procedure for Group II. The patients were monitored continuously during the surgery and for 24 hours afterward in the patient room. All the demographic features, comorbidities, the hospitalization period, the surgery time (from incision to last suture) were recorded. The surgical field pain level was evaluated with visual analog scale (VAS; 0= no pain to 10= severe pain). First, VAS levels was recorded in the postoperative recovery room in cooperation with the patients 1 (VAS 1) and at 4 (VAS4), 24 (VAS24) hours, one week, one month, and six months after the surgery. Undesirable postoperative events, such as headache, nausea/vomiting, right shoulder pain, anxiety, abdominal discomfort, and urinary retention, was recorded in both the groups. Any intraoperative complications such as vascular or nerve injury, peritoneal laceration, and visceral injuries was recorded. Any conversions from TEP to TAPP or from laparoscopic to open repair was recorded, along with the specific reason for conversion. Other complications, including hematoma or seroma formation and wound infections were also recorded. Oral intake started at six hours postoperatively and Foley catheter was removed at six hours. Urinary retention after that till discharge was

noted. Patient was discharged on 1st postoperative day (POD) unless there were any complications. Patient was followed up on 7th POD, at one month, six months, and one year.

Data analysis was done using the IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, N.Y., USA). Baseline characteristics were done using the Chi-square test for categorical variables and independent Student t-test for continuous variable. 95% confidence level was taken, and p-value less than 0.05 was termed as statistically significant.

RESULTS

A total of 86 patients underwent TEP during study period, out of which eight were bilateral inguinal hernia, 10 were recurrent /complicated inguinal hernia and two patients refused to participate leading to total of 62 cases. So either group were allotted 32 cases each, however one case of two TEP-SA group were converted to GA due to failure of spinal and cases were converted to GA due to peritoneal breach. One case of TEP-GA group was terminated due to cardiac issues on induction and two lost to follow-up so making it a total of 58 cases and 29 each group for final analysis.

Table 1. Demographic parameters.

	TEP-GA	TEP-SA	p-value
Sex, n (%)			0.641
Male	27(94)	26(90)	
Female	2(6)	3(10)	
Age (years) (Mean ± SD)	44.28±12.50	44.28±14.85	1.000
BMI Kg/m² (Mean ± SD)	23.90±4.23	23.17±3.97	0.504
Side (Right/ Left)	24/5	18/11	0.078
Duration (months) (Mean ± SD)	21.84±9.57	28.10±10.4	0.398
Type of Hernia, n(Direct/ Indirect)	4/25	6/23	0.082

Male population was predominant in either group making 94% of TEP-GA group and 90% in TEP-SA. Both the groups were comparable in age distribution with the oldest being 72 years of age. The average BMI was above 23.The population had higher incidence of hernia on right side compared to left. The mean duration of hernia symptoms was 21.84±9.57 months in GA-group and 28.10±10.4months in SA-group with the lowest duration being one month. Majority of the patient had indirect hernia while direct hernia seen in age more than 60 years. However, both the groups were comparable statistically in demographic characteristics (Table 1).

Table 2. Intraoperative and perioperative outcome.

	TEP-GA (n=29)	TEP-SA (n=29)	p-value
Difficulty in dissection	5	3	0.443
Bleeding	0	0	
Bowel injury	0	0	
Subcutaneous emphysema	2	2	1.000
Hypotension	2	2	1.000
Surgical duration (min) (Mean ± SD)	54.03±13.56	52.66±11.17	0.674
Headache	0	3	0.075
Vomiting	2	1	0.553
Hematoma	0	0	
Urinary retention	0	3	0.075
Hospital stay (Hours) (Mean ± SD)	25.46±3.37	25.41±3.33	0.969
Seroma	2	2	1.000
Wound infection	2	0	0.150
Return to work (Days) (Mean ± SD)	5.07±1.30	5.07±1.46	1.000
Recurrence in 1 year	0	0	

Extra-peritoneal space dissection was difficult in 17% cases in GA-group and in 10% cases in SA-groups (Table 2). Headache and urinary retention were noticed in only SA-group (statistically insignificant). Vomiting was seen in minority of patients in either group. Occurrence of post-operative hypotension and seroma was equal and statistically insignificant in either group. GA-group had wound infection in 6% of patients. The average surgery duration was less than one hour in either group with maximum duration of 100 minutes noticed in one patient in SA- group. The average duration of stay after TEP was slightly more than 24 hours in either group. All the patient

were satisfied with the surgery and average time taken to return to work was around 6 days. No recurrence was noted till one year postoperative visit.

Table 3. Postoperative pain scoring (VAS).

	TEP-GA	TEP-SA	p-value
Postop 1Hr VAS	2.79±1.08	1.99±0.97	0.103
Postop 4Hr VAS	2.28±1.09	1.80±0.80	0.239
Postop 24Hr VAS	1.21±0.26	0.86±0.09	0.279
Postop 7 days VAS	0.31±0.06	0.17±0.04	0.363
Postop 1 month VAS	0.7±.02	.03±.01	0.649
Postop 6 month VAS	0	0	

There were higher pain scores after first and four hours in GA-Group than in SA-Group (statistically insignificant; Table 3). The highest VAS was 4 which usually disappeared by 24 hours. Only three patients (two in GA-group and one in SA-group) had minimal discomfort till one month postoperatively which eventually disappeared on six month visit.

DISCUSSION

TEP is considered a good safety profile procedure for inguinal hernia repair.[8] Many previous studies have attempted to compare local, regional and general anesthesia, in order to improve the safety and efficacy of TEP.[9] GA is preferred by the surgeons as it provides complete muscle relaxation in laparoscopic hernia repair.[10] In this study we will be discussing about feasibility of SA in TEP.

The demographic characteristic in both arms of our study was statistically comparable somewhat similar to the previous studies.[10, 11] Difficulty in dissection was more for GA-group (17%) than SA-group (10%) (statistically insignificant) and this was attributed to long history of indirect hernia and the obesity of patients unlike previous studies by Donmez et al. and Li et al. which discussed the muscle relaxation by spinal anesthesia agent causing ease of dissection.[9, 10] The average duration of surgery was 54.03±13.56 minutes in GA-group and 52.66±11.17 minutes in SA- group which was comparable unlike previous studies by Donmez et al. and Hajibandeh et al. that reported longer duration of surgery under SA.[10, 12] It was hypothesized that this difference was a result of the SA procedure taking longer time. Post-operative stay was comparable in both groups and was limited to 25.46±3.37 hours (GA) and 25.41±3.33 hours (SA) which was comparable to Donmez et al. and Yildirim et al.[10, 11]

Incidence of seroma was 6% in either group which healed on its own without any intervention, Yildirim et al. reported higher incidence in SA-group while Hajibandeh et al. showed results comparable to this study.[11, 12] Wound infection was noticed in only GA-group but it was not significant like previous studies and was superficial, noticed in obese patients and healed on conservative management.[12] Headache and urinary retention were noted in 17% of SA-group, attributed to adverse effect of spinal agents. Other studies also reported these complications in both the arms however more in SA-group.[11-14] The average time taken to return to work was around six days and only six patients took 9-10 days to feel healthy to return to work who had seroma and wound infection which took extra three days to heal. However, it was statistically insignificant unlike previous studies where SA-group was faster to return to work.[12]

In the prospective study by Donmez et al., pain scores at the postoperative 1st and 4th hour were significantly lower in the SA-group than in the current study where the VAS was more for GA-group but statistically insignificant, which may be due to lasting analgesic effect of Bupivacaine.[10]

No recurrence was reported till 1 year of study in contrast to previous studies which reported 1-4% recurrence.[14-16] All the patient were equally satisfied at the time of discharge and one year follow up while previous studies have shown more satisfaction in SA-group attributing to low pain score in early post-operative period in those studies in contrast to current comparable pain score.[10, 11]

Limitation of this study was baseline medical problems of patients that could play roles as confounding parameters were not evaluated. Another limitation was bilateral hernias were not included which could prolong the duration and subsequent outcomes.

CONCLUSIONS

Spinal anesthesia is at par with general anesthesia for performing TEP, if not better. It may be an appropriate anesthetic modality in selected patients who are considered high risk for GA. Future high quality randomized studies may provide stronger evidence in favor of either approach.

CONFLICT OF INTEREST

None

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