IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 5 Ser.3 (May. 2021), PP 22-29
www.iosrjournals.org

Inguinal Hernioplasty: Comparison Of Local, Spinal And General Anaesthesia

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Abstract
Background:Inguinal hernia repair is one of the most performed operations worldwide. Today local anesthesia is the most preferred type over spinal and general anesthesia in daycare hernia surgeries. Advantages are post-operative pain relief, early mobilization, shorter hospital stay, and low costs. The medical fitness of patients, surgeons' skills, and technical factors also play a significant role. Hence, this study will help us decide the effectiveness of local and spinal anesthesia over general anesthesia in daycare hernia surgeries.
Aims and Objective:*To determine whether local anesthesia is an acceptable alternative to spinal anesthesia for inguinal hernia repair. Especially regarding operative condition, patient's and surgeon's satisfaction, postoperative pain, and cost-effectiveness.*
Material and Methods:*Data was collected by meticulous history taking, careful clinical examination, appropriate hematological and radiological examination, operative finding, and follow-up. Fifty patients were operated on for inguinal hernioplasty from 2004 to 2007in general surgery,RNT Medical college Udaipur Rajasthan.*
Ten patients operated under general anesthesia, twenty patients operated under spinal anesthesia, and twenty patients were operated under local anesthesia. All were male patients. The average age at presentation was 46.88 years. Concurrent medical illness was present in 28% of patients, for local anesthesia field block technique was used.
Results
Preferred anesthesia for all uncomplicated inguinal hernia was local anesthesia; it is safe, effective, and economical. Immediate pain relief was more in the local anesthesia group as compared to the spinal anesthesia group. In contrast, after 24 hours, there was no significant difference in pain score between the three groups.
Conclusions
It is concluded that local anesthesia can be a preferred method in daycare hernia surgeries owing to its advantage. However, the experience of the surgeons and patients should also be looked upon in such cases.
Keywords
Inguinal hernioplasty, Local anesthesia, Spinal anesthesia, daycare surgery.

Date of Submission: 29-04-2021 Date of Acceptance: 13-05-2021

I. Introduction

Sir Astley Paston Cooper has perfectly described as "no disease of the human body belonging to the province of the surgeon require in its treatment a better combination of accurate anatomical knowledge with surgical skill than hernia in all its varieties." Inguinal hernia is one of the most common problems encountered by surgeons accounting for about 10-12% of all patients.

The inguinal hernia operation is one of the most commonly performed operationsworldwide, can be done under general, spinal, epidural, and local anesthesia depending upon a variety

Of factors viz. surgeons' skills, patients' medical condition, patient's acceptance, safety condition, cost-effectiveness, etc. [1,2,3].

Recently there has been a revival in the use of local anesthesia techniques for hernioplasty [4,5,6]. Several retrospectives and randomized controlled trials have shown that local anesthesia provides the best

clinical and economic benefits to the patients. Obviously, the choice of anesthesia will be influenced by the patient's preferences and needs and also by local resources and skills.

In specialized hernia centers, local anesthesia is often preferred for daycare open hernia repair because of its simplicity, lowcost, early return to the home and lack of potentially detrimental cardiovascular effects observed with regional or general anesthesia [7,8].

The present study was designed to determine whether the local anesthetic technique was an acceptable alternative to spinal anesthesia for hernia repair, especially regarding operative conditions, patients' and surgeons' satisfactions, post-operative pain relief, complications, and economic benefits.

Techniques of local anesthesia are:

1. Surface anesthesia

It is produced by topical application of local anesthetics to mucous membranes and abraded skin.

2. Infiltration anesthesia

It consists of injection of a dilute solution of local anesthesia under the skin in the area of operation to block the sensory nerve endings.

3. Conduction block

It is further divided into: -

a. Field block: It is performed by injecting the local anesthesia subcutaneously in such a manner that all the nerves coming to the fields are blocked.

b. Nerve block: It is done by injection of the local anesthesia around the anatomically local nerve trunk or plexus.

Cocaine was the first local anesthetic discovered. Gadecke, in 1855 first isolated an extract from the leave of coca plant Erythroxylon coca.

II. Material and Method

This study was conducted in the Department of Surgery, RNT Medical college Udaipur Rajasthan. We study in 50 patients of inguinal hernia repair using local, spinal, and general anesthesia.

Inthis study, patients were divided into three groups.

Group A-Includes 20 patients in which hernioplasty was done under local anesthesia.

Group B- Includes 20 patients in which hernioplasty is done under spinal anesthesia.

Group C- Includes ten patients in which hernioplasty was done under general anesthesia.

Technique and amount of local anesthesia:

This study shows that the average amount of local anesthetic solution (2% xylocaine +0.5% bupivacaine in 1:1 ratio) required for the field block technique of inguinal hernia repair is 24 mlaverage range of 21-28ml for unilateral hernia repair. The amount of local anesthetic solution used depends upon the built of the patients. However, when used within the limit of 5mg /kg bodyweight xylocaine and 2mg/kg body weight bupivacaine, sign and symptoms of toxicity had never been experienced in the present study.

III. Observation and Result

Table 1: Age-wise distribution

Age group	Male	Female	Total no. patients	%
15-25	9	0	9	18
26-50	24	0	24	48
>50	17	0	17	34
Total	50	0	50	100

This is a comparative study carried out in 50 patients, with 20 patients being given spinal anesthesia, 20 patients given local anesthesia, and ten patients operated under general anesthesia. In our research, the maximum no. of the patient was in the age group of 26-50 years of age, with the average at a presentation being 46.88 years. This is because a higher incidence of concurrent medical illnesses like pulmonary and cardio-vascular complaints is more common in this age group. The youngest patient was 20 years old, and the oldest was 82 years old (Table 1).

A similar study by John C Nicholls (1974) in the UK revealed that the average age at presentation was 47.5 years. Youngest was 14 years old, and the oldest was 78 years of age [9].

In a study by Allan E kark (1997) at California, the age range was 15-92 years; 3% of patients were above 80 years of age [8].In our study, obese patients were 26%, average built patients were 42%, and thin built were 32%; thiscontrasts with a study by Abrahmson where most of the patients thin built [10].

Table 2: Distribution of patients operated under local, spinal, and general anesthesia (According to built and nutrition, n=50)

Built	Local	Spinal	General	total	%
Thin	8	6	2	16	32
Average	9	10	2	21	42
Obese	3	4	6	13	26
Total	20	20	10	50	100

26% of the total cases were obese,32% were thin, 42% were of average built(Table2). In our study,three obese patients were operated on under local anesthesia. They required a larger amount of anesthetic drug, more forceful retraction, and had pain during the procedure. Also, these points are validated by thefact that these obese patients have refused local anesthesia in the Shouldice institute, Toronto [11].

Table 3: Occupation of inguinal hernia patients

Occupation	No.	%
Laborer	25	50
Moderate hard worker	17	34
Sedentary worker	8	16

In our study, 50%of the total patients were laborers,34% were moderately hard workers, and 16% were sedentary workers.This implies that a hard-working lifestyle is directly proportional to the incidence of inguinal hernia, which is due to the increased intraabdominal pressure due to strenuous activity (Table 3)

50% of hernia patients were laborers,34% were moderately hard workers, and 16% were sedentary workers.

In a similar study by Allen K Kark (1997) in California, 31% were office workers,37% were manual or industrial workers, and 32% were retired [8].A similar study was by Bholla Singh Sidhu et al. (2002), who found that 46% have sedentarylifestyles and 54% were involved in strenuous work [12]. These studies further support our study as the conclusions are the same.

Table 4: Side of inguinal hernia

Side	Number of cases	Percentage
Right	38	76
Left	12	24

In our study, 76% of patients had a right-sided inguinal hernia, whereas 24%had a left-sided inguinal hernia. This study reflects that the most common side for inguinal hernia is right(Table 4).

Bhola Singh Sindhu et al. (2003) noted that 58% of cases had a right-sided inguinal hernia, 34% of patients had a left-sided inguinal hernia, and 8% had bilateral inguinal hernia [12].

Table 5: Incidence of type of hernia found preoperatively

Type of hernia	Number of cases	Percentage
Direct	17	34
Indirect	31	62
Pantaloon	2	4
Total	50	100

In our study,34% had direct, 62% had indirect, and. 4% of patients had pantaloon type of inguinal hernia. This study reflects that the most common type was an indirect inguinal hernia.

Table 6: Site of distribution of pain during surgery

Operative steps	LA (n=20)	Spinal(n=20)	GA(n=10)
Skin incision	1 (5%)	0	0
Subcutaneous dissection	0	0	0
External oblique aponeurosis dissection	0	0	0
Cord mobilization	2 (10%)	0	0
Sac dissection	2 (10%)	0	0
Cremasteric muscle excision	0	0	0

Suturing through pubic tubercle	0	0	0
Suturing of the conjoined tendon with inguinal ligament	0	0	0
External oblique aponeurosis suturing	0	0	0
Skin suturing	0	0	0
Total	4 (20%)	0	0

After initiation of operation under local anesthesia, 5% of patients complainedof pain during skin incision,10% during cord mobilization, and 10% during sac dissection. In our study, 20% of patients had complained of some kind of pain sensation during the operation. However, on being questioned during 24 to 48 hours of the postoperative period, only 10%

Of the patients complained that they experienced pain during the operation. This statistical discrepancy was explained by the amnesic effects of midazolam administered to all the patients before operation. During surgery,the pain was not complained about by patients operated on under spinal or general anesthesia(Table 6).

David V Young (1979-82) concluded that 13% of patients operated under local anesthesia experienced some pain during operation [13].

PA Basker Ville et al. (1980) noted that during inguinal hernia repair under local anesthesia, 93% of patients felt no pain,7% thought that the operation was painful, and used local anesthesia with adrenaline [14].

Table 7: Postoperative pain as assessed by the analgesic injections demanded by the patients

Period	**Local anesthesia**	**Spinal anesthesia**	**General anesthesia**
Immediate postoperative	0	0	4 (40%)
First 12 hours	15 (75%)	18 (90%)	9 (90%)
>12 hours	0	0	1 (10%)
Total	15 (75%)	18 (90%)	9 (90%)

Immediate postoperativeanalgesiawas demanded by 40% of the patients operated under general anesthesia, which was highly significant($p<0.001$). None of the patients in a local and spinal anesthesia group demanded immediate postoperative analgesia.

Within the first 12 postoperative hours,analgesics were demanded by 75% of patients operated under local anesthesia and 90% of patients operatedunder either spinal or general anesthesia.

Analgesics required after 12 hours of the postoperative period is 10% in case of patients operated under general anesthesia and none in case of spinal and local anesthesia group of patients. (Table 7).

Duration of action of lignocaine is 1-3 hours, and duration of action of bupivacaine is 4-12 hours, depending upon vascularity of the area injected. However, it has been noted that patients' local and spinal anesthesia groupshad less post-operative pain sensation than general anesthesia. This is explainedbased on "Windup phenomena." According to this theory, there is intense stimulation of pain pathways at the spinal cord level, at the neuronal connections involved, and so facilitated the transmission of painful impulses for a time afterward.

Patients in the local anesthesia group had a lesser need for analgesics and a prolonged time until the first analgesia was required. A mixture of lidocaine and bupivacaine further reduces the need for postoperative analgesics. Patients operated under general anesthesia needed early and a greater number of analgesics injections. Patients operated under spinal anesthesia also have prolonged time until the first analgesia was required.

Allan E Karket al. (1997) Noted that out of 3,175 patients, 19% took no analgesia at all, and all were operated on under local anesthesia [8].

ParvizK. Amid et al. (1994) noted that infiltration technique (of local anesthesia) that results in satisfactory local anesthesia and prolonged postoperativeanalgesia [7].

The conclusions of these all studies are similar to our study.

Table 8: Postoperative pain assessed by the number of analgesic injections demanded by patients

Time period	**Local anesthesia(n=20)/No. of analgesic**	**Spinal (n=20) No. of analgesic**	**General anesthesia(n=10) No. of analgesic**
Immediate postoperative	0	0	4
First 12 hours	15	18	9
Next 12 hours	0	0	1

No.of analgesic injection per patients	15/20=0.75	18/20=0.90	14/10=1.4

$p < 0.001$

The number of analgesic injections required in the immediate post-operative period was four in ten patients who were operated under general anesthesia, which was highly significant ($p<0.001$). None in those who were operatedon under spinal and local anesthesia.

The average no. of analgesic injections required per patient were highest in the Group of patients who were operated under general anesthesia. It was 1.4 injections per patient. It was 0.9 injection per patient for the spinal Group, and for the local anesthesia group, it was 0.75 injection per patient. This study concluded that the GA group of patients demanded early analgesia, andthe total number of analgesic injections demanded was highest. LA group of patients demanded the late and least number of analgesic injections (Table 8).

Table 9: Incidence of conversion of local anesthesia into general anesthesia (Local anesthesia failure)

Type of block	No. of cases	No. of cases completed under local anesthesia	No. of cases converted into general anesthesia	Percentage
Field block	20	20	0	0%
Total	20	20	0	0%

Despite complaints of pain sensation experienced by some patients during the operation, none of the patients complained of excessive pain that required conversion of local anesthesia into general anesthesia—however,the obese patients who were operated on under local anesthesia needed IV supplementation. The spinal Group of patients did not need to convert to another group of anesthesia (Table 9).

In contrast to our study, David V. Young, California (1979-1982) found that two hundred one patients of the local anesthesia group were converted to general anesthesia due to unsatisfactory local anesthesia. Of those operated under spinal anesthesia, 23 of 93 patients needed conversion to general or local anesthesia [13].

Table 10: Incidence of local anesthetic toxicity

The systemic effect of lidocaine	No. of patients	Percentage
Lightheadedness, tinnitus, circumoral, and tongue numbness	0	0
Visual disturbance	0	0
Muscular twitching	0	0
Convulsion	0	0
Unconsciousness	0	0
Coma	0	0
Respiratory arrest	0	0
CVS depression	0	0
Total	0	0

Our study highlights that despite the wide spectrum of the adverse effect of lidocaine, none of the patients had experienced toxic symptoms. This complete absence of toxic signs and symptoms was subject to local anesthesia with the dose of plain xylocaine 5 mg per kg body weight (Table 10).

Table 11: Post-operative complication

Complications	Local anesthesia(n=20)	Spinal anesthesia(n=20)	General anesthesia(n=10)
Nausea-vomiting	0	2	2
Headache	0	5	1
Backache	0	5	1
Retention of urine	0	6	1
Cardiovascular	0	1	0
Respiratory	0	0	0
Hematoma/Seroma	0	0	0
Stitch infection	0	0	0
No complaint	20 (100%)	12 (60%)	7 (70%)

$p < 0.05$(S)

In the present study, those patients who were operated on under local anesthesia, none of them showed post-operative complications like nausea, vomiting, headache, backache, urinary retention, cardiovascular and respiratory complication, hematoma, and stitch infection.

The Group of patients who were operated on under spinal anesthesia had the highest complication rate. They had a higher incidence of nausea and vomiting(10%),headache(25%),backache(25%), and voiding difficulty(30%),and needed catheterization. One patient in this Group had developed atrial fibrillation on the second postoperative day, which has probably not related to anesthetic agents. All the complication was found to be statistically significant except nausea and vomiting ($p<0.05$).

Overall, those patients operated under local anesthesia had a very smooth recovery, while those operated under spinal anesthesia had the highest complication rate.

A similar study by E.Gianettaet al. (1990-1995) noted that general and spinal anesthesia are associated with higher rates of serious post-operative complication, including occasional postoperative death. Local anesthesia is seldom followed by significant complications[15].

Allan E.Karket al.(1997) noted that the infection rate was 0.30% in patients operated under local anesthesia. Also, major cardiovascular and thromboembolic complications were rare [8].

Table 12: Amount of local anesthetic used and toxicity

Amount of local anesthetic solution used (ml)	Patients operated under field block (n=20)	Patients show sign and symptoms of toxicity
<20	0 (0%)	0
21-24	12 (60%)	0
25-28	8 (40%)	0
Average amount	24 ml	-

This study shows that the average amount of local anesthetic solution (2% xylocaine +0.5% bupivacaine in 1:1 ratio) required for the field block technique of inguinal repair is 24ml, a range of 21-28ml for unilateral hernia repair. The amount. Of local anesthetic solution used is depends upon the built of the patient.However, when used within the limit of 5mg/kg body weight. Xylocaine and 2mg/kg bodyweight bupivacaine, signs and symptoms of toxicity had never been experienced in the present study (Table12).

Irving L.Lichtenstein(1994) noted that the maximum dose local anesthetic used was 30 to 40 ml 50:50 mixture of 1% xylocaine and 0.5% bupivacaine[7]. John C Nicholls (1974-76) has required inguinal hernia under local anesthesia using 20 ml of 2% xylocaine diluted with normal saline [9].

Table 13: Duration of surgery under local, spinal, and general anesthesia

Duration to complete surgery (mins)	Local anesthesia (n=20)	Spinal anesthesia (n=20)	General anesthesia(n=10)
25-30	0	0	0
31-35	0	0	0
36-40	0	0	4 (40%)
41-45	8 (40%)	0	5 (50%)
46-50	12 (60%)	13 (65%)	1(10%)
51-60	0	7 (65%)	0
Average duration to complete surgery(mins)	45.6±3.14	50.4±4.10	41.0±3.50

$p < 0.001$

In the present study average time required to complete surgery under local anesthesia was 45.6% minutes, and under spinal anesthesia, 50.4 minutes under general anesthesia 41 minutes. It implies that the least time is required under general anesthesia and maximum time required under spinal anesthesia. Local anesthesia had its place in between general and spinal anesthesia(Table 13).

A similar conclusion was made by Allan E Karket al. (1997), that the average time for inguinal hernia repair under local anesthesia was ranging between 30 and 45 minutes [8].

Table 14: Comparison of local, spinal, and general anesthesia according totothe cost of anesthetic drugs

Type of anesthesia	Average expenditure in (□)
Local	178.00
Spinal	198.00
General	925.00

The average expenditure for aanestheticdrugfor patients operated under local anesthesia was □178/-,for patients operated under spinal anesthesia was Rs 198 and for patients under general anesthesia was □925/- It concluded that expenditure for local anesthetic drugs was least. As complication like urinary retention was found in 30% of patients operated spinal anesthesia and 10% of patients under general anesthesia,out of the 20% were catheterized, which further increased the amount of expenditure by □120/- per patients (Table 14).

Allan E Karkset al. (1997) concluded that open mesh under local anesthesia is an effective daycare technique, particularly in the elderly and medically unfit patients. The economic benefits are enhanced by low morbidity, early return to normal activity, and low recurrence rates [8].

Parviz K Amid and Irvin L. Lichtenstein et al., in a study, concluded that local anesthesia is safe,simple, economical, and withoutpostanesthesia side effects[7].

In the present study, all patients operated under local anesthesia had started early oral intake, whereas 35% of patients operated under spinal and 40% of patients operated under general anesthesia had not started early oral intake, and IV fluid was given, which further increases the expenditure.

Also, 100% of patients operated under local anesthesia were fit for early discharge. Whereas 50% of the patients operated under spinal and 40% of patients operated under general anesthesia were not fit for early discharge because of other postoperativecomplications like headache, backache,nausea, and vomiting, further increases the expenditure.

Table 15: Recurrence of an inguinal hernia withinsixmonths

Type of anesthesia	No. of patients with recurrence	Percentage
Local	0	0
Spinal	0	0
General	0	0
Total	0	0

No recurrence was found in all three patients in the first six postoperative months(Table 15).

Allan E.Karkset al. (1997) studied the advantages of ambulatory open mesh repair using local anesthesia and concluded that recurrence was 0.29% following primary repair of indirect hernia and 0.22 % following primary repair of direct inguinal hernia, and 0.51% was total, which was very low [8].

A study by Basker PA Ville et al.(1980) concluded that there is evidence that daycare repairs may have a lower recurrence rate than the national average [14].

IV. Conclusion

Comparative study of local, spinal, and general anesthesia for inguinal hernioplasty was done in 50 cases, and the following conclusions have been drawn. Local anesthesia was preferably used, particularly in patients with concurrent medical illnesses. It causes very little psychological alteration, and it was safe in patients with concurrent cardiovascular and pulmonary derangements that were considered high-risk factors for general anesthesia.

Some patients had pain during the operation under local anesthesia, but the pain grade was mild only and did not need conversion to general anesthesia. Post-operative pain was the least in those patients who were operated on under local anesthesia compared to spinal and general anesthesia. Immediate postoperative analgesia and more frequent analgesia were needed by the significant number of patients operated under general anesthesia.

Post-operative complications were least in patients operated under local anesthesia, and that's why they were fit for early discharge.

Local anesthesia was more cost-effective regarding the expenditure for anesthetic drugs.

The difference in duration of operation under local, spinal, and general anesthesia was significant. Still, lots of advantages of local anesthesia cannot be ignored only because of slightly more time-consuming than general anesthesia. Our experience has shown that local anesthesia for inguinal hernioplasty has many advantages and only a few disadvantages over spinal and general anesthesia. That is why it can be preferred except when contraindicated under particular circumstances.

Therefore, it is concluded from this study that inguinal hernia repair under local anesthesia is safe, simple, and cost-effective without complications.

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Dr. Balkrishna Sharma, et. al. "Inguinal Hernioplasty: Comparison Of Local, Spinal And General Anaesthesia."*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(05), 2021, pp. 22-29.