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Original Article

Comparative Evaluation between Local and Spinal Anaesthesia for Inguinal Mesh Hernioplasty in Elderly Patients with Limited Cardiac Reserve.

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Abstract

Background

The choice of anaesthesia technique, based on its advantages and disadvantages in elderly patients with limited cardiac reserve will be influenced by the patient's comorbid diseases. The aim of the study was to compare the effects of spinal anaesthesia and local anaesthesia in elderly patients with limited cardiac reserve for inguinal mesh hernioplasty.

Material and Methods

In the present study 60 male patients between the ages of 65 to 92 with limited cardiac reserve, reported for mesh hernioplasty were equally divided in two groups. One group received spinal anaesthesia (SA) and the other group received local anaesthesia with nerve block (LA). Effectiveness and complications of both the group were evaluated.

Results

All patients had comorbid cardiac diseases with limited cardiac reserve along with hernia. Perioperative and postoperative complications were significantly more in SA group. All the surgeons and patients were satisfied with the operating conditions.

Conclusion

Nerve block anaesthesia with skin infiltration for inguinal mesh hernioplasty in elderly patients with limited cardiac reserve is recommended, as it is safe, patient friendly with less postoperative complications.

Key Words: *Cardiac disease, Elderly, Inguinal hernia, Local nerve block anaesthesia, Mesh repair, Spinal anesthesia.*

Introduction

Hernia is a Latin word that means rupture of a portion of a structure [1]. It is an abnormal protrusion of an organ or part of an organ or other structure through the wall of a cavity normally containing it. Till date 87 various types of hernias have been described [2]. Amongst all these right indirect inguinal hernia is the commonest and 80% to 90% are male patients [3]. The

aim of treatment of inguinal hernia is strengthening the abdominal wall by surgical repair as muscle weakness plays a major role in the etiology. Various techniques have been adopted viz, Bassini's repair, darn repair, shouldice's repair and so on [4,5]. But polypropylene mesh repair is very popular to strengthen the abdominal wall [6,7]. A large number of elderly patients with hernia also suffer from co

existing cardiac diseases, which lead to reduced cardiac reserve. Apparently these cardiac diseases may be stable in his day-to-day life, but may manifest as life threatening during surgery [8]. Myocardial ischaemia may occur in upto 25% of these cases whereas 1-3% cases may develop myocardial infarction during surgery [9]. Goal of hernia surgeries and anaesthesia in such problematic elderly patients should be to reduce recurrence, the most reliable and safe anaesthesia which is acceptable to patients and surgeons, less postoperative complications, cost, less hospital stay and quick return to normal life [4, 10]. Moreover, today anaesthesia technique should be customized according to the experience of anaesthesiologists. The concept of 'tailored surgery' for hernia repair has been well stressed in the recent guidelines of the "European hernia society" published in "hernia" in 2009, which recommends to take advantages of local anaesthesia for hernia repair. This is a grade A recommendation with high scientific impact [11]. Today the surgical and anaesthesiology groups of the world have welcomed these recommendations. But still it could not gain the momentum. So the purpose of the present study was to compare spinal with local anaesthesia with nerve block skin infiltration for mesh repair of inguinal hernia in elderly patients with limited cardiac reserve.

Materials and Methods

After obtaining approval from the hospital ethical committee 60 male patients in the age group of 65-92 who reported to Nobel Medical College Teaching Hospital for inguinal hernia repair during the period April 2015 to April 2016 with limited cardiac reserve due to some cardiac ailment, as evident clinically during preanaesthetic check-up (PAC) by "Match stick test" and "Breath-holding test" and willing to participate in the study were randomly and equally divided into two groups viz spinal

anaesthesia (SA group) and local anaesthesia with nerve block (LA group) by using sealed envelope technique. Morbidly obese patients, incarcerated or obstructed or strangulated hernias, hernia with hydrocele, recurrent hernia, bilateral hernia, sensitivity to local anaesthetics and patients with bleeding disorders or on anticoagulants were excluded from the study.

All the patients were thoroughly examined and investigated at the preanaesthetic clinic. CBC, blood sugar, renal and cardiac profile, chest X-ray, ECG, and trans thoracic echocardiography were done. The patients who had positive "Matchstick test" and "Breath-holding test" of <20s were subjected to PFT, TMT or stress TMT. An Ejection fraction <35%, a positive TMT or stress TMT indicated a reduction of cardiac reserve. Patients with positive coronary angiography were excluded from the study. All the medications were continued but aspirin was stopped 7 days before surgery. On the previous evening of operation and 2 hours prior to surgery all the patients received tab. lorazepam 2 mg and tab. ranitidine 150 mg orally.

On arrival at the OR every patient was put on standard noninvasive monitor to record SPO₂, HR, SBP, DBP, MAP. An IV access with 18-gauge cannula was established to start infusion of ringer lactate /normal saline at the rate of 6 ml/kg of body weight 20 minutes before anaesthesia. O₂ was administered throughout the surgery and any significant happenings or abnormality was immediately documented and corrected. All the blocks were performed under strict aseptic conditions.

Technique of spinal anaesthesia

Lumbar puncture for all the patients in spinal anaesthesia group were done in sitting position via a midline approach with a 25 G quincke needle. After a successful dural puncture with free flow of CSF, spinal anaesthesia was performed with 15mg of

0.5% heavy bupivacaine and immediately patient was put on supine position.

Technique of nerve block

In local anaesthesia group, all the nerve blocks were performed with 1% preservative free lignocaine hydrochloride (loxicard) mixed with freshly prepared adrenaline to make strength of 1:200000. The nerve supply of the inguinal region is from the last two thoracic and the first two lumbar nerves via the iliohypogastric, the ilioinguinal and the genital branch of genitofemoral nerves. In addition, a few nerve twigs overlap from the opposite side over the spine of the pubis.

For successful block Macintosh's technique was followed, 3 wheals were raised

- 1) 2cm medial to the anterior superior iliac spine
- 2) Over the spine of the pubis
- 3) Half inch above the midpoint of the inguinal ligament which corresponds to the deep inguinal ring
- 4) At the base of the scrotum to block the spermatic cord.

Through wheal one a 22/23G large needle (3" to 3 ½ ") is introduced vertically backwards until it is felt to pierce the aponeurosis of the external oblique with a slight click. After aspiration, 15 ml of 1% solution is injected so that both the ilioinguinal and iliohypogastric nerves are surrounded and blocked. It is safe at this point, as a needle-inserted perpendicular will not pierce the peritoneum. Five ml solution is also deposited in all layers in the small area of tissue between the wheal and the anterior superior iliac spine.

Through wheal 2 about 5 ml of solution is deposited in the intradermal and subcutaneous layers in the direction of the umbilicus. This blocks the nerve twigs from the opposite side. Through wheal 3 a 22G, 2" hypodermic needle is inserted perpendicular to the skin until it pierces the aponeurosis of the external oblique. At this level another 10 ml of 1% solution was

injected to block the genital branch of the genitofemoral nerve. Through wheal 4, five ml of 1% solution was injected in the spermatic cord after holding it firmly between the thumb and index finger of the left hand, taking extreme precaution not to inject the drug in the pampiniformplexus or injure the vas deferens.

Lastly, using a 25 G, quincke type spinal needle an intradermal and subcutaneous infiltration with 5ml of 0.5% solution was administered to produce perfect analgesia keeping the total dose of lignocaine with adrenaline less than 500mg.

If during dissection of the neck of sac pain was experienced, 2 ml of 1% solution was reserved for injection in the extra peritoneal pad of fat at the neck of the sac. But no patient needed this. All the patients were sedated with midazolam 2mg IV and fentanyl 50mcg IV.

Three experienced surgeons and two anaesthesiologists were involved in the whole research. Surgeons were requested to perform sharp dissection, not to pull the spermatic cord and sac harshly, to be gentle with the gut and omentum, when these were the contents of the sac and to cauterize even small oozes as LA drug was mixed with adrenaline.

Approximate size mesh was fixed with coarse interrupted sutures overlapping the lateral tail of the mesh to provide a snug fit around the cord. After surgery the patients were transferred to post anaesthesia care unit where patients were monitored for pain, nausea, vomiting, hypotension, wound hematoma and urinary retention.

During and after surgery, surgeons and all the patients were asked to express their opinion and satisfaction level about the whole procedure.

Results

In the present study we observed and analyzed the most relevant and important preoperative, perioperative and postoperative data of all the patients and

clubbed them in table 1 to table 6 for comparative evaluation between the two groups.

Table 1: Primary data of the study

There were no statistical significant differences (p values) in age and location of hernia. But there is a significant statistical difference between the 2 groups regarding the type of hernia. (Table 1)

S. N	Comorbids	SA group	LA group	TOTAL
1	H/o Coronary artery disease	4	10	14
2	Angina pectoris (stable) with ECG changes	3	6	9
3	History of Myocardial Infarction	2	4	6
4	Coronary artery disease with DM /stroke/syncope/COPD	2	4	6
5	Mild (well compensated) valvular heart disease	7	1	8
6	Conduction defects 1 st degree heart block	5	1	6
7	Ectopics	5	1	6
8	Atrial fibrillation with h/o syncope	2	3	5

Table 2: Comorbid diseases

Factors	SA group	LA group	Independent T test	pValue
Age (mean \pm SD)	73.86 \pm 6.274	73.13 \pm 6.230	0.45469 (58)	0.651
Sex	M	M		
Details of hernia	SA group	LA group	Chi square	pValue
Site			0.0733	0.787
Right	20	19		
Left	10	11		
Type			32.9	<0.001
Direct	28	6		
Indirect	2	24		

Table 3: Comorbid disease according to ASA classification

All the 60 patients in the present study had some comorbid disease (Table 2). The total number of patients in ASA III and ASA IV were much higher (27) in the LA group than SA group (13), which is statistically significant. (Table 3)

ASA	SA group	LA group	Chi square	pValue
II	17	3	14.7	<0.001
III and IV	13	27		

TABLE 4: Perioperative complications

One of the most striking features of the study was statistically significant increase in the incidence of perioperative complications in SA group. (Table 4).

Factors	SA group	LA group	chi square	p value
Hypotension			30.9	<0.001
Mild >upto 20mmHg	16	8		
μ Moderate upto 20-40mmHg	14	4		
μ Severe <40mmHg	8	2		
Bradycardia	23	6		
Tachycardia	12	10		
Arrhythmia	16	2		
Cardiovascular collapse	4	0		
Respiratory depression	2	6		
Hypertension	3	8		
Nausea	16	4		
Vomiting	8	0		
Surgery time	50-65 mins	60-75 mins		

Only 2 patients in LA group had arrhythmia (PSVT, 1st degree heart block) whereas 16 patients in SA group had arrhythmia (ventricular ectopics, 1st degree heart block, transient ST depression)

There was not much difference in the operating time between the two groups.

TABLE 5: Intraoperative pain (VAS score) and operating condition (surgeons opinion)

Factors	SA group	LA group	chi square	p value
Pain μ 1-2-nil μ 3-4-mild discomfort μ 5-7-moderate pain μ 8-10-severe pain	25 2 1 2	18 6 5 1	6.14	0.105
Operating condition (surgeons opinion) μ Excellent μ Good μ Satisfactory μ Unsatisfactory	15 10 1 4	10 15 2 3	2.48	0.48
Patients opinion (scale of 5) μ Absolutely satisfied μ Very satisfied Moderately satisfied μ Satisfied Disappointed	13 7 6 2 2	5 10 8 4 3	5.24	0.264
Sedation and analgesics Midazolam Fentanyl	1-2 mg 30-50 mcg	2-2.5mg g 50-150mcg		

Mild discomfort or no pain was reported by maximum number of patients in both the groups and this was statistically insignificant. (Table 5)

There were 3 failures in LA group. Though the requirement of midazolam and fentanyl were more in LA group but overall assessment of the satisfaction level in both the groups shows no statistical difference. Satisfaction level as per patient’s opinion, show that more than 90% in both the groups were satisfied with the surgical and anaesthetic procedures and there is no statistical difference between the groups.

TABLE 6: Early post op complications and side effects

Factors	SA group	LA group	chi square	pValue
Postop complications · Hypotension · Urinary retention · Local hematoma · Infection · Nausea/vomiting · Itching	22 20 3 1 15 2	5 5 12 3 5 14	37.9	<0.001
Hospital stay Mean ±SD (days)	4 ± 1.082 days	2 ± 0.74 days		

Statistically significant more number of patients in the SA group had postoperative complications. But the incidences of itching and local hematoma were much higher in LA group. LA group also had less hospital stay. (Table 6)

Discussion

Any type of protrusion of abdominal cavity contents due to the weakness of the abdominal wall in the inguinal region is called inguinal hernia [12]. Curative treatment of this type of pathology is exclusively surgical. Since Bassini’s period (1844-1924) various methods of hernia repair have evolved for better results. All researchers agree that the ideal method of repair is one that causes minimal discomfort to the patient, technically simple, should have low rate of complications and recurrence [13,14]. So now everybody recommends use of prosthetic mesh, which allows tension free repair of hernia [15]. Repair of hernias are generally performed under general anaesthesia, regional anaesthesia (spinal or epidural) with their inherent risks. This risk

is more in cases of elderly patients where the patients had associated cardiac, pulmonary or other illness [16,17]. Another alternative technique of anaesthesia for hernia repair is local anaesthesia that has minimal side effects or perioperative and early postoperative complications. Several studies [18-20] like the present study and the grade A recommendation of the "European Hernia Society" in the year 2009 have shown that local anaesthesia provide best clinical, economical benefits to the patients as well as it is safer and patient friendly than other techniques.

Local anaesthesia again maybe stepwise infiltration anaesthesia with moderate to deep level of sedation or analgesics. But deep sedation sometimes may produce problems in very elderly patients with cardiorespiratory or other comorbid diseases. International literatures, current evidences as well as general recommendations of the "European hernia society" suggests the use of ilioinguinal nerve blocks with stepwise local infiltration anaesthesia [7,11,21]. But the nerve supply of the inguinal region is from last two thoracic and first two lumbar via ilioinguinal, iliohypogastric and genital branch of genitofemoral nerves. In addition, some overlapping fibres from the opposite side also innervates the small area on the medial part of inguinal region. So the present study was designed to block these three nerves and the overlapping fibres from the opposite sides separately to have a better quality of anaesthesia. As all these patients in the present study had limited cardiac reserve it was planned to use preservative free lignocaine and to add adrenaline to it to make the strength 1:200000 as this type of solution is not available in the world market. We used this type of solution for 3 reasons. 1) Loxicard is used for treating arrhythmias so may have some benefit in patients with limited cardiac reserve. 2) Less toxicity as it does

not contain preservative 3) Expert opinion-our experience to use this type of solution in such cases for more than 3 decades with good results. But "PubMed" search did not reveal any report of this type. The present study show that for inguinal hernia repair, LA with nerve block along with skin infiltration with preservative free lignocaine with adrenaline; 1:200000 offered several advantages over spinal anaesthesia. It is also safe and patient friendly and surgeons graded the operating condition to be good or excellent. Moreover, added advantage is it does not have the specific side effects and complications of spinal anaesthesia, like PDPH, spinal hematoma, permanent neurological sequel and transient radiculitis. So the current recommendation of several researchers like T Callesen, H Kehlet, EY Akcaboy, ZN Akcaboy[22,23] and the "European hernia Society" (grade A 2009) is to use LA for repair of inguinal hernia if there is no contraindication. But still today spinal and lumbar epidural anaesthesia are very popular with their inherent risks particularly in elderly with comorbid diseases for hernia repair because it is easier and quicker to administer and anaesthesiologists are well trained. The cardiovascular effect gets augmented after SA because the chemical sympathectomy always extends 2-6 dermatomes above the sensory level [24]. Patients of coronary artery diseases have fixed diameter vessel, so hypotension leads to decreased O₂ delivery, less cardiac output and a further drop of blood pressure. It is problematic to administer rapid intravenous fluids in these cardiac patients, so vasopressor remain the only choice. Moreover, systemic vascular resistance in elderly cardiac patients may decrease to 25% of normal, making them more vulnerable to hypotension and resistant to treatment [24]. Because of all these effects most of the authors traditionally recommend to avoid spinal

anaesthesia particularly in elderly patients with ischaemic and other heart diseases. All these problems do not occur in nerve block anaesthesia [5]. However, despite the advantages of LA this technique could not gain the wide scale popularity of the surgeons and anaesthesiologists [25,26] outside dedicated hernia centers [27].

In reality many other factors play a part like tradition, surgeons preference, time taking particularly for the inexperienced anaesthesiologists, inadequate training, fear of failure of the block. Many anaesthesiologists finish their training without much exposure in this field. So in practice they feel uncertain about the block and instead use other techniques like SA, epidural, GA and thereby expose their patients to much more hazards[28]. But a well-trained anaesthesiologist should be exposed to all types of anaesthesia during training so that he or she can tailor the safe anaesthetic need of his patient, which is the basic concept, and talk of today's "customized" "tailored surgery".

Conclusion

"In many cases local anaesthesia means least strain to the patients" T.Gordh (1907-2010)

The present study substantiates this old saying of Gordh and concludes that between spinal and local anaesthesia for inguinal mesh hernioplasty for elderly patients with limited cardiac reserve, local anaesthesia with nerve block along with skin infiltration with preservative free lignocaine with adrenaline; 1:200000 should be considered and practiced as it is better, safer and an effective choice. Properly administered by experienced anaesthesiologists nerve block for mesh hernioplasty is patient friendly with less incidence of anaesthesia related complications, hospital stay, cost and offers a hemodynamically stable patient. This technique needs more intense training to residents and trainees as -

"Bright is the ring of words; when the right man rings them up"

- Robert Louis Stevenson (1850-1894)

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