Comparison Of Total Intravenous Anaesthesia, Spinal Anaesthesia And Local Block For Day Care Inguinal Herniorrhaphy

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Abstract

Background: A successful day care surgery with a good anaesthetic technique provides the benefit of early recovery and cost reduction. As there is no consensus regarding the choice of anaesthesia for daycare inguinal herniorrhaphy, this study was designed to evaluate the clinical efficacy of three anaesthetic techniques for this surgery. Methods: 60 ASA I/II patients of age 18-70 yrs, scheduled for elective inguinal herniorrhaphy were randomized into three groups: Group T (n=20) receiving TIVA, Group S (n=20) receiving spinal anaesthesia and Group L (n=20) receiving local block. Preparation time, surgical time, reversal time, discharge from PACU, cost effectiveness and patient and surgeon satisfaction were compared using appropriate statistical tests.Results: The preparation timewas 12 ± 2 minutes with TIVA, 14 ± 2 minutes with local anaesthesia and 17 ± 3 minutes with spinal anaesthesia (p<.001). The surgical time wassimilar (p=0.629). The reversal time was longest in group T while it was similar in Group L & Group S (p<.001). All patients in the three groups bypassed PACU except one patient in group T. The average cost of drugsused was lowest in group S and highest in group T (p<.001). Patient satisfactionand surgeon satisfactionwas similar with TIVA and spinal anaesthesia and least with local anaesthesia. Conclusion: Local anaesthesia has a rapid turnover time but it is the least preferred technique. TIVA and spinal anaesthesia are comparable in terms of clinical efficacy however, spinal anaesthesia is the most economical and preferred technique.

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INTRODUCTION

Inguinal herniorrhaphy is a common day care surgical procedure and can be performed safely under regional or general anaesthesia. [1] Since inguinal hernia is rarely associated with serious complications, it is an ideal surgical procedure for ambulatory settings. Outpatient inguinal herniorrhaphy has been associated with remarkable reductions in cost without any obvious increase in complication rates or recurrence of hernia. [2] An ideal outpatient anaesthetic technique would provide for excellent operating conditions, a rapid recovery, no postoperative side effects and high patient satisfaction. In addition to increasing the quality and improving the operating room efficiency, the ideal anaesthetic technique would also decrease the costs of the anaesthetic services in the form of rapid turnover of the patients and provide for an early discharge. [3]

Little information is currently available in the literature comparing total intravenous anaesthesia using propofol and sufentanil with local anaesthesia or low dose spinal anaesthesia for outpatient inguinal herniorrhaphy. We, therefore, conducted this prospective randomized study to compare these three anaesthetic techniques for daycare inguinal hernia repair, with respect to preparation and discharge times as well as cost effectiveness and patients' and surgeons' satisfaction.

MATERIALS AND METHODS

After obtaining approval from Hospital Ethics Committee, 60 outpatients of ASA physical status I/II of either sex in the age group of 18-70 yrs scheduled to undergo elective surgery for inguinal hernia repair with their due consent were included in this study. Patients with large irreducible or

bilateral hernias, respiratory, cardiac or metabolic diseases, peripheral neuropathy, psychiatric diseases and spinal deformity were excluded.

Patients were randomly allocated to receive total intravenous general anaesthesia with propofol and sufentanil (Group T, 20 patients), spinal anaesthesia (Group S, 20 patients), and local block (Group L, 20 patients). After shifting the patient to the operation theatre, routine monitors were attached (ECG, SpO_2, NIBP) and intravenous access was established. All patients received injection midazolam 0.03mg/kg intravenously as standard premedication.

Group T, received TIVA 5 minutes after intravenous midazolam, with a bolus dose of sufentanil 0.5μg/kg. 3 minutes later, propofol 1-2 mg/kg was given intravenously. After 90 seconds, a suitable size Laryngeal Mask Airway (LMA) was placed. Propofol infusion @ 100μg/kg/min was started as soon as LMA was placed and sufentanil infusion was started @0.5μg/kg/hr after 15 minutes of placing LMA. The infusion rate of propofol and sufentanil were titrated according to hemodynamic parameters and to avoid arousal in response to noxious stimuli. Sufentanil infusion was stopped with the beginning of skin closure and propofol infusion was stopped as soon as the last surgical skin suture was placed followed by removal of LMA.

Spinal anaesthesia was performed in group S under aseptic conditions by injecting 7.5mg (1.5ml) of hyperbaric bupivacaine at the L_{2-3} interspace through a 25G Sprotte needle in the lateral position with the operable site dependent. After injection of the drug, the patient was kept in the same position for 15 min with a 5-10º head down tilt. When a complete loss of pinprick sensation at the level of T_{10} is obtained, the patient was made supine and judged ready for surgery.

Group L, received local anaesthesia by blocking ilioinguinal, iliohypogastric and genitofemoral nerves. A skin weal was raised 2 cm medial to the anterior superior iliac spine to block the ilioinguinal and iliohypogastric nerves and 10ml of 0.25% plain bupivacaine was infiltrated under the external oblique aponeurosis in a fan like manner. The second weal was raised just lateral to pubic tubercle to block the genital branch of genitofemoral nerve by infiltrating 5ml of 0.25% plain bupivacaine intradermally and subcutaneously, and another 5ml in the direction of umbilicus to block nerve twigs overlapping from the opposite side. 5ml of 0.25% plain bupivacaine was infiltrated subcutaneously in the line of incision. When a complete loss of pinprick sensation over the surgical site is observed, patient was judged ready for surgery.

If the local block or spinal anaesthesia was inadequate or the patient complained of pain during procedure, intravenous sufentanil 0.1μg/kg was given to a maximum dose of 0.3μg/kg. If the patient still complained of pain, general anaesthesia was administered using propofol for induction and isoflurane in O_2 and N_2O for maintenance using LMA as a standard spontaneous respiration technique.

The time from premedication to readiness for surgery (preparation time) was recorded in all patients. Also, the time taken by surgeon from incision to closure (surgical time) and from skin closure to transfer from operating room (reversal time) was noted.

The adequacy of anaesthesia to surgical needs was evaluated by the surgeon at the end of procedure using a scale based on adequacy of muscle relaxation (yes-2, no-1), excessive bleeding (yes-1, no-2), patient's response to surgical stimulus (yes-1, no-2), surgeon's preference of using same anaesthetic technique (yes-2, no-1). A score of 7 or 8 indicated that surgeon is fully satisfied, 5 or 6- partially satisfied, 4- unsatisfied with the anaesthetic technique used.

At the end of surgery, patients were transferred to post anaesthesia care unit (PACU). During PACU stay, patient was assessed every 30 min for up to 4 hr for pain using Visual Analogue Scale (VAS) of 100. If a VAS of ≥30 was recorded, rescue analgesia was provided with i.v. tramadol (100 mg). Discharge time was judged by modified Aldrete's score (Appendix 1). When a score ≥9 was observed, patient was transferred from PACU.

Patient satisfaction was evaluated 1hr after surgery by asking whether they would choose to have the same type of anaesthesia if operated on again in future.

A direct cost comparison was performed based on cost of all drugs used in the three techniques.

Any side effects of the techniques like urinary retention, nausea, vomiting, respiratory depression, headache, transient neuralgias, shivering were observed and documented.

STATISTICAL ANALYSIS

Initial sample size estimation of 20 patients in each group was based to ensure the power of 90% with an alpha error of

0.05 for this scientific study.

The preparation time, surgical time, reversal time, discharge time and cost effectiveness were analyzed using the analysis of variance.

Patient and surgeon satisfaction were analyzed using chi square test.

RESULTS

No differences in age, weight, height, gender and ASA physical status distribution were reported among the three groups. (Table 1)

Figure 1

Table 1: Demographic profile of patients in the three study groups

S.No		Group L	Group S	Group T	p Value
1.	No.of patients	20	20	20	
2.	Age(yrs)	46 ± 15	37 ± 16	42 ± 15	0.152
3.	Height (cm)	166 ± 7	162 ± 10	165 ± 7	0.170
4.	Weight (Kg)	64 ± 7	60 ± 8	64 ± 7	0.096
5.	ASA grade I/ II	18/ 2	17/ 3	18/ 2	0.851

These are the average values of the above variables (mean ± SD).

The Preparation time observed in the three groups was significantly different (p <0.001) with shortest time in Group T (11.6 ± 1.8 minutes). It was 14.2 ± 2.4 minutes in Group L and 17.4 ± 3.2 minutes in Group S.

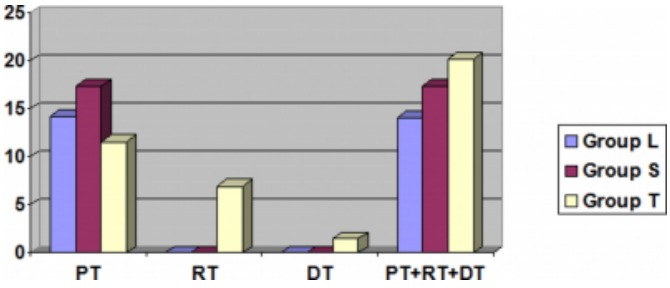
Reversal time i.e. the time taken from surgical closure to the transfer of patient from operating room (OR) to post anaesthesia care unit (PACU) was again found to be significantly different (p <0.001) with maximum time taken in Group T (7 ± 3.1 minutes). In Group S and Group L, this time was zero i.e. patients could be shifted out of OR immediately after surgical closure.

All patients of the three groups bypassed PACU according to modified Aldrete score of ≥ 9 (Discharge time zero) except one patient in Group T had a discharge time of 30 minutes. The main parameter affected in Group S was 'activity', in Group T was 'consciousness' (Aldrete score of 9), while in Group L, Aldrete score of 10 was observed in the immediate postoperative period.

When the three groups were compared with respect to sum of preparation time, reversal time and discharge time, Group L had the minimum of it (14.1 ± 2.2 minutes), which is again statistically significant (p=0.001). In Group T, it was 20.2 ± 7.1 minutes, which is statistically insignificant from that of Group S, 17.4 ± 3.2 minutes (p=0.120). (Figure 1)

Figure 2

Fig 1: COMPARISION OF VARIOUS TIMES IN THE THREE STUDY GROUPS. (IN MINUTES)



The average cost of drugs used in Group S was least while maximum in Group T (p<0.001).

(Table 2)

Figure 3

Table 2: Cost of drugs used in the three groups (mean ± SD)

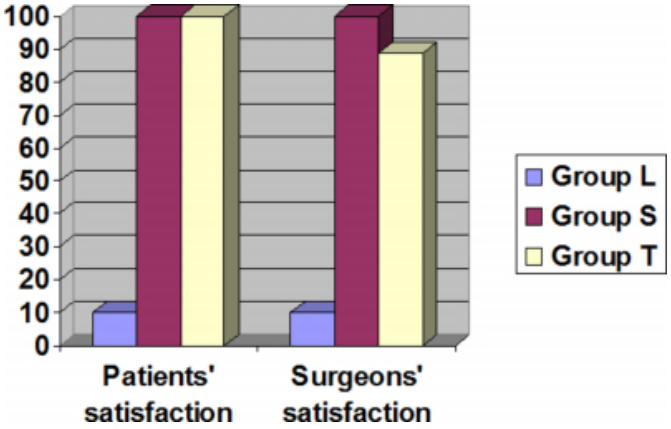
	Group L	Group S	Group T	p Value
Cost (Rs)	45.0 ± 0	15.0 ± 0	964.0 ± 220	<0.001

Regarding patients' acceptance, 90% of patients in Group L will choose another anaesthetic technique if to be operated again in future. This is against the 100% patient satisfaction in Group S and Group T (p<0.001).

Surgeons also gave a preference to use spinal anaesthesia for inguinal hernia repair (100% surgeons fully satisfied in Group S. with a score of 8). In Group L, only 10% of the surgeons were fully satisfied (score of 7) while 90% were partially satisfied (score of 5) with the anaesthetic technique used. In Group T, although 89% of the surgeons were fully satisfied (score of 7), they preferred to use spinal anaesthesia over TIVA. (Figure 2)

Figure 4

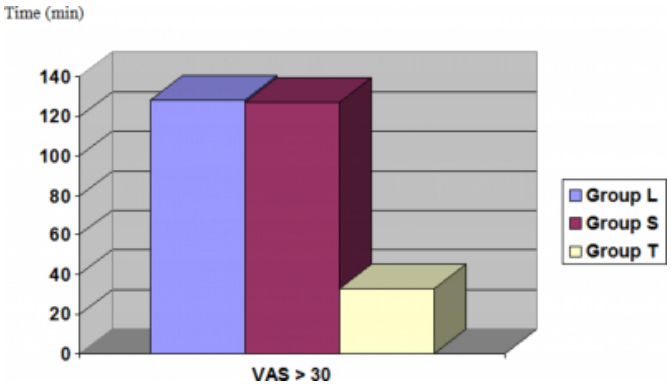
Fig 2: COMPARISION OF PATIENTS' AND SURGEONS' SATISFACTION AMONG THE THREE GROUPS. (IN PERCENTAGE)



VAS 30 was observed at an average time of 128 29.5 minutes in Group L, 127 49.5 minutes in Group S and 33 13.7 minutes in Group T, which indicates that Group T required analgesia much earlier than in Group L and Group S (p<0.001). (Figure 3)

Figure 5

Fig 3: COMPARISION OF TIME IN MINUTES AT WHICH RESCUE ANALGESIA WAS PROVIDED (VAS 30).



In Group T, one patient was given conventional general anaesthesia due to inadequate jaw relaxation with propofol. In Group L, sufentanil supplementation was done in 14 patients, while GA was administered in 3 patients after having inadequate pain relief inspite of giving intravenous sufentanil of 0.3g/kg. None of the patient in Group S received sufentanil supplementation or GA.

In Group S, 4 patients had intraoperative shivering after giving spinal anaesthesia, but it was relieved by covering the patient with cotton and by giving warm intravenous fluids. One patient had intraoperative nausea and vomiting.Two patients in Group T had postoperative shivering, which was managed conservatively.

DISCUSSION

The day care procedures, in which the patients are admitted to hospitals for surgery and discharged on the same day, were used modestly in the 1970s. In the past couple of decades, with the increase in ambulatory surgery and the move from major to less invasive procedures, recovery from anaesthesia has become an important attractive proposition. [4]

Although the surgery time was similar in all three study groups, the preparation time i.e. the time from premedication to readiness for surgery was shortest with total intravenous anaesthesia, while it was longest with spinal anaesthesia. Casati and coworkers, [5] who compared TIVA, spinal anaesthesia and combined sciatic femoral nerve block for outpatient knee arthroscopy, observed that the mean preparation time was shorter with TIVA and equal for both spinal anaesthesia and sciatic femoral nerve block. Also, a similar comparative study of spinal block and TIVA with propofol and remifentanil for gynecological outpatient procedures by Danelli and coworkers [6] showed that the median preparation time was shorter with general anaesthesia as compared to spinal block, p<0.001.

The reversal time i.e. the time taken from skin closure to transfer of patient from the operating room (OR) to post anaesthesia care unit (PACU), was maximum with TIVA and was nil with regional anaesthesia as the patient could be shifted out of OR immediately after surgical closure. This suggests that total intravenous anaesthesia with short acting anaesthetic drugs provides a shorter preparation time but the longest reversal time.

All the patients in three groups bypassed PACU i.e. they could be shifted directly to DSU (Day Surgery Unit) except one patient in group T. These results are consistent with those of Danelli and coworkers [6] who found no differences in discharge time from PACU in the two groups of spinal anaesthesia and TIVA.

Patients receiving spinal anaesthesia require a longer stay in the DSU than the patients receiving general and local anaesthesia. This is mainly related to the need for recovery of neurological and bladder functions before discharging the patient. [7] This fact is substantiated in this study, as 95% patients of spinal group regained full return of activity at 210 minutes and all patients of TIVA group regained full

consciousness after 30 minutes making an Aldrete score of 10. However, low dose spinal anaesthesia in the dose of 7.5 mg of 0.5% hyperbaric bupivacaine to patients in the spinal group, hastens the discharge of patients with early ambulation and lesser side effects. Casati and coworkers [5] used 8 mg of 0.5% hyperbaric bupivacaine and found that the mean duration of stay in DSU was shorter after spinal anaesthesia as compared to peripheral block.

When the three study groups were compared with respect to sum of preparation time, reversal time and discharge time, local anaesthesia group was found to have a rapid turnover as compared to spinal and general anaesthesia groups.

Direct cost comparison based on cost of all drugs used in the three techniques indicated spinal anaesthesia to be most economical while TIVA the costliest. The findings of this study are consistent with Dajun Song and coworkers [8] who found that the cost of drugs used during the intraoperative period was highest with general anaesthesia and lowest with spinal anaesthesia.

Patient acceptance was 100% in group S and group T, while it was just 10% in group L indicating that 90% of the patients receiving local anaesthesia will choose another anaesthetic technique if to be operated again in future. The findings are consistent with those of Asma Sultana and coworkers [9] who compared local anaesthesia and spinal anaesthesia for inguinal herniorrhaphy. They found that although patient receiving Local anaesthesia had earlier return to ambulation, intraoperative discomfort was significantly more with this technique.

This is in contrast to the findings of Dajun Song and coworkers [8] who found IHNB-MAC (ilio hypogastric nerve block as part of monitored anaesthesia care by providing propofol sedation), as the best technique with respect to patient comfort. This difference in results can be due to the choice of patients, size of hernia and the level of sedation provided to the patient.

Surgeons also prefer TIVA over local anaesthesia due to better patient satisfaction and the availability of modern short acting anaesthetic drugs. However, low dose spinal anaesthesia is again the most desirable anaesthetic technique as the patient remains comfortable & conscious and can follow the intraoperative commands.

Patients receiving TIVA required rescue analgesia at a much earlier time (33 ± 14 minutes) as compared to those receiving spinal and local anaesthesia. This is because of the short acting intravenous opioid sufentanil used for TIVA and hence early needed postoperative analgesic.

Since, day care surgery is now practiced widely throughout the world, the quality of operating conditions and a rapid recovery with minimal expenditure, has gained importance. It is a universal view that postoperative patients should not overburden the primary health care facilities.

Thus, it is concluded from this prospective study that, local anaesthesia has a rapid turnover time but it is the least preferred technique. TIVA and spinal anaesthesia are comparable in terms of turnover time, patient acceptance and surgeon satisfaction; however, low dose spinal anaesthesia is the most economical and preferred technique.

APPENDIX 1

MODIFIED ALDRETE SCORE

Figure 6

Variable evaluated	*Score*
Activity	
Able to move four extremities on command	2
Able to move two extremities on command	1
Able to move no extremities on command	0
Breathing	
Able to breathe deeply and cough freely	2
Dyspnoea	1
Apnoea	0
Circulation	
Systemic blood pressure ± 20% of preanaesthetic level	2
Systemic blood pressure 20% to 49% of preanaesthetic level	1
Systemic blood pressure ± 50% of preanaesthetic level	0
Consciousness	
Fully awake	2
Arousable	1
Not responding	0
Oxygen saturation (Pulse oximetry)	
>92% breathing room air	2
Needs supplemental oxygen to maintain saturation > 90%	1
< 90% even with supplemental oxygen	0

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