

## Recurrence of Inguinal Hernia According to the Type of Anesthesia- Three Years Prospective Clinical Study

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### ABSTRACT

**Background:** Recurrence is the most common long-term complications that can result after primary inguinal hernia repair. Despite all the progress made in inguinal hernia surgery, the proportion of recurrent inguinal hernias among the total patient collective with inguinal hernias is still elevated up to 13%.

**Objective:** To assess the recurrence rate after primary inguinal hernia repair. **Methods:** A prospective randomized clinical trial conducted in Kirkuk general hospital, Kirkuk city , North of Iraq during the period 2016-2018. Including 60 patients with unilateral primary inguinal hernia and they were seeking medical care for repair of inguinal hernia. Patients were assigned randomly into two groups with 30 patients in each. Group I received Local anesthesia and the second group under general anesthesia. All the selected patients were with ASA grade I and II. Patients were followed up for a period of three years after surgery. The same surgical procedures were applied for all patients **Results:** Patients in both groups were almost matched for baseline characteristics including, age, gender, type of hernia, site of hernia, physical activity and occupation. Recurrence within the three years reported in 7 patients (11.6%) 4 of them in the local anesthesia (LA) group and the remaining three patients in the general anesthesia (GA) group **Conclusion:** No significant differences in the recurrence and other complications across both types of anesthesia. Recurrence rate reported in the study was comparable to that reported worldwide. Further studies for longer duration are highly suggested.

**Keywords:** Inguinal Hernia, Etiology, Pathogenesis, Risk Factors, Complications, Recurrence

## **1.INTRODUCTION**

The hernia occurs when there is a weakness in the muscle wall that usually holds the abdominal organs in place - the peritoneum(1). Abdominal wall constitute the most common site of diseases to which the general surgeon faces, in their everyday practice. The classification of hernias is based on the consideration of the following aspects: Clinical and anatomical. The frequency of inguinal hernia condition is like acute appendicitis and gallbladder stones -second and third causes of admission in the operating room (2,3).

Currently treatment is surgical , and the most frequent operations among all hernias are that for inguinal hernia. Worldwide, more than 20 million patients undergo groin hernia repair annually. It is more common in men than women in almost (9: 1), presented before one year of age to older than 65 years (4). In the 90s, there were already several repair techniques. Recurrence is variable, depending on the center and the surgical technique (5).

### ***Historical view***

Inguinal hernia is known since man took the upright position, so it is one of the most common conditions. Its history is as old as humanity itself. It is a matter of interest not only to historians but mandatory knowledge for anatomists and surgeons. The first description of data at time of Hammurabi reported on the ebers papyrus, dating from 1560 BC, defining the hernia as a tumor on genitals as the bowels move as it is the protrusion of an organ in the abdominal cavity through a natural orifice or acquired. Hesinten, in 1794, established a differentiation between direct and indirect inguinal hernias. With the course of time in the modern era of hernia surgery, which began with the discovery of antiseptis by Lister, studies on anesthesia, knowledge of normal physiology of inguino-femoral region, the introduction of antibiotics and better understand the process of tissue repair and healing. Everything was linked to the emergence of better surgical methods as evidenced in the works of Henry and Marcy in the US. and E. Bassini in Italy. (6,7)

### ***Etiology and Pathogenesis***

An indirect inguinal hernia emerges from the abdominal cavity through the deep inguinal ring and passes through the spermatic cord structures by a variable distance along the inguinal canal into the scrotum or (inside the fibers of the cremaster). This type of hernia is associated with increased size in the deep inguinal orifice. If the hernia is sliding, the intestinal component constitutes part of the rear wall of the sack or all the same (blind right mesosigmoid). A direct hernia protrudes through the rear wall of the inguinal canal in the Inguinal (Hesselbach's) triangle, limited area lateral to the

inferior epigastric artery, by lower inguinal ligament and medial to the lateral edge of the rectus sheath(8,9).

### ***Clinical Manifestations***

Patients have a wide variety of medical conditions, from no symptoms to a condition that endangers the life which is caused by strangulation incarcerated hernia contents. Asymptomatic people can be diagnosed a routine physical examination or when seeking care for a painful lump in the groin. Both direct and indirect hernias are more likely to induce symptoms. Feeling of heaviness or uncomfortable pull that tends to worsen as the day progresses. The pain is usually intermittent and is common to irradiate, localized or diffuse acute pain. Individuals with particularly intense pain may need to rest for a short time or use other techniques that alter posture. Occasionally, patients should reduce the hernia manually to get relief. Although inguinal hernias tend to occur more often in those who carry out heavy labor, it is very rare a history of sudden onset of pain after a specific episode of lifting a heavy object, except workers(2,8,10).

### ***Classification***

The classification of hernias is based on the consideration of the following aspects: Clinical and anatomical. The clinical classification is only presumption because at that time is difficult to make a definitive diagnosis and can only be set if direct, indirect or femoral; primary or recurrent; complicated or uncomplicated. Instead, the anatomical classification and definitive diagnosis is made during surgery. There are different classifications taking into account the pathophysiology of hernia, anatomical (direct or indirect) , contents of hernia, site of hernia, ...,etc. (2,3,10). However, in the last 4 decades, several classifications have been adopted and the most common popular are

1. Nyhus (11) developed a classification designed for the posterior approach based on the size of the internal ring and the integrity of the posterior wall
2. Gilbert (12) designed a classification for primary and recurrent inguinal hernias done through an anterior approach.
3. Casten (13) divided hernias into 3 stages.
4. The Halverson and McVay (14) classification divided hernias into 4 classes.
5. Ponka's (15) system defined 2 types of indirect hernia.
6. In 1993, Rutkow and Robbins (16) added a type 6 to the Gilbert classification to designate double inguinal hernias and a type 7 to designate a femoral hernia.

However, the most used are the classification of Nyhus (Figure 1) and Arthur J. Gilbert (Table below). (11,12)

Nyhus Classification of Inguinal Hernias (11)	
Hernia Type	Description
<b>Type 1</b>	Indirect hernia with internal inguinal ring of normal size
<b>Type 2</b>	Indirect hernia with dilated internal inguinal ring hut intact posterior inguinal wall
<b>Type 3</b>	Posterior inguinal wall defect
<b>Type 3A</b>	Direct inguinal hernia
<b>Type 3B</b>	Indirect hernias with a large, dilated internal inguinal ring that encroaches on the posterior inguinal wall; includes pantaloon, scrotal, and sliding hernias
<b>Type 3C</b>	Femoral hernia
<b>Type 4</b>	Recurrent hernias
Gilbert's Classification of Inguinal Hernias (12)	
Hernia Type	Description
<b>Type 1</b>	Indirect inguinal hernia(IIH)-tight deep ring
<b>Type 2</b>	IIH deep ring admit 1 finger but less than 2 finger breadth
<b>Type 3</b>	IIH deep ring more than 2 finger breadth
<b>Type 4</b>	Direct hernia -entire posterior wall is defective
<b>Type 5</b>	Direct hernia-punched out hole/defect in transversalis fascia
<b>Type 6*</b>	Pantaloon/double hernia
<b>Type 7*</b>	Femoral hernia
*Type 6 & 7 are Rutkow and Robbins' modification	

### ***Risk Factor's***

*Sex:* Males are much more likely to develop an inguinal hernia. In addition, the vast majority of newborns and children who develop inguinal hernias are male.

*Chronic cough:* A chronic cough, such as smoking, increases the risk of inguinal hernia.

*Chronic constipation:* Straining during defecation is a common cause of inguinal hernias.(17–19)

*Overweight:* moderate to severe obesity increases the pressure on the abdomen.

*Pregnancy:* It can thus weaken the abdominal muscles as causing increased pressure within the abdomen.(17–19)

*Certain occupations:* Having a job that requires standing for long periods or doing heavy physical work increases the risk of developing an inguinal hernia.(17–19)

*History of inguinal hernia:* If you had an inguinal hernia, is much more likely that you develop other, usually on the opposite side.(17–20)

### ***Anesthetic Considerations in Inguinal Hernia Repair***

For many years, inguinal hernia repair has been one of the most common operations worldwide. There is still no consensus on the best choice of anesthesia. It is a sober thought that little has changed since Halsted and Cushing [1] introduced local anesthesia for this kind of surgery over 100 years ago. Thus, surgeons of the present face almost the same choice as their predecessors: the choice between local, regional or general anesthesia. Local anesthesia is preferred in many centers where there is a special interest in hernia repair [2-6], while in other settings, such as general surgery units, regional or general anesthesia are often more used [7-10 ]. This discrepancy between the type of anesthesia used has been explained by the type of surgeon performing the intervention: it is assumed that hernia repair with local anesthesia requires great experience and surgical skills and is, therefore, successful only if the surgeon is completely familiar with the technique (21–24)

There are several options for anesthesia when repairing inguinal hernias. Choices depend on technique, minimally invasive versus open and on multiple patient factors. Operative approach and anesthetic of choice varies greatly between regions of the world, and open inguinal hernia repair is the most common approach worldwide (21–26). General anesthesia also appears to be the dominant anesthesia choice in most Western medical centers. Open inguinal hernia repair under local anesthesia, compared to general anesthesia, is associated with less postoperative nausea and pain, better postoperative quality of life scores, lower overall cost, and is well tolerated by patients. Laparoscopic inguinal hernia repair is recommended for primary hernias, hernias in women, and bilateral hernias, as well as patients with a desire to return to work or activity more

quickly or those at risk of wound infections. In those patients who undergo laparoscopic repair, general anesthesia is still the standard. However, laparoscopic hernia repair under local anesthesia, especially via extraperitoneal approach, may be a promising alternative in the future (21–26).

### ***Postoperative complications***

Systemic complications appear similar to that observed in other surgical procedures comparable magnitude, usually in connection with the use of general anesthesia and frequently elderly. It should be mentioned respiratory problems, intestinal obstruction and gastrointestinal bleeding. The incidence of systemic complications can be reduced by greater use of local or regional anesthesia, especially in elderly patients or high surgical risk.(23,27,28).

### ***Recurrence of hernia***

A hernia recurs when a new hernia bulge appears in the same where a hernia was operated. There are different synonyms for naming recurrence, but always refer to the same problem (29). Recurrence is the most common long-term complications that can result after correction of inguinal hernia. About 50% of the hernia does not occur until they have been 5 years since primary surgery and 20% of recurrences may not appear for 15-25 years(29–31)

Despite all the progress made in inguinal hernia surgery (meshes and laparoendoscopic operative techniques), the proportion of recurrent inguinal hernias among the total patient collective with inguinal hernias is still from 12% to 13% (23,32) Depending on its cause, a recurrence can occur very soon after the primary operation or it can also develop much later on. There is a discrepancy in the literature between the low recurrence rates reported in individual studies and the still relatively high recurrence rates identified in a nonselective total patient collective in registers. This is mainly due to the fact that many studies have a maximum follow-up time of only 1–5 years(32,33)

Recurrence rates are reported in inguinal hernias of 0.1 to 20% based on the repair techniques and varying according to the skill of the surgeon. The problem of recurrence remains the high point and reference for deciding whether a particular technique is useful or not.

With the advent of techniques energized, the recurrences tend to decrease drastically to lower numbers. Currently it is given more importance to other postoperative complications. The truth is that, despite all the advances in techniques repair, there is not yet an ideal one, i.e., which offers a solution ultimately 0% chance of recurrence.

The use of surgical mesh techniques has brought numerous benefits, among which decreased recurrence rate, lower postoperative complications, thereby reducing recovery time so reintegration

to daily activities is earlier. Therefore There are different mechanisms involved in the recurrence of a hernia, and excessive strain on the suture line, repeated elevations of intraabdominal pressure, collagen alterations, changes in tissue quality, nutritional status, associated diseases, local factors, surgical technique, etc. For this reason it is important to investigate the main factors, which may be prevented timely to prevent relapse of inguinal hernias in patients undergoing repair of this disease in our area, because in the moment. However,few studies at local and national level on the issue (17–19,34,35).

### ***Postoperative complications***

1. Recurrence: In some studies, recurrence rates after repair of recurrent herniation can be up to 30% (17–19,34,35).

Causes of recurrence:

- A. As main causes, weak tissue quality (which may be due to large hernias for many years) or for short periods of postoperative recovery (failure) is described.
  - B. Comorbidities such as obesity, steroids and chronic obstructive pulmonary disease may affect wound healing and can thus affect the rate of recurrence.
  - C. Surgical wound infection: Despite a low risk of infectious complications after correction of an inguinal hernia; In cases with surgical wound infection the risk of recurrence may be 80%. The risk of infection is affected by many factors such as the technique used by the surgeon during primary repair, the use of drains and emergency procedures performed.
  - D. Seroma: Corresponds to a collection of serum in a surgical wound. The size of the collection is related to the amount of dissection (venous and lymphatic damage) and the size of remaining cavities. Usually it associated with tissue trauma and foreign body reaction (prosthesis). Seroma predisposes wound infection, scarring capacity decreases and increases with this hernia recurrence rate.
  - E. Hematoma: It is a preventable complication with a neat hemostasis, development of hematoma might possibly increases the risk of recurrence.
2. Urinary retention: It is caused by several factors: excess liquid parenterally extending postoperatively, plus the use of opioids and other analgesics. It is an annoying complication in extreme cases require bladder catheterization .
  3. Postoperative pain: It is estimated that up to 15 to 20% of patients undergoing repair of an inguinal hernia evolve with varying degrees of postoperative neuralgia, paresthesia, hyperesthesia neuropraxia up to 6 months after the repair carried out(36).



4. Paresthesia: The ilioinguinal nerve injury usually result in paresthesia in the scrotum in men and the labia majora in women. The effect is immediate and should be sought first postoperative day(28,37,38).

## **2. PATIENTS and METHODS**

This was analytical observational study conducted at Kirkuk general hospital during a period of 3 years ; March 2016 to April .. Including 60 patients with a primary unilateral reducible inguinal hernia and were fit for surgery according to the American Society of Anesthesiologists (ASA) (39,40)classification score of grade I and II and were operated on in the department of surgery of our hospital during the study period. All patients were operated on by the same team of surgeon and anesthesiologist during the study. And all patients were followed up for at least

**Inclusion criteria:** Adult patients, aged 18 years and older undergoing inguinal hernia repair at the surgery department during the study period were included regardless their gender, religion or ethnicity

***Exclusion criteria:***

1. Patients with femoral hernia
2. Patients with history of coagulopathy (confirmed or suspected)
3. Patients who refused to participate in the study or refused to sign the informed consent
4. Patients who already operated on for a primary inguinal hernia and had a recurrence
5. Patients who missed to follow up
6. Patients with incomplete medical records

***Study protocol:***

All ethical issues were approved prior to start inclusion of the patients. Then every patient should signed an informed consent before been included. Patients aged less than 18 years, their parents/guards should signed the informed consent too.

***Surgical technique :***

After full medical history and complete clinical examination, routine surgical technique was applied according to the patients characteristics and the surgeon decided the appropriate technique for each individual case , a case by case.

Patients who were operated on using Local anesthesia, (30 patients) were assigned in group I (LA group) where local anesthesia consisted of lidocaine (10 mg per milliliter) and ropivacaine (7.5 mg



per milliliter). During the operations , the surgeon and the anesthesiologist (the researchers) act together to confirm that the same technique and anesthesia were used in for all patients.

The other group also included 30 patients and were operated on using general anesthesia (GA group). General anesthesia used included the available GA agents in our hospital that used in our operations and follow the standard GA protocol.

All patients in both groups received a prophylactic dose of antibiotics.

Postoperatively, a routine postoperative protocol was followed up. Post-operative pain was evaluated using the visual analogue scale (VAS) of 100 mm (41,42) after 6 hours, 1 day, two days and three days postoperative , then patients were discharged according to the surgeon decision . All patients were followed up during the study period of 3 years, at a scheduled visits to the department of surgery or private clinic at each 3 months or when a complication developed.

#### ***Type of anesthesia:***

According to the type of anesthesia used , patients were categorized into two groups

Local anesthesia (LA) group included 30 patients .

General anesthesia (GA) group included 30 patients

#### ***Data analysis:***

A computer database was generated and the data were entered in Microsoft Office Excel 2013 Microsoft Word and then finally the SPSS program version 25, for tables and graphs. Appropriate statistical tests and procedures were applied accordingly. Odds ratio (OR) was calculated with confidence interval at 95% (95% CI).

### **3. RESULTS:**

A total of 60 patients were enrolled in this study, all with primary unilateral hernia and fit for surgery. All patients had grade I and II ASA classification score. Patients assigned into two groups namely LA group and GA group with 30 patients in each. The mean age of the patients was  $40.7 \pm 14.4$  (range: 18 -57) years in LA group and  $42.7 \pm 12.9$  (range: 19 – 59) years in GA group. In both groups males were dominant 26/30 in LA group and 27/30 in GA group with a male to female ratio of almost 9 to one , however, details of baseline characteristics of the patients in both groups are summarized in (**Table 1 , 2 and 3**).

The mean operative time was relatively longer in LA group compared to GA group , (39.6 ) vs. 35.4 minutes, respectively, with no statistically significant difference between groups (**Figure 1**).

The evaluation of patients for postoperative pain was made using visual analogue scale (VAS) of 100 points was used and revealed that in both groups the mean score decreased from significantly with the time to reach minimal value at the third day (**Table 4**) , however, no significant differences had been found between both groups in the changes of postoperative pain scores; trends of change in both groups were almost parallel (**Figure 2**)

**Table 5** shows the postoperative complications and outcome of patients in both studied groups, in LA group one patient had postoperative nausea and vomiting , two wound infection , one hematoma, 2 Postoperative hydrocele , one Seroma and one patient need re-admission , in GA group 4 nausea and vomiting , one wound infection , one hematoma, one postoperative hydrocele , one retention of urine , one Seroma and two patients need re-admission . No significant difference was found in the incidence of complications between both groups, in all comparisons , P. value > 0.05. At one year postoperative, none of the patients had recurrence inguinal hernia, additionally all patients were evaluated for any complication , pain or discomfort and assessed for their satisfaction; in LA group only 4 patients had mild groin pain and two patients had moderate groin pain . Two patients were discomfort able due to aching and three patients due to feeling of numbness, Burning sensation reported by one patient, however, 93.3% were satisfied about their operation and outcome. In GA group , mild groin pain reported by 5 patients, and moderate groin pain by 2 patients. Aching in 5 patients, numbness reported by 4 patients , one patient had burning sensation and 86.7% were satisfied with their about their operation and outcomes, (**Table 6**).

Regarding the recurrence, at the end of the 3<sup>rd</sup> postoperative year (follow up period) , unfortunately 7 recurrent inguinal hernias were reported in our patients, 4 cases in the LA group and 3 cases in the GA group. Despite the higher proportion of recurrent cases in LA group (13.3%) than the 10% in GA group, the difference did not reach the statistical significance, (P. value > 0.05) (**Table 7 and figure 3**)

From other point of view, the overall incidence rate of recurrence after three years was 11.7% (3/60), (**Figure 4**)

It is worth mentioning that the three recurrent cases were males, unemployed, with moderate to heavy physical activities, their ages were 25- 39 years, 5 of them had direct hernias, on the left side and two cases with indirect hernia on the right side.

**Table 1. Age distribution of the patients in both studied groups**

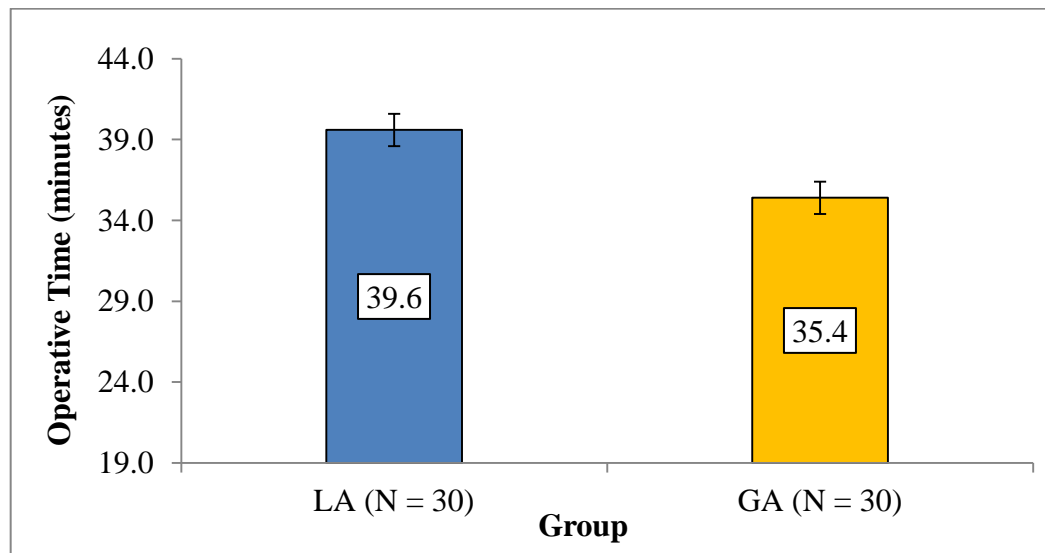
Age (year)	LA group (N = 30)	GA group (N = 30)	P. value
Mean $\pm$ SD	40.7 $\pm$ 14.4	42.7 $\pm$ 12.9	0.569
Range	18 – 57	20 - 59	
SD: standard deviation			

**Table 2. Baseline demographic characteristics of the patients in both studied groups**

Variable		LA group (N = 30)		GA group (N = 30)		P. value
		No.	%	No.	%	
Sex	Male	26	86.7	27	90.0	0.688
	Female	4	13.3	3	10.0	
Occupation	Unemployed	16	60.0	14	46.7	0.848
	Employed	7	10.0	9	30.0	
	Retired	5	20.0	6	13.3	
	Housewife	2	10.0	1	10.0	
Physical activity	Sedentary	8	26.7	11	36.7	0.699
	Mild	6	20.0	7	23.3	
	Moderate	9	30.0	8	26.7	
	Heavy	7	23.3	4	13.3	

**Table 3. Baseline clinical characteristics of the patients in both groups**

Variable		LA group (N = 30)		GA group (N = 30)		P. value
		No.	%	No.	%	
Site of hernia	Left	18	60.0	16	53.3	0.602
	Right	12	40.0	14	46.7	
Type of hernia	Indirect	17	56.7	18	60.0	0.793
	Direct	13	43.3	12	40.0	
ASA grade	Grade I	14	46.7	11	36.7	0.432
	Grade II	16	53.3	19	63.3	



*Figure 1. Comparison of Operative time of LA and GA groups*

*Table 4. Pain scores of the patients at 6 hours to 3 days postoperative*

Pain score	LA group (N = 30)		GA group (N = 30)	
	Mean	SD	Mean	SD
6 hours Postop	22.8	2.6	26.3	2.6
One day Postop	19.3	2.9	18.3	2.4
2 days Postop	10.5	1.6	11.7	2.0
3 days Postop	4.6	1.2	5.8	1.2

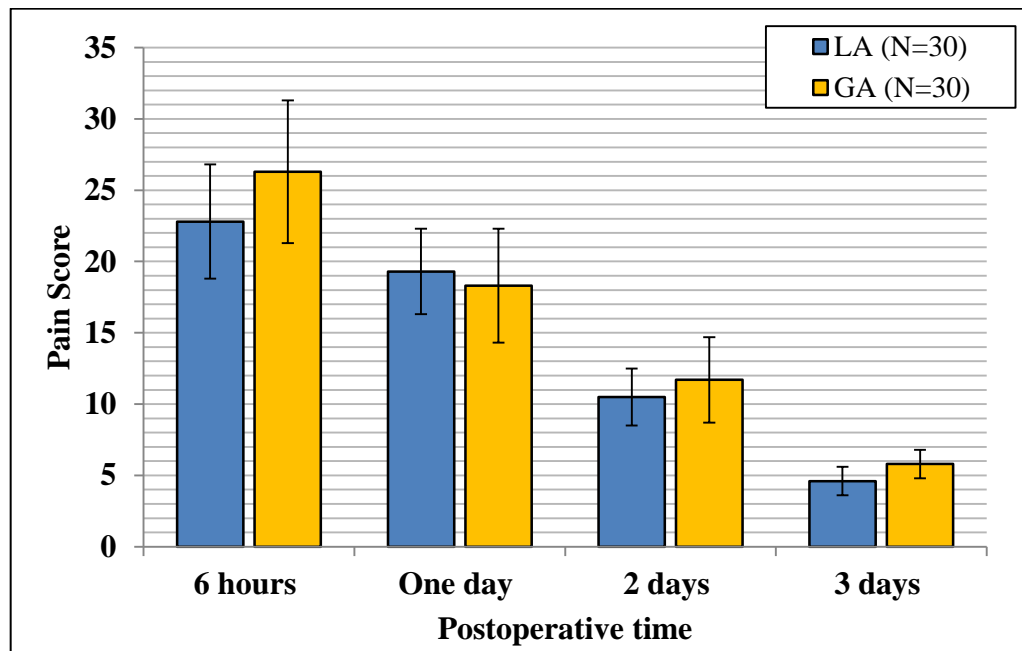


Figure 2. Changes in Postoperative pain scores of patients in both studied groups

Table 5. Postoperative complications and outcome of patients in both studied groups

Outcome	LA group (N = 30)		GA group (N = 30)		P. value
	No.	%	No.	%	
Nausea and vomiting	1	3.3	4	13.3	0.667
Wound infection	2	6.7	1	3.3	1.00
Hematoma	1	3.3	1	3.3	0.472
Postoperative hydrocele	2	6.7	1	3.3	1.00
Retention of urine	0	0.0	1	3.3	1.00
Seroma	1	3.3	0	0.0	1.00
Re-admission	1	3.3	2	6.7	1.00
None	21	70.0	20	66.7	1.00

**Table 6. Follow up findings and outcome at 1 Year postoperative**

Variable	LA group (N = 30)		GA group (N = 30)		P. value
	No.	%	No.	%	
<b>Recurrence/Reoperation</b>	0	0.0	0	0.0	-
<b>Chronic groin pain</b>					
Mild	4	13.3%	5	16.7%	0.852
Moderate	2	6.7%	2	6.7%	
Severe	0	0.0%	0	0.0%	
None	24	80.0%	23	76.7%	
<b>Discomfort</b>					
Aching	2	6.7%	5	16.7%	0.576
Numbness	3	10.0%	4	13.3%	
<b>Burning sensation</b>					
Present	1	3.3%	1	3.3%	0.472
Absent	29	96.7%	29	96.7%	
<b>Satisfaction scores</b>					
Satisfied	28	93.3%	26	86.7%	0.667
Dissatisfied	2	6.7%	4	13.3%	

**Table 7. Recurrence rate at the end of third postoperative year**

Recurrence	LA group (N = 30)		GA group (N = 30)	
	No.	%	No.	%
Recurrence	4	13.3	3	10.0
No recurrence	26	86.7	27	90.0
P. value = 0.500				

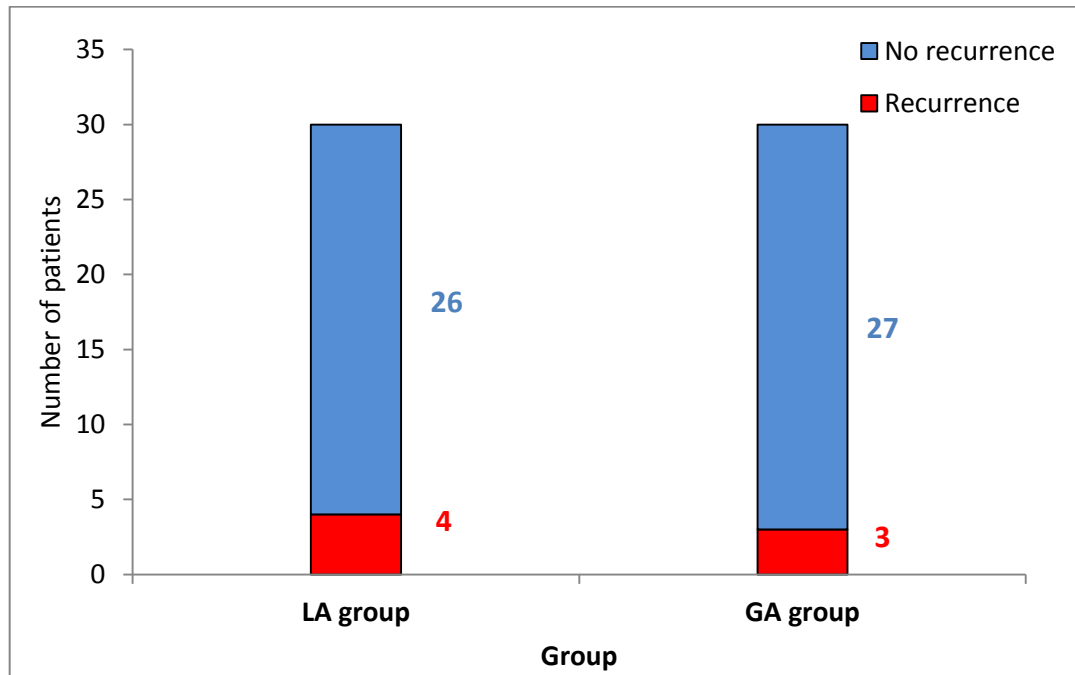


Figure 3. Incidence rate of post-repair recurrent Inguinal hernia in each studied group

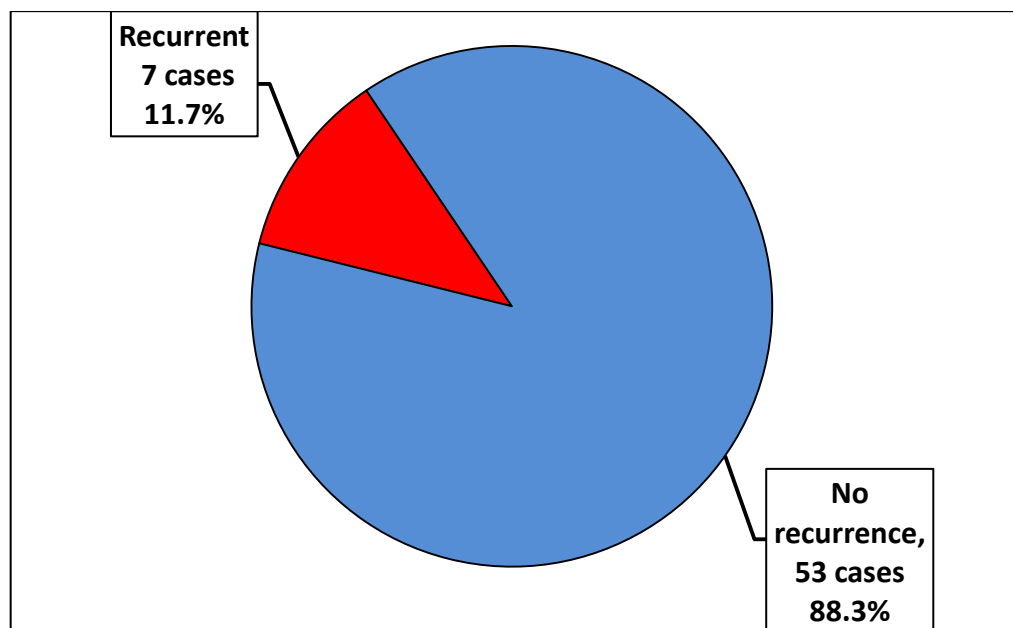


Figure 4. Overall Incidence rate of post-repair recurrent Inguinal hernia out of the total 60 patients



#### **4. DISCUSSION**

Inguinal hernia is one of the most common surgical procedures performed in hospitals. Surgical outcomes, recurrence and surgical techniques that are used are mostly reported but in reference to early or late postoperative complications are just mentioned and as little information about them exists in general, and only it mentioned in some clinical guidelines. Previous studies either concerned with early and late complications or conducted for short duration that couldn't detect the recurrence rate where the recurrence of inguinal hernia after repair need longer duration to occur, it is mentioned in previous literatures and guidelines that recurrence after primary hernia repair occur could occur soon after primary operation , and could be attributed to the failure of operation or it takes much longer time (20). Nonetheless, recurrence still the most common long-term complications that take much attention among surgeons and anesthesiologists (29–31,34,43). Therefore, in our present study we tried to compare the early and late complications of inguinal hernia repair and to detect and compare the recurrence rate in patients with primary hernia repair performed under local anesthesia compared to general anesthesia, hence a total of 60 patients with primary inguinal hernia were operated on in our hospital , department of surgery and assigned into two groups , LA and GA group with 30 patients in each, patients were followed up postoperatively until discharged and followed up for two to three years in scheduled visits each three months or when a complication occur . Patients in both groups were almost matched for the baseline demographic and clinical characteristics , including age, gender, occupation, physical activity, type of hernia, site of hernia and ASA grade (39,40).

Findings of the present study revealed no significant difference in the operating time which indicated that none of the types of anesthesia was superior to other with regards to this point. But the advantage is paid towards LA when we take into account the simplicity, safety, extended postoperative analgesia, early mobilization without postanesthesia side effects, and low cost (26) .

In the present study we evaluated the patients about their postoperative pain uwith VAS of 100 points (41,42) which revealed that in both groups the mean score decreased significantly with the time to reach minimal value at the third day.

No significant differences had been found in the incidence of early complications in both studied group , however, nausea and vomiting was more frequent in GA group and this was expected as it is one of the early outcomes after operations under GA. Regarding the recurrence , none of the patients reported recurrence at one year of follow up, however, 7 cases of recurrence were reported

among our cohort, 4 of them in LA group represented a recurrence rate of 13.3% and 3 cases (10%) in GA group, the recurrence was relatively higher in LA group but did not reach statistical significance. All the recurrent cases were males, between age 25 – 39 years, unemployed with moderate to heavy physical activities. Five cases had direct type while the other two with indirect , in majority of the recurrent cases their primary hernia was in the left side.

Our findings supported the growing literatures in the field that compare local versus general anesthesia . however, previous investigators reported a collective recurrence rate among male population about 12 – 13% . From other point of view, about 50% of the hernia does not occur until they have been 5 years since primary surgery and 20% of recurrences may not appear for 15-25 years. There are many factors associated with the recurrence among these factors the surgical technique, it has been reported that use of meshes associated with lower recurrence , moreover, open mesh repair had lower recurrence rate compared to laparoendoscopic mesh repair . Other factors, sliding inguinal hernia among males had higher recurrence rate and reoperation compared to non-sliding hernias (29–31,33,43).

Regarding the association between type of anesthesia used in inguinal hernia repair and the recurrence , no previous study was available in our country , to best of our knowledge this is the first study at least in our center and previous studies did not focus the light on such association or registered recurrence rate associated with each type of anesthesia. Nonetheless , some isolated studies reported recurrence rate for some types of anesthesia(24,25,38,44,45).

**Callesen T** found no significant association between the type of anesthesia and the recurrence of inguinal hernia after primary repair which supported our findings(46).

Another study was conducted by **Kulacoglu and Alptekin** (44) reported that Local anesthesia have certain advantages over general and regional anesthesia in inguinal hernia repairs. It is more economic and requires a shorter time in the operating room and shorter stay in the hospital. With less postoperative pain, less analgesic consumption; avoids nausea, vomiting, and urinary retention. Patients can mobilize and take oral liquids and solid foods much earlier.

**Ozgün et al** (38) from Turkey found that Local anesthesia is suitable for day-case hernia repair with fewer postoperative problems and less analgesia requirement. Patients also reported greater satisfaction also **Ozgün et al** preferred LA than other methods(38).

Conversely **Nordin et al.** (26) documented that “LA was associated with a significantly increased risk of recurrence and reoperation after primary repair”. Additionally, Nordin et al. found that the use of mesh was significantly reduced the recurrence rates after primary repair and that the Lichtenstein repair was associated lower risks of recurrence than other procedures. An earlier study was conducted by **Kehlet et al.** (45) from Denmark found that surgeon experiences and hernia type are important factors associated with recurrence and independent of the type of anesthesia. Additionally , authors mentioned that local anesthesia could be additional risk factor for recurrence after primary repair of direct inguinal hernia.

**Conclusions:**

Local anesthesia is a safe technique could be applied effectively in primary inguinal hernia repair and had good outcome compared to general anesthesia surgeries. Almost similar recurrence rates reported when the operations performed under local or general anesthesia. Both early complications and recurrence reported in this study were comparable to and supported that reported in previous studies.

**Ethical clearance :**

All ethical issues were approved by the local authorities.

All patients signed informed consents before participation and surgeries.

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