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## Original Research Article

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## A comparative study of small incision open Cholecystectomy (3-4cm) with Laparoscopic Cholecystectomy - A study of 50 cases at tertiary care centre in Northern India

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### Abstract

#### Introduction :

Cholelithiasis is a common disorder affecting a large number of population in the world. Cholecystectomy remains the gold standard of treatment for benign gall bladder disease. Open cholecystectomy has been the treatment of choice for symptomatic gall stones for many years. Small incision open cholecystectomy may confer certain advantages such as decrease in post operative pain and morbidity and rapid return to normal life which are similar to those of laparoscopic cholecystectomy, while avoiding the increased rate of bile duct injury associated with laparoscopic cholecystectomy.

#### Materials and Methods:

Fifty patients diagnosed with cholelithiasis in the department of surgery at Guru Nanak Dev hospital were randomly assigned into two groups of twenty five each. Group A consisted of patients who underwent small incision open cholecystectomy and group B consisted of patients who underwent laparoscopic cholecystectomy. Two groups were then compared for intra operative, post operative complications and cosmetic results after months.

#### Conclusion :

Data were collected based on various parameters and the comparison was made between small incision open cholecystectomy (3-4cm) with laparoscopic cholecystectomy. small incision open cholecystectomy (3-4cm) can be considered better alternative to laparoscopic cholecystectomy especially in centre where facilities or expertise for laparoscopic cholecystectomy is not possible.

**Keywords:** small incision open cholecystectomy, laparoscopic cholecystectomy.

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## Introduction

Cholelithiasis is a common disorder affecting a large number of population in the world. Of these 20% are symptomatic at the time of diagnosis, while as many as 80% remain asymptomatic during life time. Out of these asymptomatic patients, 1-4% per year will develop symptoms. Epidemiological studies have clearly demonstrated a linear relationship between increase in age and prevalence of cholelithiasis.<sup>1</sup>

Cholecystectomy remains the gold standard of treatment for benign gall bladder disease. Open cholecystectomy has been the treatment of choice for symptomatic gall stones for many years. The first ever open cholecystectomy was performed by Carl Langenbuch in 1882.<sup>2</sup> The pain and long hospital stay associated with standard cholecystectomy is due to big incision used in standard procedure. So as an attempt towards miniaturization, there has been evolution of small incision open cholecystectomy, micro incision open cholecystectomy and laparoscopic cholecystectomy.<sup>3</sup>

There are number of clinical situations, when present, make laparoscopic approach difficult and should prompt consideration to open cholecystectomy, like morbid obesity, cirrhosis, portal hypertension, severe obstructive lung disease, previous surgery and pregnancy. Laparoscopic surgery can be performed in pregnant patient in the first two trimesters; while open cholecystectomy should be considered the procedure of choice in patient with severe cholecystitis, empyema of gall bladder, acute cholangitis, gallbladder perforation, cholecystoenteric fistula or a suspected gall bladder neoplasm.<sup>9</sup>

The term small incision open cholecystectomy was suggested by Rozsos, Sebeszeti, Osztyal es Peci et al in 1992 for 2-4cm transverse incision in right sub costal area.<sup>4</sup> In contrast to conventional open procedure in which all three abdominal wall muscles, including neurovascular bundles coming on the way are cut, small incision open cholecystectomy technique involves retraction of the rectus muscle without cutting any of the major cutaneous nerves leading to less post operative pain. Small incision open cholecystectomy is an effective alternative to laparoscopic cholecystectomy, especially in centres where laparoscopic facilities are not available.<sup>5</sup>

Small incision open cholecystectomy may confer certain advantages such as decrease in post operative pain and morbidity and rapid return to normal life

which are similar to those of laparoscopic cholecystectomy, while avoiding the increased rate of bile duct injury associated with laparoscopic cholecystectomy.<sup>6</sup> In addition small incision open cholecystectomy is more cost effective than laparoscopic cholecystectomy because it obviates the need for sophisticated equipment and specialized medical personal.<sup>7</sup>

Despite the advent of minimally invasive technology, small incision open cholecystectomy continues to be a perfectly acceptable method for removal of gall bladder under any circumstance and should certainly be considered if proper facilities for performance of laparoscopic surgery are not available or if surgeon is not adequately trained in technology.

## Review of Literature

Johann August Langenbuch (1846-1901) was the first surgeon, in 1882, to propose that the gall-bladder might on occasion be excised. It was rather remarkable that it should be as late as 1882 before that operation was proposed on the human subject, because in 1760 or there abouts there were records of a good many experimental operations on dogs in which the gall-bladder was deliberately removed. Unfortunately the patient did not recover after Langenbuch's first cholecystectomy.<sup>10</sup> In 1884 the same surgeon proposed that for stones in the common bile duct the duct might be exposed, deliberately opened, and the stones removed, but he did not himself have the first success. It was Kummell of Hamburg who actually performed the operation.<sup>11</sup> An excellent surgeon of the older sort at about that time was Frederick Page, who operated on a good many gall-stone cases and tried to carry out the traditions of Lawson Tait, though like many other surgeons of the period he was rather impressed by size and number and oblivious of the fact that the one gall-stone left behind was the one which was causing patient's symptoms.<sup>12</sup>

Physicians have long pursued and investigated other less invasive option. The earliest attempt of medical dissolution of cholesterol gall stones was reported in 1920. Although two agents for oral dissolution are commercially available (CDCA-chenodeoxy cholic acid and UDCA-urso deoxy cholic acid), their use has been limited by stone recurrence, side effects and toxicity.<sup>13</sup> The development of direct contact dissolution agent Methyl ter butyl ether in 1980 provided the opportunity for the introduction of gall stone dissolution in which catheter was used percutaneously in the gall bladder and agent was

directly installed. This technique is invasive in nature.<sup>14</sup>

ESWL (extra corporeal shock wave lithotripsy) is another technique for symptomatic biliary tract stones. Shock wave can exert a destructive effect on solids without damaging tissues with the same acoustic impedance as water. Patients excluded are with more than three stones, very large size or calcified stones, non functioning gall bladder, presence of acute cholecystitis and jaundice. The major problem with ESWL for gall stones continues to be the high stone recurrence. Cost effectiveness analysis was also disappointing and raised concerns about the value of ESWL as a first line of therapy for gall stone patients.<sup>15</sup>

Because non-operative or non-invasive methods leave a diseased gall bladder in place, cholecystectomy has remained the treatment of choice for symptomatic gall stone disease.

During the last several years minimally invasive procedures have emerged world wide as preferred treatment for patients with uncomplicated cholelithiasis and cholecystitis.

Bozzini in 1795 is credited with the first endoscope. He used candle as a light source to examine the rectum and uterus. In 1986, Muhe performed the first laparoscopic cholecystectomy, 104 years after first open cholecystectomy.<sup>17</sup> However, first laparoscopic cholecystectomy recorded in medical literature was performed by Mouret in Lyon, France.<sup>15</sup> Technique was perfected by Dubois in Paris in 1988. First laparoscopic cholecystectomy in India was performed by Professor Udwadia at J.J hospital Mumbai.<sup>16</sup>

Dion and Morin stated that laparoscopic cholecystectomy should be considered the procedure of choice for elective treatment of uncomplicated symptomatic gall stone disease.<sup>17</sup>

Although it has been speculated that the incidence of bile duct injuries has increased significantly with laparoscopic cholecystectomy, it is still quoted approximately <1.5%.<sup>20</sup>

## Materials and Methods

Fifty patients diagnosed with cholelithiasis in the department of surgery Guru Nanak Dev hospital were randomly assigned into two groups of twenty five

each. Group A consisted of patients who underwent small incision open cholecystectomy and group B consisted of patients who underwent laparoscopic cholecystectomy. Two groups were then compared for intra operative , post operative complications and cosmetic results after months.

### Small incision open cholecystectomy

#### Procedure

Subcostal incision was given to all patients. Incision of 3-4 cm was made 2cm below costal margin half incision would cover rectus muscle. Skin, subcutaneous tissue, superficial fascia were cut. Anterior rectus sheath was opened in the line of incision. Rectus muscle was split. External oblique, internal oblique and transverse abdominis muscles were split. Posterior rectus sheath and peritoneum were opened between forceps.

#### Exposure and packing

After getting adequate exposure packing was done, first pack was put inferiorly to displace duodenum, transverse colon and small intestine, second pack was put medially to retract stomach. Third pack was inserted in right paracolic gutters. At all sites Deavers retractors were used.

#### Inspection

Fundus of gall bladder was grasped with babcock forceps to retract gall bladder downwards. Peritoneum on the anterior aspects of cystic duct which is continuous with anterior layer or lesser omentum overlying the bile duct was carefully dissected to see anatomy of Calot's triangle.

#### Ligation of cystic artery and duct

With left hand operating, the surgeon held the babcock forceps and gall bladder was lifted towards the edge of the wound. Cystic artery was identified, dissected adequately, doubly ligated and was cut between ligatures. Cystic duct was dissected identifying its junction with CBD leaving a stump of 2.5mm. it was again ligated towards GB and then was cut in between.

#### Removal of gall bladder

Babcock forceps was held firmly in the left hand to put tension on the plane between gall bladder and

liver. Index finger of right hand was used to separate gall bladder from liver bed. Gentle blunt dissection was done.

### Gall bladder bed

After removal of gall bladder, liver bed was inspected for any bleeding points which were caught and ligated, packing was done for few minutes for ruling out any central oozing and bile leak.

### Final assessment and closure

Operative field was inspected with particular reference to see ligation of cystic artery and duct. Drain was put. Posterior rectus sheath and peritoneum was closed by continuous locking absorbable suture material (vicryl no 1-0).

Anterior rectus sheath was closed with continuous sutures of vicryl. Skin was closed by non absorbable material.



### Post operative care

- **Analgesia:** Inj. Tramadol 100 mg (12 hourly or according to patient requirement) then patients were shifted to oral analgesics
- **Antibiotics:** postoperatively given for seven days
- **Physiotherapy:** essential to encourage respiration and to keep limbs mobile. The patients were encouraged to walk within 24 hrs.
- **Drain:** removed when drainage was minimal (<50 ml)
- **Discharge:** patients were discharged as early as second post operative day.
- **Follow up:** patients were reviewed in OPD for 6 months after operation. Patients were examined for

persistent pain, wound infection, hernia, jaundice and other complaints. They were advised to rejoin day to day activity as early as possible.

### Laparoscopic cholecystectomy

- **Position:** supine with 20-30 degree trendelenburg for creation of pneumoperitoneum.
- **Position of surgeon:** to the left side of patient.

### Procedure

- Creation of pneumoperitoneum
- Veress needle puncture

**Site:** midline subumbilical



1.0 cm size incision was made over the skin below umbilicus, skin, subcutaneous tissue was cut, prechecked veress needle was held like a pen in between thumb and index finger. It was directed towards pelvis through layers of abdominal wall. A click was heard when peritoneum was penetrated.

Intra peritoneal placement was confirmed by :

- Free movement of needle
- Drop test
- Injection of saline into peritoneal cavity and finding no return on aspiration
- Zero or negative pressure on CO2 insufflator display.

Veress needle was attached to insufflators to which CO2 cylinder had been attached. Flow was commenced at a rate of 1 litre/minute to obtain and maintain pressure at 10- 12mm of Hg. 2-3 litres of gas which had been sufficient for average adult for establishment of pneumoperitoneum upon which hypochondrium became tympanic and abdomen distended symmetrically.

Trendelenberg position was slightly increased. Veress needle was removed. 10 mm trocar and cannula were introduced obliquely aiming at hollow of sacrum by screwing movement through subumbilical incision. Trocar was removed after penetration of peritoneum and sheath was advanced for short distance.

Tubing of insufflators was attached to the sheath, systemic inspection was done especially to rule out any inadvertent injury to hollow viscera and vessels and any other abdominal pathology.

### Accessory ports

- **Trocar 2:** under laparoscopic visual control through 5mm skin incision at right midclavicular line 2cm below costal margin.
- **Trocar 3:** under laparoscopic visual control, a 10 mm port was inserted in the midline in epigastrium, passing just to the right of falciform ligament towards the gall bladder.
- **Trocar 4 :** under laparoscopic visual control through 5mm skin incision in right anterior axillary line below rib margin depending on height of the patient.

Position of liver and gall bladder in its relation was inspected. Anti – Trendelenburg position was given.

Adhesions if any involving omentum, colon, stomach, duodenum were carefully taken down near fundus of gall bladder first and later on Calot's triangle.

Grasping forceps was introduced and adhesions were separated by right hand.

### Calot's Triangle Dissection

Dissection was done by traction on Hartmann's pouch using atraumatic forceps by lateral and caudal traction which widened the angle of Calot's triangle and placed structures in tension. The infundibular grasper was retracted laterally to expose anterior aspect of triangle and anteromedially to expose the posterior aspect of triangle. Dissection was begun directly adjacent to gall bladder. Adhesions were separated till cystic duct was identified entering the gall bladder.

### Skeletonisation of cystic pedicle

Peritoneal covering overlying the triangle of Calot was gently dissected by elevating thin tissue with minimal cautery and blunt dissection anteromedially and also with inferomedial blunt dissection with anteromedial infundibular traction. Once the peritoneal covering was dissected off the cystic triangle, the cystic duct and artery were identified and dissected individually utilizing blunt dissection.

Cystic duct was doubly clipped towards the CBD and another clip was applied towards GB and it was divided between the clips. Cystic artery was doubly clipped and was divided in between clips.

### Dissection of gall bladder

Gall bladder was detached from liver bed taking care to avoid penetration of gall bladder, remaining away from liver with the help of blunt and sharp dissection with scissors and minimal cautery. Prior to complete detachment of gall bladder, liver bed was inspected for adequate haemostasis or bile leak. Gall bladder was extracted from epigastric port after grasping it with Babcock's forceps. Peritoneal cavity was irrigated and drain was put in.

Trocars were removed under direct visual contact to ensure no bleeding. 10 mm ports were closed with interrupted vicryl stitches for fascial layer. No fascial closure had been necessary for 5 mm trocar. Skin was closed by non absorbable suture. Sterile dressing was applied.

**Post operative care**

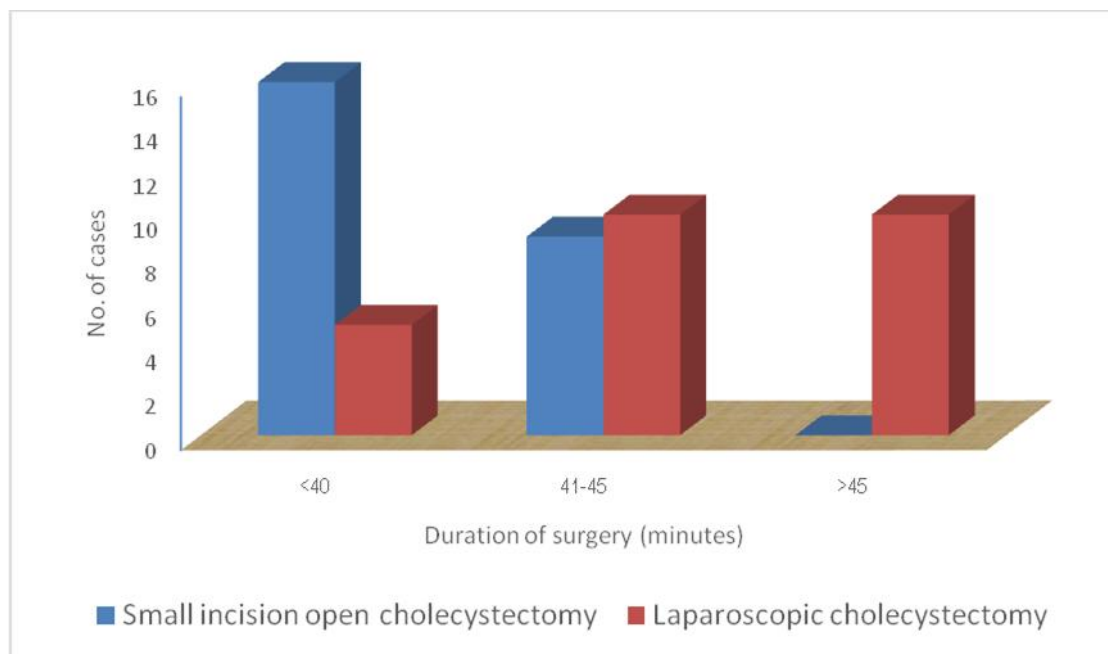
- **Antibiotics:** three doses of iv antibiotics were enough. First pre operatively, second post operatively and last at night of operation. Then patients were put on oral antibiotics.
- **Physiotherapy :** essential to encourage respiration and to keep limbs mobile, patients were encouraged to walk early.

- **Drain :** was removed when drainage was minimal
- **Discharge :** patients were encouraged to walk as soon as it had been possible . patients were discharged after 48 -72 hours of surgery once they start accepting fully orally, passed stool and after repeat ultrasound.
- **Follow up :** patients were followed up for 6 months after surgery.

**Observations**

**Operative time**

Duration of surgery (minutes)	Small incision open cholecystectomy		Laparoscopic cholecystectomy		Total	
	No.	%	No.	%	No.	%
<40	16	64	5	20	21	42
41-45	9	36	10	40	19	38
>45	0	0	10	40	10	20
Total	25	100	25	100	50	100
Mean±SD	37.24±4.30		46.00±4.72		4.92±6.50	
p-value	<0.001					

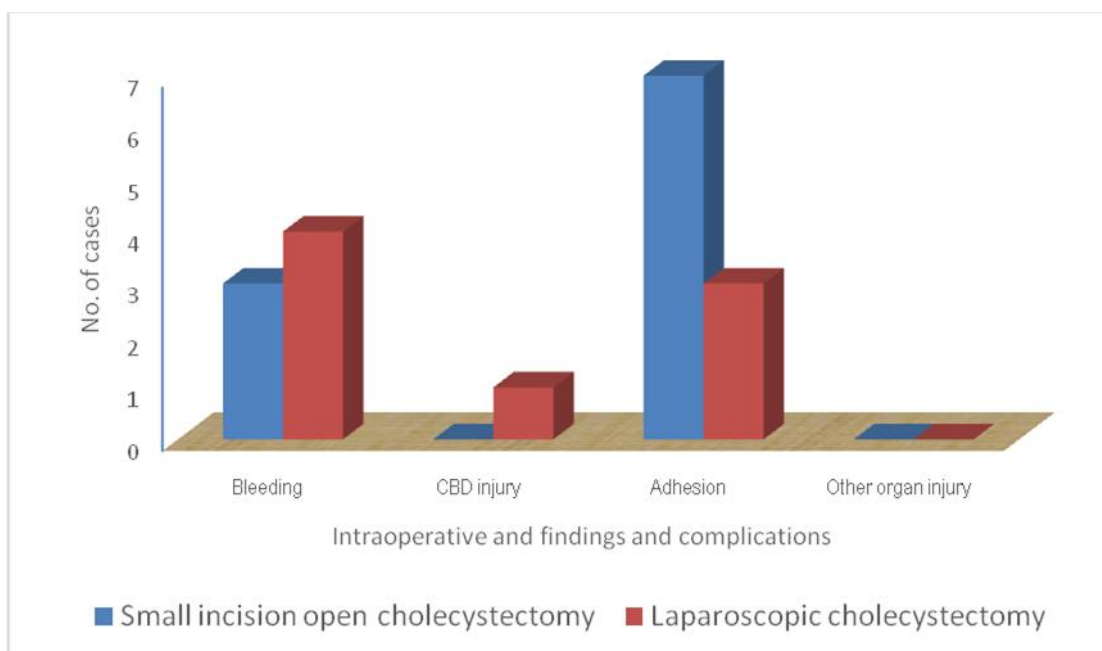


Time was calculated from the time of incision to the time of skin closure. In our study small incision open cholecystectomy took 37.24±4.30 minutes and laparoscopic cholecystectomy took 46.00±4.72

minutes. Small incision open cholecystectomy took lesser time for completion than laparoscopic cholecystectomy. The difference was statistically highly significant.

**Intraoperative findings and complications**

Intraoperative findings and complications	Small incision open cholecystectomy (n=25)		Laparoscopic cholecystectomy (n=25)		Significance
	No.	%	No.	%	
Bleeding	3	12	4	16	X <sup>2</sup> : 0.166; df:1; p=0.684
CBD injury	0	0	1	4	X <sup>2</sup> : 1.020; df:1; p=0.312
Adhesion	7	28	3	12	X <sup>2</sup> : 2.000; df:1; p=0.157
Other organ injury	0	0	0	0	

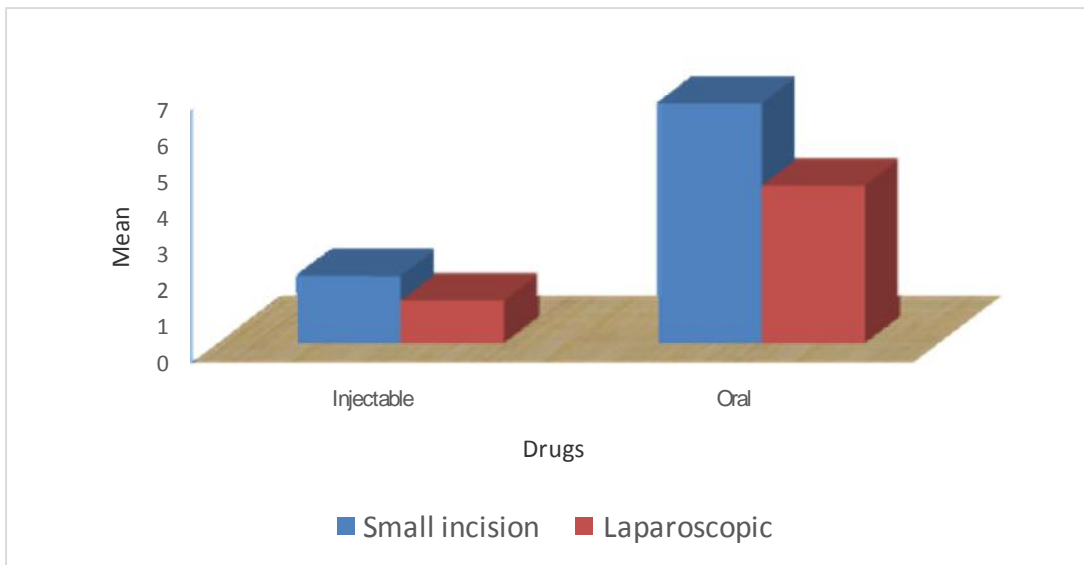


Intraoperatively most common finding was adhesions. 7 patients in small incision open cholecystectomy group had intraoperative adhesions and 3 patients in laparoscopic cholecystectomy adhesions. Intraoperative bleeding was present in 3 patients of small incision open cholecystectomy group and 4

patients were present in laparoscopic cholecystectomy group therefore CBD injury was present in 1 patient in laparoscopic group. Overall intraoperative complications was greater in laparoscopic cholecystectomy group.

**Postoperative analgesia**

Drugs	Small incision (days)	Laparoscopic (days)
Injectable	1.86±0.47	1.18±0.32
Oral	6.64±1.25	4.36±0.64

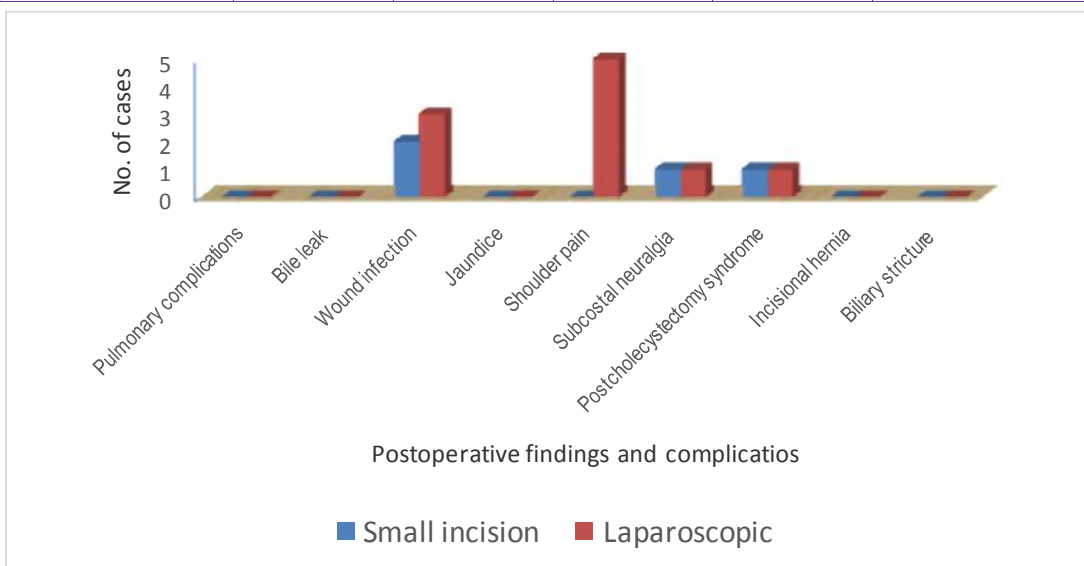


In our study, patient required injectable analgesics for 1.18±0.32 days and oral analgesics for 4.35±0.64 in laparoscopic group. In small incision group injectable analgesics were required for 1.86±0.47 days and oral

analgesics for 6.64±1.25 days. In one of the studies injectable analgesia was required 0.5-1.0 days and oral analgesia for 2.3 days.

**Postoperative complications**

Postoperative findings and complications	Small incision open cholecystectomy (n=25)		Laparoscopic cholecystectomy (n=25)		Significance
	No.	%	No.	%	
Pulmonary complications	0	0	0	0	
Bile leak	0	0	0	0	
Wound infection	2	8	3	12	X <sup>2</sup> : 0.012; df:1; p=0.966
Jaundice	0	0	0	0	
Shoulder pain	0	0	5	20	X <sup>2</sup> : 5.556; df:1; p=0.018
Subcostal neuralgia	1	4	1	4	X <sup>2</sup> :0.00; df: 1; p=1.00
Postcholecystectomy syndrome	1	4	1	4	X <sup>2</sup> :0.00; df: 1; p=1.00
Incisional hernia	0	0	0	0	
Biliary stricture	0	0	0	0	



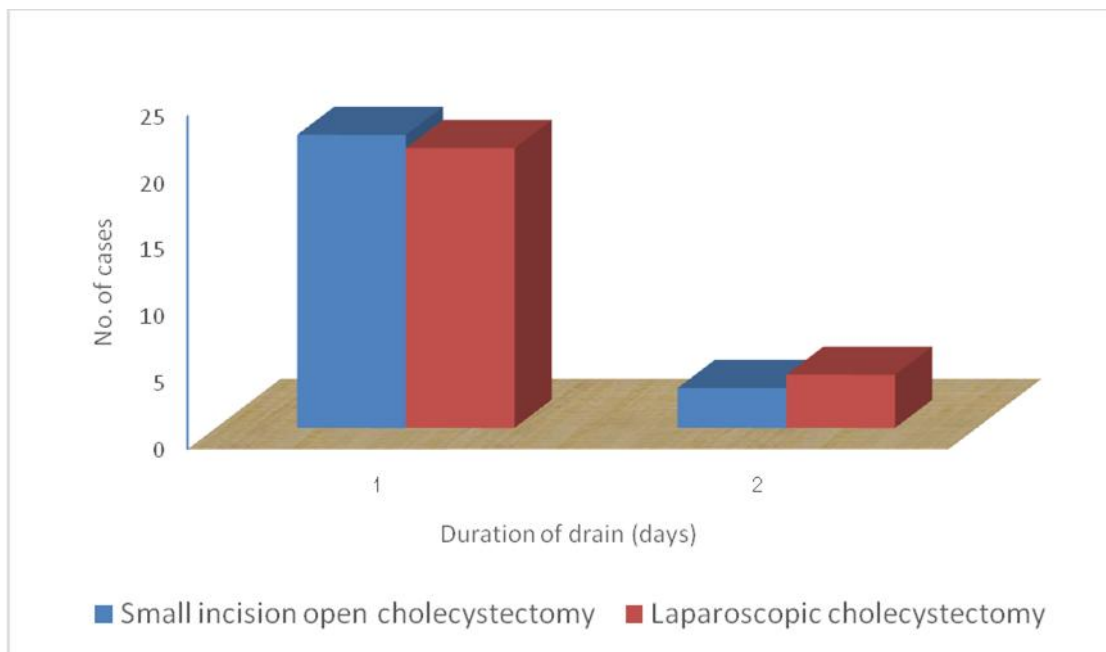


2 patients in small incision open cholecystectomy group had wound infection and 3 patients in laparoscopic cholecystectomy group developed wound infection which was managed conservatively with daily dressing and antibiotics. 5 patients in laparoscopic cholecystectomy group had shoulder pain which was managed conservatively with analgesics and it improved with time. 1 patient each in small incision cholecystectomy and laparoscopic

cholecystectomy group had subcostal neuralgia which was managed conservatively with analgesics. 1 patient each in small incision cholecystectomy and laparoscopic cholecystectomy group developed postcholecystectomy syndrome which was managed conservatively with analgesics and proton pump inhibitors. Overall postoperative complications were less in small incision open cholecystectomy group.

**Duration of drain**

During of drain (days)	Small incision open cholecystectomy		Laparoscopic cholecystectomy		Total	
	No.	%	No.	%	No.	%
1	22	88	21	84	43	86
2	3	12	4	16	7	14
Total	25	100	25	100	50	100
Mean±SD	1.12±0.32		1.16±0.36		1.14±0.34	
p-value	0.124					

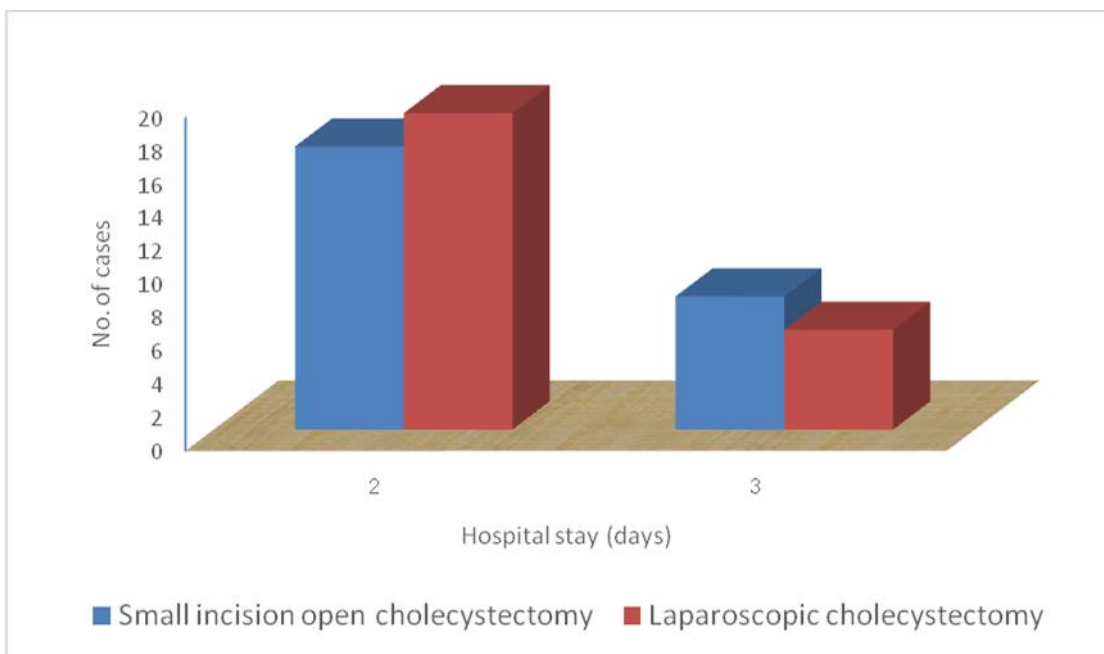


The mean duration of drain in small incision open cholecystectomy less compared laparoscopic

cholecystectomy group and the difference was not statistically significant.

**Duration of hospital stay**

Hospital stay (days)	Small incision open cholecystectomy		Laparoscopic cholecystectomy		Total	
	No.	%	No.	%	No.	%
2	17	68	19	76	36	72
3	8	32	6	24	14	28
Total	25	100	25	100	50	100
Mean±SD	2.16±0.37		2.24±0.43		2.20±0.40	
p-value	0.490					

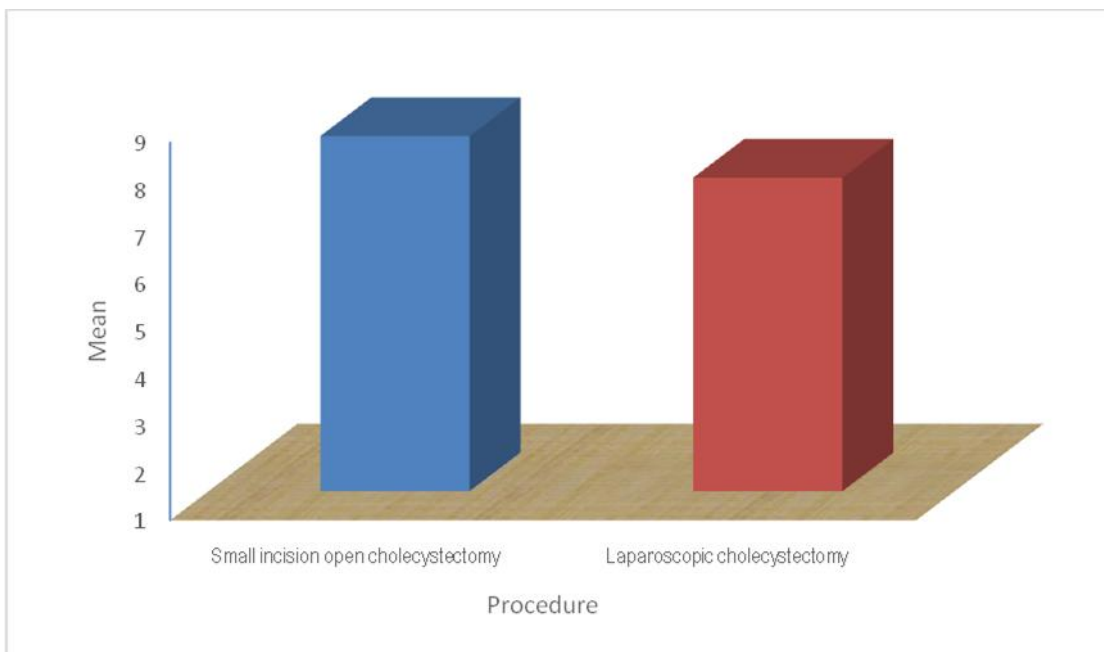


The mean hospital stay in days for patients in small incision cholecystectomy group was  $2.16 \pm 0.37$  and in

laparoscopic cholecystectomy group was  $2.24 \pm 0.43$  and difference was not statistically significant.

**Return to normal activity**

Procedure	Days (mean)
Small incision open cholecystectomy	$8.52 \pm 1.55$
Laparoscopic cholecystectomy	$7.64 \pm 0.99$
Small incision v/s laparoscopic cholecystectomy	$t=2.38; p<0.021$ (significant)



Patients in laparoscopic cholecystectomy group returned to normal activities after  $7.64 \pm 0.99$  and patients in small incision open cholecystectomy after  $8.52 \pm 1.55$  days. Thus patients operated by

laparoscopic cholecystectomy returned to routine normal activities earlier than patients operated by small incision open cholecystectomy and this was statistically significant.

## Discussion

In the present study 50 patients of cholelithiasis admitted in surgery department Guru Nanak Dev Hospital attached to Government Medical College, Amritsar were enrolled. Majority of patients had pain in right upper quadrant of abdomen. Ultra sound abdomen was the main investigation for diagnosis. Cholelithiasis was common in middle aged females. Patients were randomized in small incision open cholecystectomy group and laparoscopic cholecystectomy group. 25 patients were enrolled in each group. Small incision open cholecystectomy took much lesser time to perform than laparoscopic cholecystectomy group. Intra operative complications were less in small incision cholecystectomy group but no major intra operative complications occurred in both groups. No major post operative complications were observed in both groups. There was not much difference in post operative analgesic consumption between both small incision and laparoscopic cholecystectomy group. But patients in laparoscopic cholecystectomy group complained of shoulder pain. There was no difference in post operative hospital stay between small incision and laparoscopic group but patients in laparoscopic cholecystectomy group returned to normal activity faster than small incision cholecystectomy group. The present study showed that the results of small incision open cholecystectomy was similar to laparoscopic cholecystectomy in terms of intra operative and post operative complications, post operative analgesic consumption and cosmetic results. But small incision open cholecystectomy is a much easier technique to perform and requires less operative time and does not require the expertise and equipments as laparoscopic cholecystectomy. Therefore small incision open cholecystectomy can be considered as an effective alternative to laparoscopic cholecystectomy especially in centres where facilities or expertise for laparoscopic cholecystectomy is not available.

**Conflicts of interest:** none

**Financial support:** none

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