



Research Article

PROSPECTIVE SIGNIFICANCE OF LOCAL ANESTHESIA FOR LICHENSTIEN TENSION FREE MESH HERNIOPLASTY COMPARED TO REGIONAL ANESTHESIA

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ABSTRACT

Background: Hernia is a common surgical problem which requires good surgical skill as well as good knowledge about anatomy and various repair of hernia. The choice and delivery of safe effective anesthesia for inguinal herniorrhaphy is based on the type and extent of surgical procedure, concomitant medical diseases, side effects of anesthetic agents and organ function. An increased attention has been paid to the provision of stress free anesthesia and surgery in order to reduce postoperative pain and morbidity. These considerations must be balanced with the direct cost of medical procedures including anesthetic service and pre operative examination. Local anesthesia is an acceptable alternative to spinal anesthesia for hernioplasty especially with regard to operative condition, patient's surgeon's satisfaction, post operative pain relief, complications and effectiveness. This study focus on the efficacy of using local anesthesia in comparison to regional anesthesia in repairing uncomplicated inguinal hernia by measuring post-operative pain and post operative complications and to check the feasibility of using local anesthesia for short stay surgery.

Materials & Method: Sixty patients were randomized to study & control group. In control group spinal anesthesia was used for hernioplasty whereas in the study group local anesthesia was used. Both groups were further compared for intra-operative, immediate and delayed postoperative complications.

Results: Both local & spinal anesthesia can be used for hernia repair on short stay bases, but spinal anesthesia has shown higher complication rates. Significant increase in general complications like hypotension, urinary retention & headache were seen in the patients where spinal anesthesia was used. Whereas local complications like seroma, hematoma, scrotal edema & recurrence were similar in both the groups.

Conclusion: Local anesthesia is best suitable for short stay surgery when compared to spinal anesthesia with less immediate and post operative complications. When short stay service is implemented there will be considerable benefits to the hospital service & to the patients.

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INTRODUCTION

The term hernia is derived from Greek meaning "offshoot, a budding or bulge".¹ Hernias may be generally defined as a "protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity".² Sir Astley Cooper 1804³ "A protrusion of any viscus from its proper cavity is denominated as hernia. The protruded parts are generally contained in a bag by a membrane with which the cavity is naturally invested". Conze *et al.* 2001⁴ defined inguinal hernia as a bulge of the peritoneum through a congenital or acquired defect in the muscular and facial structures of the abdominal wall. Italian Surgeon E. Bassini

(1884) contributed most of the repair of inguinal hernia and he is called the "father of modern herniorrhaphy".⁵ Inguinal hernias are recorded since 1500 BC by the ancient Greeks. They are the commonest of all hernias. About 75% of all hernias occur in the inguinal region. Two thirds of these are indirect, and the remainder is direct inguinal hernias. It is estimated that 5% of the population develops an abdominal wall hernia, but the prevalence might be even higher. Surgery is the definitive treatment for all types of hernias. If hernias are not operated they often result in complications which increase the morbidity and mortality rates. Hernia surgeries are basically of three types; Herniotomy- Excision of hernia sac. Herniorrhaphy- Repair of hernia defect with use of anatomical tissue. Hemioplasty- Repair of the hernia defect with reinforcement of mesh. All these can be done either through open or laparoscopic surgery. Inguinal hernias are operated

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both as an outpatient procedure and in the traditional way in which the patient is first hospitalized and then operated. Although they can be discharged after a short period (short-stay surgery) or after complete recovery. For more than a century it has been customary to admit patients for all surgeries and keep them in hospital until they are self sufficient, ambulant and till the sutures are removed. This results in an increasing demand of the hospital beds and an increased waiting list for hernia surgery. It further increases the economic burden for the hospital and to the patients. Prolonged rest in hospital often leads to complications. Hence out patient repair of groin hernia's has proved to be more cost effective and enhances the quality of surgical care. So now a days discharging the patient early from the hospital is being practiced. This introduction of short stay surgery, not only relieves the hospital waiting lists but also represents an economic advantage for the patients.

Hernia repair can be done under local, spinal as well as general anesthesia. General anesthesia and spinal anesthesia have their own complications. Prerequisites such as medical fitness, post operative care, trained personal and field block technique for hernia repair is within the capability of operating surgeon. Complications and post anesthesia care for local anesthesia is negligible compared to traditional spinal or general anesthesia. With the introduction of day care surgery for inguinal hernia repair, the local anesthesia has its role as it reduces the cost and duration of hospital observation. Local anesthesia can be considered for hernial repair operations, in the areas where lack of trained personal and anesthetic facilities are not available. Our study focuses on the fact that for conventional hernioplasty local anesthesia is an acceptable alternative to spinal anesthesia.

Etiology and Pathophysiology

The cause of hernia is multifactorial.^{6,7,8,9}

Evolution: The absence of posterior rectus sheath below the arcuate line and only rather substantial transversalis fascia unsupported by muscles or aponeurosis resisting the intra-abdominal pressure and holding the breach between the abdomen and the thigh. It is compounded by humans having adopted the upright posture and change from quadruped to bipedal locomotion. In man, the upright posture causes gravitational stress to pass down to the lower abdominal wall, which is structurally not designed for it nor has the evolution suited it for its new role.⁶

Congenital and Anatomical Factors

- a. Patent Processes Vaginalis is the prime cause of indirect inguinal hernia in infants and children. The development of processus vaginalis, its migration and its final obliteration are intimately linked to the descent of the testis from the abdominal cavity into the scrotum. The incidence of patent processus vaginalis in adults who do not develop hernia during their life is up to 20%.
- b. Subtle varieties in the attachment and arrangement of abdominal muscles.
- c. Females are particularly free of direct inguinal hernia. The narrowness of the interval between the transversus arch and the inguinal ligament and the hermetical attachment of external oblique aponeurosis are the important factors in protecting women against direct

hernia. On the other hand, musculo-aponeurotic attachments in woman are such that they frequently develop femoral hernia. Other factors that are significant in the etiology are the number of aponeurotic fibers in the transversus aponeurosis which determines the intrinsic strength of the layer. The disposition of the transversus arch in relation to the iliopubic tract indirectly determines the size of the inguinal gap or defect in the Hesselbach's triangle.

- d. The obliquity of the inguinal canal: The sudden exertion increases the intraperitoneal pressure, compress in the anterior and posterior walls of the canal there by occluding the canal.

Shutter Mechanism: The accepted explanation for this is the physiologic "Shutter mechanism" which is activated, when the abdominal muscles contract to raise the intra abdominal pressure. As the internal oblique and transverse abdominis muscles contract, their lower fibers forming the myoaponeurotic roof of the inguinal canal "the conjoined tendon", that arches over the spermatic cord also sharply contracts and as the fibers shorten, the arch straightens out and descends to come to lie close to or on the inguinal ligament and so covers and protects the fascia transversalis. The shutter also passes down in front of the internal ring and counteracts the pressure on the ring from inside the abdomen. Contraction of the transverses abdominis muscle also pulls up and tenses the curare of the internal ring which make up the thickened bands of the iliopubic tract and fascia transversalis causing the ring to close like a sphincter snugly around the cord.

Integrity of the Fascia Transversalis: The ability of the fascia transversalis to withstand physiologic and pathologic elevations in the intra abdominal pressure is dependent on the state of the collagen fibers that make up its tissues and give its strength.⁸ The factor which interferes with normal production of collagen or causes its increased destruction or abnormal production of collagen fibers decreases the strength of transversalis fascia. These factors include congenital connective tissue disorders like Marfan's, Ehler-Danlos and Hurler-Hunter syndromes and mesenchymal metabolic defects. It is found that substances in cigarette smoke inactivate anti-proteases in lung tissues and so upset the protease/antiprotease system which is responsible for destruction of elastin and collagen of the rectus sheath and fascia transversalis and predispose to herniation in smokers.

General Contributing Factors

- Weakening of muscle and fascia by advancing age
- Lack of physical exercise
- Obesity
- Multiple pregnancies
- Loss of weight
- Operation or prolonged bed rest
- Very low and unduly long transverse abdominal incisions for gynecological, urological and appendectomy incision.
- Pulmonary diseases like COPD and Emphysema
- Prostatism
- Chronic constipation
- Diverticular disease
- Genito-urinary causes like cystitis, cystocele and urethrocele

Components

The sac consists of a diverticulum of peritoneum, which is divided into mouth, neck, body and fundus.^{10,11}

Mouth: part between the sac interior and the abdominal cavity.

Neck: narrowest section between the mouth and the body of the sac.

Body: lies between the neck and the fundus.

Fundus: blind end or the distal most part of the sac.

Contents

These can be almost any abdominal viscera, except the liver. The commonest are

- a. Fluid- derived from peritoneal exudates, usually in congenital hernias
- b. Omentum - Omentocele (Synonym -Epiplocele).
- c. A loop of intestine- Enterocele (Usually small intestine, but in some instances large intestine or vermiform appendix).
- d. A portion of the circumference of the intestine - Richter's hernia.
- e. A portion of urinary bladder wall or a diverticulum of the bladder.
- f. Ovary with or without the corresponding Fallopian tube.
- g. Meckel's diverticulum - Littre's Hernia.
- h. Two loops of intestine in the manner of W - Maydl's hernia.
- i. Rarely stomach, spleen or caecum may be found within the sac.
- j. Sliding or Hernia-en-Glissade (Contents - Caecum, Urinary bladder).
- k. Maydl's hernia or Hernia-en-W (Contents-W shaped loop of intestine).
- l. Dual hernia (saddle or pantaloons). Hernia, on either side of the inferior epigastric vessels

Coverings

All the coverings of the sac of hernia are derived from the various layers of the abdominal wall through which the sac passes. They vary as per the duration and size of the hernia. In long standing cases they become atrophied from stretching, or become amalgamated especially at the neck of the sac and often become thickened to produce strangulation. Coverings in case of an indirect inguinal hernia are from inside out from extra peritoneal fatty tissue, internal spermatic fascia, cremasteric fascia, external spermatic fascia, two layers of superficial fascia and skin. In case of a direct hernia the coverings are from extra peritoneal fatty tissue, fascia transversalis, conjoint tendon, external oblique aponeurosis, two layers of superficial fascia and skin.

Classifications of Inguinal Hernias

The classification of inguinal hernia has been considered as a useful tool for the surgeon to decide which type of hernia repair may be the best in the individual patient. Several important contributions were made by American, French and German surgeons. Classifications, therefore, are not regarded as eternally firm constructions, but reflect the developments in hernia surgery.

Casten Classification 1967¹²

The difficulties in classifying the various anatomic types of hernias were recognized more than 30 years ago when Casten, in 1967, classified the inguinal hernia according to three functional structures: transversalis fascia, transverses abdominis aponeurosis, and ileopectineal or Cooper's ligament.

Halverson and Mcvay Classification 1970¹³

In 1970, Halverson and McVay categorized the inguinal hernia based on pathologic anatomy and repair techniques in four classes: small indirect inguinal hernia, medium indirect inguinal hernia, large indirect and direct inguinal hernia, femoral hernia.

Gilbert Classification 1989¹⁴

In 1989, Gilbert published his classification system on anatomic and functional defects established intra-operatively the presence or absence of a peritoneal sac, the size of the internal ring, and the integrity of the posterior wall. Rutkow and Robbins (1993)¹⁵ added the combined direct and indirect hernia and the femoral hernia to this classification system.

Nyhus Classification 1991^{16,17,18}

Nyhus used anatomic criteria, e.g., size of the internal ring and integrity of the posterior wall, to classify the inguinal hernia.

Nyhus Classification (nyhus 1993)

Type 1: Indirect inguinal hernia with a normal ring sac in the canal

Type 2: Indirect hernia with an enlarged internal ring but the posterior wall is intact; inferior deep epigastric vessels not displaced, sac not in scrotum

Type 3a: Direct hernia with a posterior floor defect only

Type 3b: Indirect hernia with enlargement of internal ring and posterior floor defect

Type 3c: Femoral hernia

Type 4: Recurrent hernia

A direct B indirect C femoral D combinations of A-B-C

Aggravating factors: local or systemic, upstage type by 1 (Stoppa 1998)

Bendavid Classification 1993¹⁹

Bendavid has proposed the T.S.D. (Type, Staging, and Dimension) system which includes five types of groin hernia and three stages for each type. In this classification he emphasizes the extension (sliding) of the hernia which may lead to destruction of important functional structures, e.g., lacunar ligament, inguinal ligament (Rutkow and Robbins 1993; Bendavid 2002). Bendavid classification 1994 (From Rutkow and Robbins 1994).

Type 1 Anterolateral or Indirect

Stage 1: Extends from the deep inguinal ring to the superficial ring

Stage 2: Goes beyond the superficial ring but not unto the scrotum

Stage 3: Reaches the scrotum

Type 2 Anteromedial or Direct

Stage 1: Remains within the confines of the inguinal canal

Stage 2 :Goes beyond the superficial ring but not into the scrotum

Stage 3: Reaches the scrotum

Type 3 Posteromedial or femoral

Stage 1: Occupies a portion of the distance between the femoral vein and the lacunar ligament

Stage 2: Goes the entire distance between the femoral vein and the lacunar ligament

Stage 3: Extends from the femoral vein to the pubic tubercle (recurrences, destruction of the lacunar ligament)

Type 4 Posterolateral or prevascular

Stage 1: Located medial to the femoral vein: Cloquet and Laugier hernia

Stage 2: Located at the level of the femoral vessels: Velpeau and Serafini hernias

Stage 3: Located lateral to the femoral vessels: Hesselbach and Partridge hernias

Type 5 Anteroposterior or inguinofemoral

Stage 1: Has lifted or destroyed a portion of the inguinal ligament between the pubic crest and the femoral vein

Stage 2: Has lifted or destroyed the inguinal ligament from the pubic crest to the femoral vein

Stage 3: Has destroyed the inguinal ligament from the pubic crest to a point lateral to the femoral vein

Aachen Classification 1995

The Aachen classification has introduced the diameter measurement of the hernia orifice to the lateral, medial, combined and femoral hernia (Conze *et al.* 2001).⁴

Aachen classification (Schumpelick and Arlt 1995)²⁰

L Lateral hernia

M Medial hernia

Mc Combined hernia

F Femoral hernia

I Hernia orifice < 1.5 cm

II Hernia orifice 3 cm

III Hernia orifice >3cm

Zollinger Classification 2003²¹

In 2003, Zollinger presented a modified traditional classification that included all the classes or grades within the Nyhus-Stoppa, Gilbert, and Schumpelick- Arlt systems. This modified classification grades the size of the hernia in small, medium, and large using “fingertips” or “fingerbreadths” for measurement. The large indirect hernia is characterized by a disrupted internal ring that is greater than 4 cm or two fingerbreadths in width, whereas the large direct hernia is defined by a complete blowout of the entire floor.

Modified Traditional Classification (Zollinger 2003)

I A Indirect small

B Indirect medium

C Indirect large

II A Direct small

B Direct medium

C Direct large

III Combined

IV Femoral

O Other Any not classified by number above

Femoral + indirect or direct

Femoral + indirect + direct

Massive > 8cm (4 fingers)

inguinal defect

prevascular

R Recurrent

Defect size: A < 1.5 cm; B 1.5 to 3 cm; C > 3cm

Proposal for a Surgery-Based Classification

An adapted classification on inguinal hernia may be helpful in several aspects of hernia surgery: strategy for dissection of the inguinal canal (landmarks), comparison of surgical repairs, evaluation of postoperative follow-up, complications and quality of life. Based on intra-operative findings the classification of hernia may be simple: (A) indirect, (B) direct, (C) giant or scrotal, (D) femoral, and other rare hernias, e.g., Spieghelel hernia, lumbal hernia, supravescical hernia, hernia obturatoria, hernia ischiadica, hernia perinealis (Montes and Deysine 2003²²; Schumpelick 2000²³). The type of hernia is then graded as uncomplicated without defect in the posterior wall or in the internal ring, and then according to the defect in the abdominal wall as with defect in the posterior floor and with defect in the posterior floor plus defect in either the aponeurosis of the external oblique and/or external ring and/or inguinal ligament. Scrotal or giant hernia and femoral hernia are considered to have a defect in the posterior wall with change in other supporting elements of the abdominal wall. Each type of hernia may then be classified as primary or recurrent inguinal hernia. A modified classification, including aggravating factors, may be used for a numerical classification of the severity of hernia. In this classification combined femoral, indirect and/or direct hernias can be categorized by using the types A, B, C, or D as in a modular construction system. The category “other” is reserved for rare types of hernia, e.g., obturator hernia, Spieghelelian hernia.

Clinical features: Inguinal hernia can occur at any age. They may be present at birth or appear suddenly in 80 years old. The peak time of presentations is in the first few months of life, in the late teens and early 20's and between 10 and 60. They are 9 times more common in men than in women, still being the most common hernia in women. The overall lifetime risk of developing a groin hernia is approximately 15% in males and less than 5% in females.^{24, 25} There is clearly an association between age and hernia diagnosis. In the same way the complications of hernias (incarceration, strangulation, bowel obstruction) are found commonly at the extremes of age. Hernia is seen to be associated with heavy work, especially lifting, puts a great strain on the abdominal muscles. If there is an underlying weakness, the appearance of a hernia may coincide with strenuous physical effort. Hard labour workers, sportsmen and weight lifters are more prone.

Local Symptoms: In the initial stage most common symptoms are discomfort, heaviness and pain. The patient complains of a dragging, aching sensation in the groin region which gets worse as the day passes. A lump in the groin is the second most common complaint. This may be a small lump of 2–3 cms or a huge lump going as down to the knee level. Patient feels that it gets smaller when he lies down and bigger when he strains or stands. If the hernia becomes very painful and tender, then it is probably strangulated. If hernia is reduced encase, patient may complain of pain on

touching the scrotum. History of frequent micturition may be in cystocele.^{24, 25}

Systemic Symptoms: If the hernia is obstructing the lumen of a loop of bowel the patient may complain of one or more of the four cardinal symptoms of intestinal obstruction: colicky abdominal pain, vomiting, abdominal distension and absolute constipation. In late cases of strangulation where gangrene has set in, patient can present with features of peritonitis more so if perforation of bowel has occurred.^{24, 25}

Signs: On inspection in standing position a bulge or swelling will be seen in groin. This might disappear in lying down position if the hernia is reducible spontaneously in direct hernia. Impulse on coughing is present in reducible hernia. Visible peristalsis is seen in enterocele. Malgaigne's bulges are seen in lax abdominal wall.²⁴

An indirect hernia is sausage or pear shaped and lies parallel to the inguinal ligament. After reduction it reappears more laterally and runs down above the inguinal ligament towards the scrotum. A direct hernia is more rounded, more medial, bulges forward and tends not to go down to scrotum. After reduction it reappears in a forward direction.

On Palpation: Reducing the hernia by manipulation is called taxis and it is performed in lying down position of the patient. As the hernia is reduced gurgling sound felt in enterocele. Impulse on coughing is felt.

Internal Ring Occlusion test: Internal ring is occluded and patient is asked to cough. If a bulge is seen medial to the occluding finger then it is a direct hernia, if not indirect.

External Ring Occlusion Test: After complete reduction, the external ring is occluded with a finger and patient is asked to stand up gently. The reducible inguinoscrotal swelling will not come down as its descent is prevented by occluding finger, where as swelling is filling gradually from below in case of varicocele and lymph varix.

Finger Invagination Test: After reduction of the hernia this test may be performed to palpate the hernia orifice. The skin in invaginated from the bottom of the scrotum by little finger, which is pushed up to palpate the pubic tubercle. The finger is then rotated and pushed further up into the superficial inguinal ring. Normal ring is a triangular slit, which admits only the tip of a finger. When patient is asked to cough the examining finger will be squeezed by approximation of two pillars. A palpable impulse will confirm the diagnosis.

Differential Diagnosis of Inguinal Hernia

When the swelling is incomplete i.e. an inguinal or a groin swelling

- a. Femoral hernia.
- b. Enlarged Inguinal Lymph Nodes.
- c. Saphena Varix
- d. Femoral Aneurysm.
- e. Encysted Hydrocele of the Cord.
- f. Lipoma of the Cord.
- g. Undescended or Ectopic Testis.
- h. Psoas Abscess.

- i. Malgaigne Bulges.
- j. Spermatocele.
- k. Lymph Varix.

When the swelling is complete i.e., inguinoscrotal swelling

- a. Infantile Hydrocele.
- b. Congenital Hydrocele.
- c. Encysted Hydrocele of the Cord: Already discussed.
- d. Varicocele.

Diagnosis

Diagnosis of classic inguinal hernia is mostly straightforward using physical and ultra-sound examination. CT-scan, MRT, x-rays are not recommended for routine use (Conze *et al.* 2004).⁴

Investigations

Laboratory and radiological aids are of limited use in the diagnosis of inguinal hernias. Routine laboratory investigations like Hb%, urine routine, blood urea, serum creatinine will aid in the search of normal parameters before taking the patient for surgery. Roentgenographic examination of the abdomen may reveal the patterns characteristic of intestinal obstruction with air and fluid filled loops of intestine on plain x-ray erect abdomen as in complicated presentations of inguinal hernias. Ultrasound of the abdomen to know the obstructive urinary outflow diseases and chest X-ray to find pulmonary pathology. Herniograph is used primarily in patients with unexplained groin pain, or to find nonpalpable, symptomatic cases of hernia recurrence. The technique of examination is described by Gullmo. A 20 to 22 gauge Veress needle is used to puncture the midline below the umbilicus. The catheter is guided into the lesser pelvis and 50 to 80 ml of contrast medium is injected. As the patients turns from side to side in the prone position, the contrast medium pools in the inguinal region. With the techniques now available, we believe that there is no indication for herniography, even if the complication rate is low.

Treatment

Aim of treatment of inguinal hernia comprises of exposing the site of defect, correcting the anatomical defect, strengthening or reinforcing the deficiency in the posterior wall of the inguinal canal. Treatment of inguinal hernias is essentially surgical, exceptionally temporarily conservative, when efforts are made to keep the hernia in reduced state by clinical maneuvering, till the time the patient becomes fit for surgery.^{24,25}

Types of Surgical Treatment for Inguinal Hernia

Herniotomy: This is the essential and basic operation and it entails dissecting out and opening the hernial sac, reducing any contents and then transfixing the neck of the sac and removing the remainder. It is employed either by itself or as the first step in herniorrhaphy or hernioplasty. Herniotomy is sufficient for the treatment of hernia in infants and adolescents. In High herniotomy, the sac is removed at the level of deep inguinal ring.

Herniorrhaphy: refers to the strengthening or reconstruction of the posterior wall of the inguinal canal.

Hernioplasty: is the addition of grafts or prosthetics to herniorrhaphy (Reinforcement).

Bassini's Repair: This classical operation was first described

by Bassini in 1888.⁵

Indications

1. Indirect inguinal hernia in healthy young adults with good musculature, in whom the deep ring is not stretched.
2. Adults in whom the internal ring is stretched.
3. Also suitable for large indirect inguinal hernia where the internal ring is stretched and posterior inguinal wall is distorted.

MATERIALS & METHODS

A retrospective study of 60 patients of inguinal hernia was conducted in Department of General Surgery, Kasturba Hospital, BHEL, Bhopal satisfying inclusion and exclusion criteria. A thorough history and clinical examination of the cases were done. Clinical parameters were recorded from the OPD files obtained from the Dept of General Surgery, Kasturba Hospital, BHEL.

All patients were operated for Lichtenstein’s tension free hernioplasty. Patients were randomized either to control group (where regional anesthesia was used) and study group (where local anesthesia was used) by lottery method. Investigations required were according to the standard protocol which do not involve any animal experiments The investigations included were routine blood and urine tests, RBS, blood urea, serum creatinine, chest X-ray (age of patient is >35yrs or if necessary), USG, test dose of local anesthesia. Patients were explained in detail about the type of anesthesia used & surgery, about the benefits of early mobilization, early discharge & socioeconomic benefits of short stay surgery. Intraoperative observations like bradycardia, hypotension and pain during surgery were assessed. Post-operative recovery was assessed including complications like urinary retention, postoperative pain, headache, seroma, hematoma, scrotal edema, wound infection, ambulation time, recurrence and duration of hospital stay. Postoperative pain was assessed using visual analogue scale at 30, 60, 120 and 240 minutes. The patients were followed up in surgery OPD for 6 months. Final outcome was evaluated.

Inclusion criteria

- The patients of primary uncomplicated inguinal hernia admitted in surgical wards of Kasturba Hospital, Bhopal on selective basis.
- Patients aged above 18yrs.
- Patients with unilateral hernia.

Exclusion criteria

- Patients with complicated and irreducible hernia, recurrent hernia, bilateral hernia, psychiatric problems, pregnancy
- Patients below 18yrs of age
- Anxious and apprehensive patients.

METHODOLOGY

1 gm of inj. cefotaxime I.V was given 30 min before surgery. After the local anesthesia given by the surgeon himself & spinal by the anesthesiologist, Lichtenstein tension free hernioplasty was performed irrespective of the type of anesthesia used. (Fig A,B,C,D,E,F,G,H,I,J)

Following Parameters Were Studied In Both Local & Spinal Anesthetic Group

1. Time taken for the procedure: This included time taken from giving anesthesia to completion of surgery.

2. Complications During of Surgery

- i. Bradycardia: In our study heart rate of <60 b/min.
- ii. Hypotension: If systolic bp falls less than 90 mm Hg in supine position.
- iii. Pain during surgery: Patient complaining of intolerable pain needing sedation analgesic after the initial anesthesia.
- iv. Any hemorrhage & cardio-respiratory complication during surgery.

3. Immediate Postoperative Ambulation & Complications

- i. Ambulation after 1 hr of surgery
- ii. Nausea & vomiting
- iii. Difficulty in voiding & urinary retention
- iv. Headache
- v. Postoperative pain

4. Hospital Stay

5. Complications

- i. Seroma
- ii. Haematoma
- iii. Scrotal edema
- iv. Ischemic orchitis
- v. Infection
- vi. Recurrence
- vii. Testicular atrophy, chronic groin pain & par-aesthesia or hyperesthesia if any.

Early discharge option was given to the patients & encouraged. Maximum postoperative stay of 7days was fixed for all patients, except for the conditions, which necessitates hospital stay like infection, hematoma & other complications. Stitches were removed on 7th postoperative day. All patients were followed up for 6months to study late complications.

OBSERVATIONS AND RESULTS

The total number of 60 cases of inguinal hernia were included in the study. The male: female ratio was 19:1, with 57 men (95%) and 3 (5%) women. They were found to be more frequent in the fifth decade, overall ranging in age from 20 to 70 years. In this study 68.33% of inguinal hernia were of indirect type & remaining 31.67% were direct. Out of 60 patients 58.33% had right sided inguinal hernia compared to left side which accounted for 41.67% (**Table 1**) The local anesthesia group (LA GROUP) & the spinal anesthesia group (SA GROUP) were compared on various parameters:

Table 1 Location and type of hernia

Type & location	Indirect	Direct	Total
Right	25	10	35
Left	16	9	25
Total	41	19	60

- a. Time taken for surgery
- b. Observations during & after surgery
- c. Complications of hernia repair
- d. Duration of post operative stay
- e. Recurrence

Time Taken for Surgery (Table 2)

In the LA group the time taken for the procedure was in the range of 40-55 min, with maximum number of patients (53.33%) required 45 min. Whereas in the SA group the time taken for the procedure was in the range of 35-60 min, with maximum number of patients (46.67%) required 50 min. Mean time taken for procedure in SA group was 48 minutes & in LA group was 46 minutes. pvalue 0.017, not significant.

Table 2 Time taken for surgery

Time (in mins)	no of patients in LA	No of patients in SA
35	0	1 (3.33%)
40	6 (20%)	2 (6.67%)
45	16 (53.33%)	10 (33.33%)
50	4 (13.33%)	14 (46.67%)
55	4 (13.33%)	1 (3.33%)
60	0	2(6.67%)

Observations during surgery

The following parameters were studied during the surgery

Bradycardia: Heart rate <60beats / min

Hypotension: Systolic BP < 90 mmHg

Pain: By questioning the patient during procedure

None of the patients met with troublesome hemorrhage during surgery.

- Bradycardia was noted in 3(10%) of LA group & 4 (13.33%) of SA group. They were treated with injection atropine 1mg IV & heart rate was converted into normal rhythm 3(10%) patients. (p=0.001)
- 11 (36.67%) patients experienced hypotension in SA group, who were treated with crystalloids & vasopressors. One patient in LA group (3.33%) experienced hypotension (p=0.009).
- LA group 6 (20%) patients experienced severe pain & needed sedation & analgesia during surgery, none of the patients experienced pain in SA group (p=0.001)

Observations after surgery

- 6 patients in SA group (20%) & 3 patients (10%) in LA group experienced nausea & vomiting.
- 8 patients in SA group (26.67%) & none patient in LA group experienced retention of urine which required catheterization (p=0.002)
- 25 patients (83.3%) in LA group were ambulant at end of 1 hour & none in SA group (p=0.001)
- 2 hours after patients were questioned about pain & need for analgesia noted.
- 7 patients in SA group (23.33%) & 5 patients in LA group (10%) experienced pain & needed analgesia.
- Post operative head ache seen in 4 (13.33%) patients in SA group & 1 (3.33%) of LA group (p=0.001)

Complications of Hernia Repair

- 3 (10%) patients in LA group & 6 (20%) in SA group developed seroma. In total of 60 patients 9(15 %) developed seroma.
- 3 (10%) of LA group & 4 (13.3%) SA group developed scrotal edema & in total 7 (11.6 %) developed scrotal edema.
- Hematoma developed in 4 (13.33%) patients of LA group and 2 (6.67%) patients of SA group. In total 6

(10%) patients develop Hematoma.

- 2 (6.67%) patients of LA group and 4 (13.33%) patients of SA group develop in wound infection. In total 6 (10%) patients develop wound infection.

Duration of post operative stay

- Most of the patients 18 (60%) in LA group were discharged on 2 to 3 days while in SA group on 6 to 7 days post operatively accounts for 13 (43.33%).
- 2 patients in LA group (20%) & 5 from SA group (16.67%) discharged from more than 7 days post operatively.

Recurrence

No patients in study or control group developed recurrence during follow up period of 6 months.

DISCUSSION

In the present study 60 cases of inguinal hernia were included. Various parameters were assessed and further compared on different factors.

Age: In a study done by Ira on inguinal hernia 18% of cases were <15 yrs of age, 20% were 24-44 yrs, 23% were 45-65 yrs & 30% were > 65 yrs, with maximum number of cases between 25-65 yrs of age (Ira M Rutkow 1998).²⁶ The incidence of age at presentation of inguinal hernia was maximum between 30-60 years of life (Louies & Wendell,^{27,28} Delvin, Bholla singh sidhu²⁹). These results were comparable with the present study (**Table 3**)

Table 3 Age at presentation

Age group (yrs)	Lousies & wendell(%)	Delvin(%)	Bholasingh sidhu(%)	Present study(%)
<20	0.3	-	-	-
20-30	12.1	10.1	12	20
31-40	16.2	11.6	28	15
41-50	17.3	17.3	20	18.33
51-60	27.4	28.6	8	30
61-70	23.3	-	24	16.67
>70	3.5	32.4	8	-

Sex distribution: In study by Ira²⁰, 90% inguinal hernia cases were seen in males & 10% were in females. In the study done by Liechenstein³⁰ 94% were males & 6% females. These studies are in accordance with our study in which 95% were male & 5% were female patients.

Type: In our study 68.33% were indirect hernias whereas 31.67% were direct hernias which is in accordance with other studies. (**Table 4**)

Table 4 Type of hernia

Type	Lousies& wendall	L palanivelu	Rhs	Present study
Indirect	65%	76%	63%	68.33%
Direct	20%	24%	35%	31.67%

Location: Right sided inguinal hernia is more common in both direct & indirect type of hernias. This is due to later descent of right testis & higher incidence of failure of closure of processes vaginalis. (**Table 5**)

Comparison Between Spinal & Local Anesthesia Group.

In our study both local & spinal anaesthesia were used in equal number of cases (30 each). The following parameters

were studied & compared between the two groups (p value identified by using Mann-Whitney U test)

Table 5 Location of hernia

Location	Lousies&wendall	Bhola singh sindhu	Delvin	Bk study	Present study
Right	49%	60%	55%	63%	58.33%
Left	38%	36%	45%	37%	41.67%
Bilateral	13%	4%	-	-	-

Duration of Procedure: In SA group the mean operating time was 48+/-5 minutes & in LA group same procedure took 46+/-2 minutes. There was not much difference between the time taken for the procedure in both the groups.

Pain: In the present study none of the patients experienced pain under SA group. This could be because of higher level of SA that is >T9 level attained, than the previous study done by (David V Young 1987). Whereas patients operated under LA experienced mild pain during surgery.

Complications: The patients under SA group manifested more general complications like intra operative hypotension, post operative urinary retention & headache than LA group patients. In addition, there were local complications like seroma, hematoma, scrotal edema, wound infection & recurrence seen in both the groups. In present study, the type of anesthesia had no significant influence on local complications. (Table 6,7) Only the skills, technique, gentleness & experience of the surgeons have influence on these complications. Most of the patients in LA group (>80%) were ambulant after 1 hr of the surgery but none of the patients were in SA group.

Table 6 Complications

Complications	SA	LA	Pvalue	Significant Pvalue<0.05
Bradycardia	4	3	0.001	Significant
Hypotension	11	1	0.009	Significant
Pain during Surgery	0	6	0.001	Significant
Nausea&vomiting	6	3	0.001	Significant
Ambulationafter 1 hr	0	25	0.001	Significant
Postoperative Pain after 2hrs	7	3	0.001	Significant
Urinary retention	8	0	0.002	Significant
Postoperative Headache	4	1	0.001	Significant
Seroma	6	3	0.104	Not significant
Scrotaledema	4	3	0.001	Significant
Hematoma	2	4	0.732	Not significant
Wound infection	4	2	0.001	Significant
Recurrence	0	0		

Table 7 Table comparing complications

Complications	David v young 1987		Present study	
	LA(%)	SA(%)	La(%)	Sa(%)
Nausea/ vomiting	8	7	10	20
Pain during Surgery	13	7	20	0
Urinary Retention	7	18	0	26.67
Headache	7	8	3.33	13.33
Hematoma	5	4	13.33	6.67
Infection	1	2	6.67	13.33

Complications of Hernia Repair: The local complications like seroma, hematoma, scrotal edema, taken together from both the groups, 15 % seroma, 11.6% scrotal edema, 10% hematoma, 10% infection. All complications were treated conservatively. With the help of scrotal support &

analgesics they resolved within 15-20 days. Infections eventually resolved after drainage of the pus in two patients & change of antimicrobial treatment in rest of the cases. None of the cases developed chronic groin pain, testicular atrophy & paraesthesia. In previous studies infection occurred in 7.8% cases (T.B Burke, 1978) , 5.9% of cases (Maxemo Deysine, 1991) , 1.2% of cases (B Millant 1993) , upto 8%of cases (Allen E Kark 1998) , & 2% cases in (T Faish 2000) . These are similar to the present study & are comparable with the previous studies

Table 8 Local anesthesia

Advantages	Disadvantages	Adverse effect related to drug
does not require an anesthetist patients operated are able to walk eat and pass urine earlier safe acceptable less complication rates less disturbance of cardio- respiratory functions. require less intensive postoperative- care early ambulation perfect choice for day care and short stay surgery doesnot require post operative monitoring minimizes the cost of surgery with no increase in recurrence rate The ability to do an intra operative stress test with an awake, co-operative patient helps in identification of strength of posterior wall to identify any evasive hernia or missed hernia and to test the suture line and the anatomic relationships.	can't be used in patients who are sensitive to local anaesthesia. (Dr ugs, obese and markedly over weight. (BMI > 26.2) can't be employed in children and patients with anxiety.	Toxic effects of lignocaine due to intravenous injection or due to over dosage are twitching convulsions apnea acute cardiac failure contraindicated in patients susceptible to malignant hyperpyrexia. The clearance of lignocaine is reduced in the presence of propranolol with increased risk of toxicity. Treatment consists of small doses of Barbiturates to control convulsion, O2 inhalation and supportive necessary resuscitative measures.

Table 9 Spinal anesthesia

Advantages	Disadvantages	Contraindications
simple effective almost 100% of time. rapid analgesia small amount required requires less skill obviates the need for deep anesthesia, and profound muscle relaxant drug dosage preserves spontaneous respiration Economic decrease the aspiration pneumonia	Possibility of hypotension secondary to production of sympathetic blockade. Spinal headache may occur in 2-10% of patients. Backache Retention of urine Meningitis Paralysis of 6 cranial nerve	Severe shock, hypovolemia, Deformity of spine Skin sepsis in lumbar region Patients with disorders of blood clotting and patient on anticoagulant. Patients with breathless from any cause, they may become hypoxic if level of analgesia is high. Abnormalities of CNS like raised intracranial pressure, congenital or acquired CNS disorders.

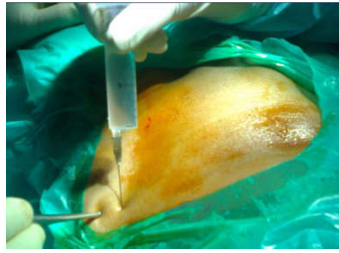


Fig A

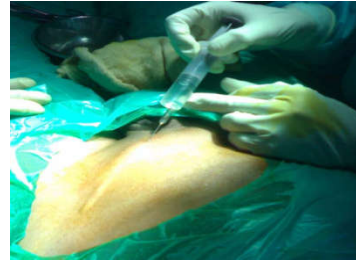


Fig B

Fig A & B showing infiltration near anterior superior iliac spine & medial to pubic tubercle

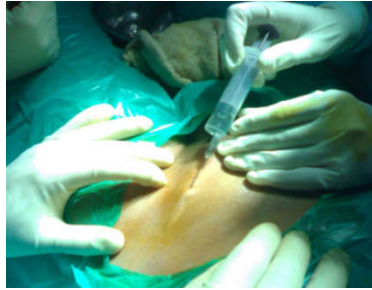


Fig C

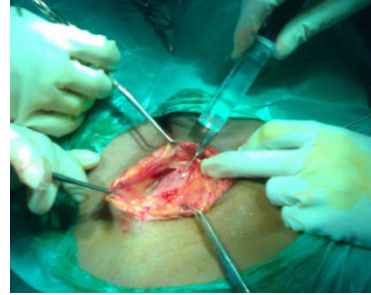


Fig D

Fig C & D showing infiltration along line of incision & subaponeurotic part of external oblique aponeurosis

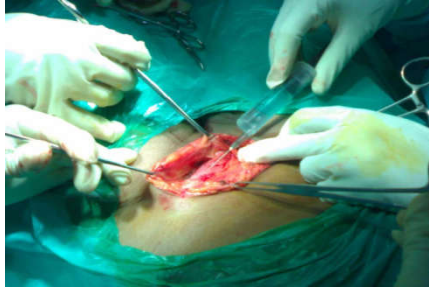


Fig E

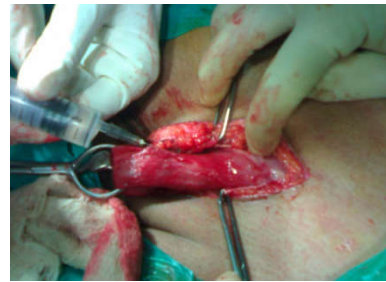


Fig F

Fig E & F showing infiltration along cord & into the cord structure

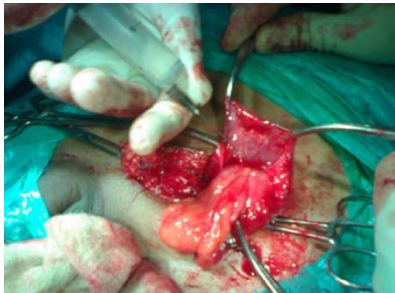


Fig G



Fig H

Fig G & H showing infiltration into the sac & near pubic tubercle



Fig I



Fig J

Fig I & J showing immediately after operation patient able to sit & walk

Duration of hospital stay: Because of the delay in the pre-operative investigations in our study only the post operative period was calculated. 80% of the patients in the LA group & more than 40% patients in SA group were discharged by the fifth day. Other studies showed that the post operative stay for short stay surgery was 3-4 days (Sven Kornhale 1976)³⁷, 2.2 days (Makuria 1979)³⁸, 3.8 days (S R Canon 1982)³⁹, 2-3 days (Glassow 1984). David Young 1987³¹ study showed 4.4 days stay for LA group patients & 6 days for SA group. This is comparable with the previous studies which showed that the short stay surgery can be very well practiced in our hospital.

Recurrence: In the present study the recurrence rate was nil even though it cannot be compared because the study group here is small & follow up period was less. It was very difficult to project accurate incidence of recurrence, since it depends on length of follow up. In ideal surgeries the recurrence rate would be <1%. This is possible only in hernia specialization centers.³²

CONCLUSION

Even though hernia is a common surgical problem, up to date knowledge of herniology is important for proper repair of inguinal hernias to reduce recurrence rate, and careful handling of these unusual contents of inguinal hernias, to avoid damage to some of these structures.

Our study helps to evaluate the significance of local anesthesia over spinal anaesthesia in conventional hernioplasty. It highlights the effectiveness of using local anaesthesia over spinal anesthesia in repairing uncomplicated inguinal hernia by measuring post-operative pain and post-operative complications. Our study also focused on the feasibility of using local anesthesia for the short stay surgeries. Though both local & spinal anaesthesia can be used for hernia repair on short stay bases, but spinal anaesthesia has higher complication rates compared to local anaesthesia. There is significant increase in general complications like hypotension, urinary retention, & headache in spinal anaesthesia & local complications like seroma, hematoma, scrotal edema & recurrence were similar in both the groups. When short stay service is provided use of local anesthesia showed less post operative complications, with significant number of patients being ambulant after two hours post operatively. It results in less post operative hospital stay and less complications with high patient acceptability. Hence local anesthesia is best suitable for short stay surgeries.

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Declarations: Ethics approval and consent to participate: The study was conducted at Department of General Surgery, Kasturba Hospital, BHEL, Bhopal. The data of the patients were collected after attainment of written consent forms from the patients. A formal informed written consent was taken from all the patients.

Consent for Publication: 'Not applicable' Availability of data and material: All data generated or analysed during this study are included in this published article. Competing interests: None

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