Feasibility of Local Anesthesia in Various Upper Abdominal Surgical Procedures; A Tertiary Care Hospital Study

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Significance:
Many studies are available comparing the efficacy of local anesthesia and general anesthesia in other fields of surgery, but the data is scarce related to limited upper abdominal surgery. The purpose of our study is to assess the efficacy of local anesthesia as compared to general anesthesia in various upper abdominal surgical procedures.

Abstract

Background: This study was conducted to evaluate the feasibility of local anesthesia (LA) instead of general anesthesia (GA) in upper gastrointestinal abdominal procedures including open gastrostomy, gastrojejunostomy, gastroduodenal disjunction, jejunostomy and traction esophageal stenting.

Materials and Methods: This study was conducted at Thoracic surgery department, Nishtar Hospital Multan, Pakistan from September,1st-December,31st,2020. Out of 147 patients 80 and 67 patients were operated under LA and GA respectively. Age, BMI, gender, procedure performed, etiology, mean time, stay in recovery, PONV, postoperative pain at 4, 8, 12 hours, postoperative sedation and discomfort, within 3-and 7-days postoperative mortality were documented and compared between the two groups.

Results: Mean age of the patients in group LA was significantly higher as compared to group GA($p<0.001$). Procedure time was 30.06±12.01minutes and 34.42±11.76minutes ($p=0.029$), mean duration of stay in recovery was 2.31±5.68minutes and 18.80±6.40minutes($p<0.001$) in group LA and GA, respectively($p=0.029$). Postoperative discomfort was also higher in group GA as compared to group LA($p=0.001$). The incidence of PONV was 12.5% and 35.8% in group LA and GA, respectively($p=0.001$). Complaint of postoperative pain was 16.2% and 37.3% at 4 hours($p=0.004$); 18.8% and 35.8% at 8 hours($p=0.020$); and 21.2% and 26.9% at 12 hours($p=0.426$) in group LA and GA, respectively.

Conclusion: For performing various upper abdominal procedures, LA is safe for the patients who are medically unfit for GA. Moreover, LA is associated with lesser adverse effects as compared to GA. Patient is more comfortable and there is better pain relief in early postoperative period.

Introduction:

In the field of surgery and allied, we need temporary loss of consciousness and awareness for the painless performance of surgical procedures, which would be impossible in conscious patient [1]. To achieve this state of unconsciousness and unawareness, we use anesthesia. Anesthesia has various components which include analgesia, paralysis and amnesia [2]. There are two broad categories of anesthesia, general anesthesia and local anesthesia [3]. General anesthesia encompasses complete loss of consciousness, full analgesia and gain of complete muscle relaxation [4]. Whereas these qualities are partially lacking in local anesthesia.

General anesthesia while very safe, is more likely to cause adverse effects as compared to local anesthesia. This is the type of anesthesia which requires very close monitoring of the patient, before, during and after the procedure, to address any type of adverse effects in time and to watch for the possibility of more severe complications [5]. All the body systems are affected one way or other as the drugs used to induce general anesthesia are injected into the systemic circulation [6]. When a patient undergoes a general anesthesia, the autonomic nervous system is compromised [7]. A significant decrease in pulse rate as well as arterial blood pressure has often been concomitant with general anesthesia induced with propofol [8]. Sometimes, it is not possible to induce general anesthesia in severely malnourished and debilitated patients, which can otherwise lead to higher morbidity and even mortality [9]. Least number of adverse effects are expected while giving local anesthesia to the patients, while those occurring are very mild and can be controlled very easily. Local anesthesia includes the injection of anesthetic agents into a smaller part of the body over which any sort of intervention is being performed [10]. This numbs that local area but the attainment of muscle relaxation is not possible. Local anesthesia is being widely used in a lot of medical fields including dental surgery, total knee arthroplasty, hernia repair, open gastrostomy and non-intubated transpleural thoracic surgery with significant lesser risk of complications.

Procedures including open gastrostomy is performed in patients with esophageal injury due corrosive ingestion and those with post cricoid area squamous cell carcinoma [11]. Gastrojejunostomy is performed in patients with pyloric cancer or pre-pyloric obstruction due to corrosive injury [12]. Feeding jejunostomy and gastroduodenal disjunction is performed in patients with cancer of stomach or who ingested corrosive substance

leading to stomach destruction [13]. Traction rigid esophageal stenting is performed in patients with lower esophageal carcinoma. Majority of these patients are debilitated and having multiple co-morbidities which makes them high risk for general anesthesia.

Many studies are available comparing the efficacy of local anesthesia and general anesthesia in other fields of surgery [14, 15] but the data is scarce related to limited upper abdominal surgery. The purpose of our study is to assess the efficacy of local anesthesia as compared to general anesthesia in various upper abdominal surgical procedures. This study was conducted to evaluate the feasibility of local anesthesia instead of general anesthesia in upper gastrointestinal abdominal procedures including open gastrostomy, gastrojejunostomy, gastroduodenal disjunction, jejunostomy and traction esophageal stenting.

Materials and Methods

Current study is a prospective randomized controlled trial conducted in the Department of Thoracic Surgery, Nishtar Medical University and Hospital Multan, Pakistan. The data was collected over a period of four months from September 1st, 2020 to December 31st, 2020. Data was collected over four months and total 147 patients could be selected for the study. Before the performance of any sort of procedure, informed written consent was taken from all patients.

Five Procedures which could be performed under both local as well as general anesthesia were undertaken after dividing the patients into two groups based on fitness for anesthesia. Total 80 patients, unfit for GA, were operated under local anesthesia while 67 patients were operated under general anesthesia. The procedures performed included open gastrostomy, gastrojejunostomy, gastroduodenal disjunction and feeding jejunostomy and traction rigid esophageal stenting. Patients with large abdominal mass, severe respiratory distress, BMI >28 kg/m^2 and bleeding tendencies were excluded from our study.

For general anesthesia, propofol was the inducing agent and succinylcholine was used as muscle relaxant. Basic principles of general anesthesia were followed. For local anesthesia, 40 ml of 2% lidocaine and 10ml of 7.5% ropivacaine diluted in 150ml of normal saline was used. Painkillers and sedating agents (midazolam 3-5 mg) were injected intravenously before the infiltration of local anesthesia. Pain free environment was achieved with Nalbuphine 10mg diluted in 10ml of normal saline, given as intravenous injection. Intravenous metoclopramide 10mg was used to prevent the sensation of nausea and vomiting following nalbuphine and midazolam injection. Continuous infusion of 200mg tramadol in 1000ml ringer's lactate was given during the procedure. Oxygen supplementation was given and pulse rate, SpO_2, respiratory rate and blood pressure were monitored continuously throughout the whole procedure.

Age, BMI, gender, type of procedure performed, primary etiology, mean procedure time, stay in recovery, postoperative nausea and vomiting (PONV), postoperative pain at 4 hours, 8 hours and at 12 hours, postoperative sedation, postoperative patient discomfort (on a scale of 1 to 10, 1 being the least and 10 being the most), within 3 days postoperative mortality and within 7 days mortality were documented and compared between the two groups.

Grade of postoperative sedation was assessed as: 0=Alert, 1= Arouse to voice, 2= Arouse with gentle tactile stimulus, 3= Arouse with vigorous tactile stimulus, 4= No awareness. All the data was collected on a pre-designed Performa by the researcher himself. Nominal data was compared by applying chi-square test and continuous data was compared by applying independent t-test. Mann Whitney U-test was applied to compare grade of postoperative sedation. Data was analyzed with SPSS version 23.0. Significant value of p was ≤ 0.005.

Results:

Mean age of the patients in group LA was significantly higher as compared to that of patients in group GA ($p<0.001$). There was no statistically significant difference in term of BMI, gender distribution, type of procedure performed, and underlying etiology ($p>0.005$). Procedure time was shorter in group LA ($p=0.029$). Mean duration of stay in recovery was significantly longer in group GA ($p<0.001$). Table-I

The incidence of PONV was significantly lower in group LA than in group GA. Complaint of postoperative pain at 4 hours and 8 hours were significantly lower in group LA, while there was no statistically significant difference at 12 hours. Postoperative sedation was significantly higher in group GA. With 3-days mortality was not significantly different between the two groups but within 7-days mortality was significantly higher in group GA. Postoperative discomfort was also higher in group GA patients as compared to group LA patients. Table-II.

Discussion

In our study, we observed that the time required to perform the procedure was shorter in the patients who were undergoing any type of surgical intervention under local anesthesia. Various outcomes were significantly much better in the local anesthesia group. Muscle relaxation cannot be achieved with local infiltration of the anesthesia [4]

in mildly sedated patients, therefore, this was not compared between the two groups. In our reference study by Bach JR et al. [16], successful open gastrostomy was observed under local anesthesia. We modified our study to evaluate the effectiveness of local anesthesia in various other upper abdominal surgical procedures. In current study, postoperative within 7 days mortality was higher in the general anesthesia group.

Table-I Baseline Characteristics

Factor	Group-LA (n=80)	Group-GA (n=67)	p-value
Age, years (mean± S.D)	39.15±12.89	29.76±14.63	<0.001
BMI, kg/m^2 (mean± S.D)	23.87±3.11	24.67±3.03	0.120
Gender (Male/Female)	46/34	46/21	0.164
Type of Procedure, n (%)			
Open Gastrostomy	25 (31.2)	22 (32.8)	0.994
Gastrojejunostomy	18 (22.5)	15 (22.4)	
Gastroduodenal disjunction	16 (20.0)	14 (20.9)	
Feeding jejunostomy	12 (15.0)	10 (14.9)	
Traction esophageal stenting	9 (11.2)	6 (9.0)	
Underlying primary Etiology, N (%)			
Corrosive ingestion	27 (33.8)	10 (14.9)	0.060
Carcinoma esophagus	19 (23.8)	23 (34.3)	
Cancer pyloric area	24 (30.0)	26 (38.8)	
Neurological	10 (02.5)	8 (11.9)	
Procedure time, min	30.06±12.01	34.42±11.76	0.029
Stay in recovery room, min	2.31±5.68	18.80±6.40	<0.001

Data is entered as mean ± S.D unless mentioned otherwise.

Faizer et al. [17] conducted a study in 2019. Endovascular repair of ruptured abdominal aortic aneurysms was performed under local and general anesthesia. In the group of patients who were treated under local anesthesia, number of intraoperative transfusions and crystalloids were decreased, intraoperative time and length of ICU stay were shorter, and postoperative pulmonary complications were lesser as compared to those patients who were treated under general anesthesia. Mortality was 15.5% in local anesthesia group as compared to 23.3% in general anesthesia group. Muton et al. [18] conducted a similar study and found out that there was significantly lesser in hospital mortality (18.5%) in local anesthesia group as compared to 28% in general anesthesia group.

Table-II Outcome Variables and Adverse Effects

Variable	Group-LA (n=80)	Group-GA (n=67)	p-value
PONV, N (%)	10 (12.5)	24 (35.8)	0.001
Postoperative Pain, N (%)			
At 4 hours	13 (16.2)	25 (37.3)	0.004
At 8 hours	15 (18.8)	24 (35.8)	0.020
At 12 hours	17 (21.2)	18 (26.9)	0.426
Postoperative Sedation, median(IQR)	1(0-1)	2(2-3)	<0.001
Postoperative Mortality, N (%)			
Within 3-days	1 (1.2)	3 (4.5)	0.231
Within 7-days	1 (1.25)	6 (9.0)	0.029
Patient discomfort score	2.37±1.19	4.55±1.38	<0.001

Data is put as number (percentage).
PONV=postoperative nausea and vomiting

Kim et al. [19] studied thyroidectomy and selective neck dissection. Local and general anesthesia group included 30 patients each. The incidence of throat discomfort, postoperative nausea and vomiting and voice changes was significant less in local anesthesia group. They suggested use of local anesthesia for thyroidectomy and selective neck dissection.

Various other studies have shown that the patients, who were operated under general anesthesia, complained of postoperative pain. When ropivacaine was injected around the incision, postoperatively, very good analgesic effects were achieved [20-23]. LeBlanc et al. [20] did a systemic review and concluded that some studies have revealed the effectiveness of postoperative local anesthetic infiltration in reducing the pain, while the results were not good enough in other studies. According to Sun JX et al. [21], local infiltration of anesthetics after open hepatectomy gave promising results in terms of relieving postoperative pain, increasing the rate of postoperative recovery and lessening surgical stress responses to a great extent. Non-randomized studies have shown good results in carotid endarterectomy performed under local anesthesia but there were no clear-cut results observed in the randomized control trials [22].

Gulur P et al. [23] observed in their study that the supplementation of local anesthesia to the general

anesthesia resulted in significant decrease in postoperative pain. This might be due to the prolongation of the intraoperative effects or via continued infiltration of the local anesthetic through the placement of the catheter. Yeap YL et al. [24] have suggested that TAP block provides more effective and constant analgesic effect than wound infiltration with local anesthetics and result is higher patient satisfaction. These results contradict with those observed in current study.

Above mentioned data suggests that local anesthesia can be a very effective replacement for general anesthesia and these results are in accordance with the results observed in our study. Various short upper abdominal procedures have shown better outcome when performed under local anesthesia rather than when performed under general anesthesia. Performing these procedures under local anesthesia on regular basis can save the patients from the stress of general anesthesia.

Conclusion

For performing various upper abdominal procedures, local anesthesia is safe and a good alternative to general anesthesia for the patients who are medically unfit for general anesthesia. Moreover, local anesthesia is associated with lesser adverse effects as compared to general anesthesia. Patient is more comfortable and there is better pain relief in early postoperative period.

Conflict of interest: Authors do not have any conflict of interest to declare.

Disclosure: None

Human/Animal Rights: No human or animal rights are violated during this study.

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