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ORIGINAL ARTICLE

A COMPARATIVE STUDY OF RECOVERY TIME AFTER GENERAL ANESTHESIA AND SUBARCHNOID BLOCK FOR INGUINAL HERNIORRAPHY IN PACU

Dipalisingh[1], Shivaprakash S[2], Shiopriye[3], Sathyanarayan J[4], Srinivas V. Y[5]

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ABSTRACT: BACKGROUND: Inguinal herniorraphy is commonly performed on an outpatient basis under nerve blocks, local, spinal or general anesthesia (GA). We have selected inguinal herniorraphy under general anesthesia and spinal anesthesia (SA). **OBJECTIVE**: To compare the recovery time, postoperative pain and patient satisfaction in the Post Anesthetic Care Unit (PACU). **METHODS**: A prospective, single blinded, controlled study involved total 60 patients belonging to American Society of Anesthesiologists (ASA) I/II scheduled for elective repair of unilateral inguinal hernia. Randomization was done using computer generated random numbers. GA group received intravenous (IV) propofol (2mg/kg), butorphanol (40µg/kg) and skeletal muscle relaxation was achieved with vecuronium bromide (0.1 mg/kg). Patient was maintained with nitrous oxide and oxygen (66:33) and sevoflurane. SA group received 2ml of 0.5% of hyperbaric bupivacaine intrathecal in lateral decubitus position with 0.04mg/kg midazolam injection IV for sedation. Modified Aldrete scoring system, Visual Analogue Scale (VAS) and modified Bromage score were employed to assess recovery time. When pain score was more than 5, rescue analgesia was given with IV injection ketorolac 30mg. All data were analyzed statistically. **RESULTS**: Patients in GA group (136.23 ±17.82 minutes) showed a statistically significant ($p< 0.05$) recovery time to get shifted from PACU compared with patients in the SA group (176.00 ± 11.92 minutes). But patients in the SA group had significantly less VAS score pain (1.30±1.76 vs. 3.23±2.88), less number of patient received rescue analgesia (16.7% vs. 50%) and satisfaction was higher than GA group. **CONCLUSIONS**: We conclude that GA group resulted in faster recovery time from PACU but SA group had less post-operative pain and better satisfied.

KEYWORDS: Inguinal hernia, Post Anesthesia Care Unit, postoperative analgesia, and Visual Analogue Score.

INTRODUCTION: Inguinal hernia repair is a common surgical procedure and is typically performed on an outpatient basis. The choice of anesthetic technique depends on patient and surgeon preference, feasibility of the technique in a given patient, intra and postoperative pain control, early recovery and monitoring requirements (e.g., ability to fast-track), skills of the anesthesiologist. Local anesthesia or field block with intravenous (IV) sedation (Monitored Anesthesia Care), spinal anesthesia, and general anesthesia are all commonly used anesthetic techniques for out-patients undergoing inguinal herniorraphy procedures.[1]

Several surveys suggest that for this procedure most anesthesiologists choose GA (60–70%) and far fewer choose centroneuraxial blocks (10–20%) or field block anesthesia with sedation (5–15%) as the primary anesthetic technique.[2,3] Postoperative pain is expected but nonetheless

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undesirable 'by- product' of all surgical procedures. Inadequate pain control may result in increased morbidity or mortality.[4] In this study we compared the recovery time from Post Anesthesia Care Unit (PACU), Visual Analog Scale (VAS) and patient satisfaction with two standard anesthesia techniques in outpatients undergoing unilateral inguinal herniorraphy procedures.

METHODS: This was a prospective, randomized, single blinded controlled study duly approved by the hospital ethical committee and informed written consent was obtained from all the study patients. Randomization was done using computer generated random numbers.

Sixty patients of age group between 30-50 years belonging to American Society of Anesthesiologists (ASA) I/II, irrespective of caste, creed and socioeconomic status, were posted for elective open repair of a primary unilateral inguinal hernia using Bassini's Technique.

Patients with co-morbid conditions like ischemic heart disease, bronchial asthma, uncontrolled diabetes mellitus, uncontrolled hypertension, chronic renal disease, chronic hepatic disease, central nervous system disorders, and spinal deformities were excluded from the study.

Patients were randomly assigned to one of the two groups with 30 each in General anesthesia (GA group) and Spinal anesthesia (SA group) using a computer generated randomized number.

All patients were premedicated with oral 5mg diazepam at bed time and 2 hours prior to surgery. Patient were kept fasting from midnight for solids.

In patients of GA group, general anesthesia was induced with intravenous (IV) propofol (2mg/kg), butorphanol (40µg/kg) and endotracheal intubation was facilitated with vecuronium bromide (0.1 mg/kg). Patient was maintained with nitrous oxide and oxygen (66:33) and sevoflurane (inspired concentration of 0.8%). At the end of surgery reversal of residual neuromuscular block was achieved by using neostigmine and glycopyrrolate.

In SA group, unilateral subarachnoid block was administered under aseptic precautions using 25 gauze Quincke needle. All patients were preloaded with 500ml of 6% hydroxyethyl starch and 2ml of 0.5% of hyperbaric bupivacaine was administered in lateral decubitus with operating site in dependent position. Patients were then placed supine after 10 minutes. Supplemental oxygen (4 L/min) was administered by facemask throughout and sedation was achieved with IV midazolam 0.04mg/kg.

Intraoperative monitoring included electrocardiogram, non-invasive arterial blood pressure, heart rate and pulse oximetry.

After surgery patient stayed first in the Post Anesthesia Care Unit (PACU). Nurses were blind to the anesthetic technique used and had no access to the anesthesia record. Patients were evaluated using a modified Aldrete score and modified Bromage score by the PACU nurse who made decision regarding the patient's eligibility to discharge to the Ambulatory Surgical Unit (ASU) for complete recovery before being discharged home.

Duration of surgery was recorded which was defined as the time of incision to the time of completion of wound closure.

Recovery time was defined as the length of time from entry into PACU, until the patient is discharged to the ASU.

A visual analogue scale (VAS) with 0 = none to 10 = most severe pain was used to assess the intensity of pain at 60 minutes after the end of surgery. Whenever pain score was more than 5, rescue analgesia was given with IV ketorolac 30mg.

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Patient satisfaction with the anesthetic technique was evaluated using a three point scale[1] includes 1 = poor, 2 = good, 3 = excellent.

Patients were discharged from the PACU when they fulfilled the following criteria:

- Stable vital signs for 30 minutes or more.
- No new signs and symptoms after the operation.
- No active bleeding or oozing.
- Minimal nausea or emesis for 30 minutes or more.
- Intact neurocirculatory function without evidence of swelling or impaired circulation.
- Orientation to person, time and place.
- Minimal dizziness after changing clothes and setting for 10 minutes or more.
- Presence of responsible escort.

In our study the discharge criteria were scored using Modified Aldrete score.[5]

In addition to the above points, patients of SA group were also be assessed by Modified Bromage score to assess the recovery of the motor block.[6]

Post-operative nausea and vomiting (PONV) was also recorded in both the groups.

A minimum of 30 patients in each group would be required to detect a 20% reduction in recovery time in PACU with a power of 90% at the 0.05 level of significance. This group size would also be adequate to detect a 20% difference in VAS score of pain and nausea with a power of 0.8(α= 0.05). Data were analyzed using t test and Chi-square test with p value of less than 0.05 was considered as statistically significant. The SPSS for windows (version 10) statistical package (SPSS Inc., Chicago, IL) was used.

RESULT: Patients in both the groups had comparable demographics in relation to age, sex, weight, American Society of Anesthesiologists' (ASA) distribution, heart rate and mean arterial pressure (MAP) (Table 1). There were no statistically significant differences in duration of surgery (Table 2).

On comparison of recovery time from Post Anesthesia Care Unit (PACU), GA group showed significant ($p<0.05$) recovery time (136.23±17.82minutes) than in SA group (176.00±11.92minutes) (Table 2). While Visual Analogue Scale (VAS) score of pain at 60 minutes after the end of surgery showed significantly less in SA group (1.30±1.76) than GA group (3.23±2.88). There was significantly less number of patients of SA group (16.7%) received rescue analgesia (IV ketorolac 30mg) than GA group (50%) (Table 3).

Patient rated overall satisfaction for anesthesia technique as poor, good and excellent. In GA group it was 11(36.7%), 17(56.7%) and 02(6.7%) respectively whereas no patients in SA group showed poor satisfaction. It was found that spinal anesthesia was associated with significantly higher patient satisfaction scores than in general anesthesia. There was no significant difference in PONV in both GA group 5 (16.7%) and SA group 4(13.3%) (Table 3).

DISCUSSION: Daycare surgery is widely practiced now-a-days. It is very cost effective and increases patient satisfaction. There is greater flexibility in scheduling surgery and hospital burden is reduced. Also the rate of hospital acquired infections is decreased.

Inguinal hernia repair is commonest presentation in the outpatient setting. The choice of anesthetic techniques ranges from local infiltration to regional block to general anesthesia.

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In our study the discharge criteria were scored using Modified Aldrete score.[5] (Appendix I) In addition to the above points, patients of SA group were also assessed by Modified Bromage score to assess the recovery of the motor block.[6] (Appendix II)

The mean duration of recovery time from Post Anesthesia Care Unit (PACU) in GA group was 136.23±17.82 minutes whereas in SA group was 176.00±11.92 minutes, which was statistically significant ($p<0.05$) (Table 2). In a study similar to ours, Song D et al[1] compared recovery time after ambulatory inguinal hernia repair under regional nerve block with sedation(including propofol), general anesthesia using LMA and propofol, and subarachnoid block with 0.75% bupivacaine in a total of 81 patients.

They also found that recovery room times measured from end of operation to discharge were much longer with the long acting bupivacaine induced subarachnoid block than with LMA and propofol (280 vs. 171 minutes). Mulroy MF et al[7] compared general, epidural and spinal anesthesia for outpatient knee arthroscopy. 48 patients were randomized to receive either propofol – nitrous oxide general anesthesia with a LMA, 15-20 ml of 3% 2-Chloroprocaine epidural, or 75 mg of subarachnoid procaine with 20µg fentanyl.

They also found that the discharge time of spinal anesthesia group from PACU is prolonged than the general anesthesia and epidural group. Erhan E et al[8] had compared recovery profiles and side effects of spinal anesthesia and total intravenous anesthesia in patients undergoing varicocele repair. Subarachnoid block was given by 5mg of 0.5% hyperbaric bupivacaine with 25 µg of fentanyl and TIVA group received propofol and remifentanyl by infusion. In their study the patients undergoing varicocele repair under spinal anesthesia had longer discharge time.

Salonia A et al[9] had concluded from their study that spinal anesthesia resulted in a faster post-operative recovery than general anesthesia. However in our study we found that the discharge time is prolonged in spinal anesthesia as compared to general anesthesia. The prolonged discharge time in our study resulted from the delay in return of muscle power in the lower limbs.

However Burney RE et al[10] found no difference between short acting spinal anesthesia and general anesthesia in efficiency or in early or late outcomes after elective inguinal hernia repair. They had used 5% hyperbaric lidocaine for subarachnoid block and intravenous propofol with LMA for general anesthesia.

The possible reason is that they had used short acting lidocaine whereas we had used bupivacaine which is longer acting. Wong J et al[11] compared spinal anesthesia and general anesthesia for outpatient knee arthroscopy. They used 1% lidocaine for subarachnoid block and for general anesthesia they used propofol, fentanyl and maintenance with isoflurane and found that there was no difference in the length of stay in patients of both spinal and general anesthesia group.

The probable reason for early recovery of patients of spinal anesthesia group was that they had used shorter acting lignocaine for subarachnoid block.

The Visual Analogue Scale (VAS) scoring system was used in our study to grade the intensity of pain at 60 minutes after surgery. The mean VAS score of pain in GA group was 3.23±2.88 whereas in SA group it was 1.30±1.76. Thus SA group had significantly lower pain scores than GA group (Table 3). Hence, on the basis of the above findings spinal anesthesia provides better early postoperative analgesia as compared to general anesthesia.

The findings of our study are in concordance with the study conducted by Salonia A et al[9] in which they concluded that spinal anesthesia results in less postoperative pain than general

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anesthesia in patients undergoing radical retropubic prostectomy. Korhonen AM et al[12] randomized 64 knee arthroscopy patients to receive either 4mg of hyperbaric bupivacaine for spinal anesthesia or general anesthesia with desflurane, and found that the pain scores were significantly lower in patients undergoing operation under spinal anesthesia than in that undergoing inguinal hernia repair under general anesthesia.

In the study by Gonano C et al, [13] they concluded that spinal anesthesia group showed lower pain scores during their stay in PACU in patients undergoing hip and knee replacement surgery. Wong J et al[11] compared spinal anesthesia and general anesthesia for outpatient knee arthroscopy and found that the patients in the general anesthesia group had more pain and required more analgesic.

Patients receiving GA had significantly greater ($P < 0.0001$) occurrence and amount of intravenous pain treatment than those receiving SA. Patients with SA required less intravenous pain medication and less treatment for nausea/emesis.[14]

Patient satisfaction with the anesthetic technique showed that in GA group 11 (36.7%) patients reported a score of "poor" whereas none of the patients of SA group reported a score of "poor". 17(56.7%) patients of GA group and 19(63.3%) of SA group reported a score of "good". A score of "excellent" was reported by only 2(6.7%) of patients of GA group whereas 11(36.7%) patients of SA group reported excellent satisfaction. Hence, we found that spinal anesthesia was associated with significantly higher patient satisfaction scores than general anesthesia.

Song D et al[1] also found significantly higher patient satisfaction scores in patients of spinal anesthesia than patients undergoing inguinal herniorraphy under general anesthesia. In a study by Kemal Tolga Saracoglu et al[15] patient satisfaction was higher in the SA group, but this result did not affect the discharge rates from the hospital, with the SA group on an average taking 28 minutes longer discharge time. Spinal anesthesia provided sufficient post-operative analgesia.

PONV remains a common problem after anesthesia; these symptoms commonly result in discharge delays after ambulatory surgery.[16,17-21] In our study there was no significant difference in PONV in both GA group 5(16.7%) and SA group 4(13.3%). Using antiemetic with different sites of action may have reduced the risk of PONV in the GA group.[22-24]

Rapid recovery, adequate analgesia, prevention of PONV, and timely discharge are essential to a successful ambulatory anesthesia practice.[16,25,26] For hospital and the patient's perspective, there are advantages to using SA for outpatient unilateral inguinal hernia surgery. Spinal anesthesia (SA) was associated with longer time to discharge from PACU, less postoperative pain, and more satisfied with anesthesia technique.

Some perceived disadvantages of Para vertebral block (PVB) versus GA include the lack of training, the additional time required to perform the block, the possibility of block failure, and the potential that patients receiving block ultimately may have more pain when the block wear off.

Studies have demonstrated that the field block and/or ilioinguinal/iliohypogastric blocks are significantly more cost-effective anesthesia techniques than GA or spinal anesthesia[1]. Surprisingly, according to several large reports, GA remains the most commonly used anesthesia technique for inguinal herniorraphy, whereas local anesthesia is used in only 15%–18% of hernia operations.[2, 27]

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CONCLUSION: The following inferences were drawn from our study:

The patients who underwent inguinal hernia repair under spinal anesthesia had a longer recovery time compared to general anesthesia.

The pain scores in patients of spinal anesthesia group were lower assessed at 60 minutes after surgery and less number of patients was received rescue analgesia than general anesthesia

The patients who underwent inguinal hernia repair under spinal anesthesia were more satisfied with the anesthetic technique than general anesthesia.

So, both spinal and general anesthesia is suitable for day care surgery for inguinal herniorraphy with spinal anesthesia providing better patient satisfaction and pain relief. But, general anesthesia provides earlier recovery from the PACU.

Appendix I: The modified Aldrete Scoring System[8] for determining when patients are ready for discharge from the Postanesthesia Care Unit:

Activity: able to move voluntarily or on command

4 extremities---------- 2
2 extremities---------- 1
0 extremities---------- 0

Respiration:

Able to deep breathe & cough freely---------- 2
Dyspnea, shallow or limited breathing---------- 1
Apneic---------- 0

Circulation:

BP ± 20 mm of preanesthetic level---------- 2
BP ± 20-50mm of preanesthetic level---------- 1
BP ± 50 mm of preanesthetic level---------- 0

Consciousness:

Fully awake---------- 2
Arousable on calling---------- 1
Not responding---------- 0

O_2 saturation:

Able to maintain o2 saturation >92% on room air---------- 2
Needs o2 inhalation to maintain o2 saturation >90% ----- 1
O2 saturation <90% even with o2 supplementation --------0
A score ≥ 9 was required for discharge.
BP = blood pressure

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Appendix II: Modified Bromage Score.[9]

Score Criteria:

1. Complete block (unable to move feet & knees)
2. Almost complete block (Able to move feet only)
3. Partial block (Just able to move knees)
4. Detectable weakness of hip flexion while supine. (Full flexion of knees}
5. No detectable weakness of hip flexion while supine.
6. Able to perform partial knee bend.

	GA group (n=30)	SA group (n=30)
Age (years)	41.63 ± 9.40	43.87 ± 8.92
Gender (M:F)	30: 00 = 30	30: 00 = 30
Weight (kgs)	61.90 ± 8.96	62.37 ± 8.29
ASA distribution(I/II)	18: 12	19: 11
Heart Rate (bpm)	78.80 ± 5.56	75.47 ± 4.03
MAP (mm Hg)	74.53 ± 4.38	72.63 ± 5.39

Table 1: Patient data

	GA group(n=30)	SA group (n=30)	P value
Duration of Surgery (min)	55.60 ± 8.90	54.43 ± 9.00	-
Duration of stay in PACU (min)	136.23 ±17.82*	176.00 ± 11.92	< 0.05

Table 2: Duration of surgery and recovery time in PACU

p <0.05 = significance

	GA group(n=30)	SA group (n=30)	P value
VAS score in PACU	3.23±2.88*	1.30±1.76	<0.05
No of patient's receiving rescue analgesia	15(50%)	5(16.7%)*	<0.05
PONV in PACU	5 (16.7%)	4 (13.3%)	
Patient's experience of anesthesia excellent	02 (6.7%)	11 (36.7%)*	<0.05
Patient's experience of anesthesia good	17 (56.7%)	19 (63.3%)	
Patient's experience of anesthesia poor	11(36.7%)	00	

Table 3: Side Effects and Patient Satisfaction

p <0.05 = significance

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AUTHORS:

1. Dipalisingh
2. Shivaprakash S.
3. Shiopriye
4. Sathyanarayan J.
5. Srinivas V. Y.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Anaesthesiology, Vydhehi Institute of Medical Sciences & Research Center (VIMS & RC), Bangalore.
2. Assistant Professor, Department of Anaesthesiology, VIMS&RC, Bangalore.
3. Associate Professor, Department of Anaesthesiology, VIMS&RC, Bangalore.
4. Assistant Professor, Department of Anaesthesiology, VIMS&RC, Bangalore.
5. Associate Professor, Department of Anaesthesiology, MMC&RI, Mysore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Srinivas V. Y,
Associate Professor,
Department of Anaesthesiology,
Stone Building, K. R. Hospital,
MMC & RI, Mysore.
Email: drsrinivasvy@gmail.com

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