# **Original Research Article**

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# A comparative study of inguinal hernia repair: Shouldice versus Lichtenstein repair

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## **ABSTRACT**

**Background:** Inguinal hernia is a common problem and its repair is one of the most frequently performed operation in general surgical practice. There are appreciable advantages of Lichtenstein over Shouldice repair in terms of simplicity, less time consuming and postoperative pain; there in the context of less developed countries with limited economic resources, however Shouldice repair is more cost effective and there are no differences in recurrences and other complications which would be a better proposition. The present study aims at comparing the results of Shouldice versus Lichtenstein's repair in inguinal hernia in adult male (≥18 years).

**Methods:** Total of fifty cases was included in this study, were equally divided into 2 groups; Group A and Group B and subjected for Shouldice and Lichtenstein mesh repair respectively. Operating time, postoperative complications as Wound infection, Seroma, Hematoma, Postoperative pain, and days of hospital stay, total costs and time to return to usual activity was noted.

**Results:** Out of 50 patients, 36 (72%) were had indirect hernia and most of them were in between 18-29.9 years of age. There were no difference between two groups with respect to postoperative pain, Wound infection 12% and 8%, Seroma 8% and 4% and Hematoma 4% and 4% in Group A and Group B respectively. However, there is significant difference noted in operating time period in which Shouldice repair took more time (Mean time in Shouldice 84.16 min and Lichtenstein 58.80 min). There were no recurrences in either group.

**Conclusions:** So, comparing our results of both groups, Lichtenstein repair were found to be better as it is simple procedure and is less time consuming than Shouldice repair. However, Shouldice repair was found to be cost effective which could be an important consideration in developing countries.

**Keywords:** Hernia, Lichtenstein, Shouldice

### INTRODUCTION

Hernia is defined as an abnormal protrusion of an organ or a tissue through a defect in its surrounding wall. Inguinal hernia is a common problem and its repair is one of the most frequently performed operation in general surgical practice. Despite this, patients continue to have complications, like prolong postoperative recovery, delayed return to work and hernia may recur, thereby

having significant impact on quality of life and economy. The past 25 years have witnessed fundamental changes in the surgical repair of inguinal hernias.

Apart from the conventional Shouldice repair, endoscopic and open procedures, which involve covering the abdominal wall defect with a biocompatible mesh, have gained widespread use. The success of surgery can be

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measured on the basis of recurrence rates and patient comfort.

# Current surgical procedures

- The Modified Shouldice repair.
- The Lichtenstein repair.
- The Transabdominal Preperitoneal (TAPP) approach to hernia repair.
- The Totally Extraperitoneal (TEP) approach to hernia repair.

The TAPP and TEP require high expertise and have a slow learning graph and have been reported with little extra benefits over the open repairs viz. – Modified Shouldice and Lichtenstein. There are appreciable advantages of Lichtenstein over Shouldice repair in terms of simplicity, less time consuming and postoperative pain; there in the context of less developed countries with limited economic resources, however Shouldice repair is more cost effective and there are no differences in recurrences and other complications which would be a better proposition.<sup>2</sup>

Furthermore, moreover theoretically surgeons refrain from doing Lichtenstein mesh repair in strangulated hernia because of increase chance of infection. Hence Shouldice repair could be a more attractive proposition in such cases.

# **METHODS**

This Hospital based interventional study was conducted at B.P. Koirala institute of health sciences, Dharan, Nepal between June 2015 to June 2016, with approval by 'The Institute Protocol and Ethical Committee'.

Fifty (25 in each group) patients above 18 years with inguinal hernia admitted to the Department of General surgery for inguinal hernia repair were included.

Patient of age less than 18 years, with obstructed or Strangulated Hernia, who disagreed to participate in the study, female patients (excluded as due to the paucity of the cases which may cause inadequate comparison), patients with comorbidities i.e. Chronic Obstructive Pulmonary Diseases, Prostatic problem, diabetes or cardiovascular diseases etc. and recurrent bilateral hernias were excluded.

The cases were divided into group A and B randomly after admission. Total of 50 male patients of age 18 years and above having right sided, left sided or bilateral inguinal hernia was divided into odd and even numbers in two groups.

Shouldice repair was done in patients who are in group A and Lichtenstein repair in patient of group B. Informed consent was taken from all the patients of group A and B.

#### **RESULTS**

Most of the patients were in between 18-29.9 years of age (34%). Mean age was 40.90 years and SD 17.09.

Table 1: Age distribution of patient.

Age	Frequency	Percent (%)
18 to 29.9	17	34
30 to 44.9	12	24
45 to 59.9	14	28
>60	7	14
Total	50	100

Table 2: Frequency of hernia.

Types	Frequency
Indirect	36
Direct	11
Both	3
Total	50

In this study most of the hernia was indirect (72%), and in 22% direct hernia was seen.

Table 3: Types of hernia with age.

Age	Indirect	Direct	Both
18 to 29.9	18	0	0
30 to 44.9	10	0	0
45 to 59.9	8	2	1
>60	0	9	2

Most indirect hernia was present in age group 18-29.9 years and direct hernia in above 60 years of age.

Table 4: Types of hernia in Group A and Group B.

Types of hernia	Shouldice	Lichtenstein
Indirect	18	18
Direct	6	5
Both	1	2
Total	25	25

In both Groups most of the hernia was indirect hernia and it was 72% in both groups. 18 patients was indirect hernia out of 25 in Group A and were subjected for Shouldice repair similarly 18 patients in Group B had indirect hernia and was subjected to Lichtenstein repair.

Table 5: duration of operation in both Groups.

<b>Duration of operation</b>	Shouldice	Lichtenstein
<60 min	5	16
≥60 min	20	9
Total	25	25

In group A operating time ranges from 55-100 minutes with mean duration of  $84.16 \pm 14.87$ ). In Group B

operating time ranges from 45-80 minutes with mean time of  $58.80(\pm 9.49)$ , which was statistically insignificant (P= 0.479). Post-operative pain was analyzed by visual analogue score at different interval as given in Table 6 and Table 7.

Table 6: Post-operative pain score within 12 hrs of surgery.

Pain score	Shouldice	Lichtenstein
Mild	4	17
Moderate	19	08
Severe	2	0
Worst	0	0
Total	25	25

Table 7: Post-operative pain score within 24hours of surgery.

Pain score	Shouldice	Lichtenstein
Mild	20	23
Moderate	5	2
Severe	0	0
Worst	0	0
Total	25	25

Most of the patient had moderate pain in Group A (76%) and mild pain in Group B (68%) in 12 hours of surgery and no significance was shown (P=0.168). After 24 hours, most had mild pain in both Groups with P value 0.007. After 48 hours of surgery both groups had only mild pain according to VAS.

**Table 8: Complications in both the groups.** 

Complications	Shouldice	Lichtenstein
Wound site infection	3	2
Seroma formation	2	1
Hematoma formation	1	1
Recurrence	0	0

Wound site infection was 3 (12%) in group A and 2 (8%) in group B, and seroma formation was 2 (8%) and 1(4%) in group A and B respectively, whereas hematoma formation occurred in both groups were equal in number. It was statistically insignificant (Infection P=1.0, Seroma P=0.11, Hematoma P=1).

**Table 9: Grading of wound site infection.** 

Wound infection	Shouldice	Lichtenstein
Grade 1	2	1
Grade 11	1	1
Grade III	0	0
Grade IV	0	0
Total	3	2

Most of the patient who had infection had grade l infection.

Table 10: Postoperative mean days of hospital stay.

	Shouldice	Lichtenstein
Days of hospital stay after surgery	4.00	3.64

The average days of hospital stay after operation was 2-10 days in group A and 2-9 days in group B. Mean hospital stay in Group A was 4.0 ( $\pm 2.30$ ) days and in Group B 3.64 ( $\pm 2.19$ ) days.

Table 11: Total costs.

	Shouldice	Lichtenstein
Total cost	NPRs 3812	NPRs 4940

The operation charge for hernia was fixed in the hospital and was same for the both groups that was 3000nrs. However the extra expenses has been calculated by the different consumables undergoing the particular operation (prolene mesh, sutures) and bed charges for hospital stay.

Table 12: Days of return to usual activity after surgery.

Return to usual activity	Shouldice	Lichstenstein
<20days	4	15
20-30 days	15	10
>30 days	6	0
Total	25	25

Mean days of return to usual activity was 26.04 days with minimum of 15 days to maximum of 45 days with SD of 7.90 in Group A. Mean days of return to usual activity was 19.40 days with minimum of 14 days to maximum of 29 days with SD of 4.52 in Group B.

Table 13: Chronic pain in both groups.

Duration	Shouldice	Lichtenstein
1st months	4	2
3 <sup>rd</sup> months	2	2
6 <sup>th</sup> months	0	0

Chronic pain was decreasing in both groups and at 6 month it was nil.

# **DISCUSSION**

Hernia is a common problem; however, their true incidence is unknown. It is estimated that 5% of the population will develop an abdominal wall hernia, but the prevalence may be even higher. Approximately 75% of all hernias occur in the inguinal region. Two third of these are indirect and the remainder are direct inguinal hernias <sup>1</sup>.

Malangony MA et al found men are 25 times more likely to have a groin hernia than women. An indirect inguinal

hernia is the most common hernia, regardless of gender. In men, indirect hernias predominate over direct hernias at a ratio of 2 to 1.<sup>1</sup>

Hay JM et al, conducted a study in 1578 adult males with a total of 1706 non-recurrent inguinal hernias were prospectively and randomly allotted to undergo either a Bassini's repair, Cooper's ligament, or Shouldice repair.<sup>2</sup> Fifty-nine hernia repairs were withdrawn after inclusion. Of the 1647 remaining hernias, 52.2% were indirect, 25.6% were direct and 23.2% were combined.

In present study all patients were males and indirect hernias was found in 36 cases (72%) and direct hernias in 11 cases (22%). The ratio of indirect to direct was 3.6:1.1. There were more indirect hernias in the age group of 18-29.9 years. Direct hernia was seen more in extreme age group i.e. >60yrs (i.e. 81.81%).

F.H. Hetzer et al conducted a prospective comparative study comparing mean operative time for both technique the duration of operation was much longer in Shouldice group (Lichtenstein group 80 min and Shouldice group 88 min).<sup>3</sup> Similar findings were observed in other studies.<sup>4-6</sup>

Barth R J et al studied the cases and found that the median operative time differed significantly: 80 minutes for a mesh repair versus 95 minutes for a Shouldice repair (p = 0.01; ranges for mesh, 70 to 96 minutes; Shouldice, 80 to 109minutes).<sup>7</sup>

In present study, the mean operative time in Group A was 84.16 minutes±14.87 and in Group B was 58.80 minutes±9.49. Operating time was significantly (P=0.005) more in Shouldice than Lichtenstein group. Lichtenstein mesh repair is easier and require less anatomical dissection so is less time consuming contradictory to Shouldice which require skilled surgery, more anatomical dissection and multilayer repair. Hence our result agreed with the analysis of other studies.

Barth RJ et al showed no significant difference between the two types of repair in regard to pain at rest.<sup>7</sup> Pain at rest was considered mild on postoperative day 1 after a mesh repair and day 2 after a Shouldice repair. Pain at rest was considered very mild on 3<sup>rd</sup> postoperative day after a mesh repair and day 4 after a Shouldice repair. Fifty percent of the patients had no pain at rest by 9 days after either repair.

Danielsson et al found no difference between the two groups in VAS on the first (p = 0.32), second (p = 0.96), or third days, (p = 0.89) postoperatively. There was no difference in the number of days before appreciable pain or discomfort had disappeared. The outcome was equal with a mean (SD) of 10 days in each group (4.9 Lichtenstein) (5.2 Shouldice). The prescribed painkillers were used by 71 patients (82%) in the mesh group and by 67 (78%) in the Shouldice group.

In present study, most of the patient had moderate pain in Group A (76%) and mild pain in Group B (68%) after 12 hours of surgery as per VAS scale but after 24 hours of surgery pain becomes mild in most of the patient in both groups, which was statistically not significant (P=0.168). Hence, our result agreed with other studies.

Shulman et al reported his experience of Lichtenstein repair of 3,019 primary hernias. The overall infection rate was 0.03% with no mesh rejection. The overall rate of recurrence was 0.2%. Shulman published another study of Lichtenstein tension free mesh repair performed by 72 general surgeons with no special interest in hernia repairs to determine if similar degree of success could be obtained. Over 16,000 repairs were performed with an infection rate of 0.6% and a recurrence rate of less than 0.5%.

Awan WS et al found the rate of hematoma and seroma formation was the same (1.28%) in both groups, however infection was seen slightly more in Lichtenstein repair (3.84%) as compared to Shouldice repair (2.56%). Tension free Lichtenstein technique was found to be superior to the tissue based Shouldice repair with respect to postoperative complications and recurrence.

Hetzer FH et al conducted a study and found hematoma /seroma in Lichtenstein group 4.6% and in Shouldice group 4.7%.<sup>3</sup> Subcutaneous infection was 1.3% in Lichtenstein group and 1.8% in Shouldice group. Reoperation was needed in 3.3% in Lichtenstein and 5.3% in Shouldice group, with no mortality.

Present study showed that, there were wound site infection rate of 12% (3 patients) in Shouldice group 2 patient with grade I and 1 patient with Grade II and 8% (2 patients) with 1 patient each in Grade I and II in Lichtenstein group. Seroma formation was seen in 8% in Shouldice and 4% in Lichtenstein group and hematoma formation was same in both groups i.e. 4% with no recurrence. There was slightly increase in infection rate and seroma formation in group B. This was statistically insignificant (Infection P=1.0, Seroma P=0.11, Hematoma P=1). There was slightly lower rate of infection in other studies which could be due to highly sophisticated operating theatre and techniques.

Hetzer FH et al found the duration of hospitalization were similar for both technique.<sup>3</sup> For the tension-free repair the mean post-operative stay was 3.5 days, and for the Shouldice repair was 3.3 days.

Danielsson et al found that, patients stayed in the hospital less than one day in 83% of the cases in the Lichtenstein group and in 76% in the Shouldice group.<sup>8</sup> The mean hospital stay was 2.0 days in the Lichtenstein group (range 1-6) and 1.9 in the Shouldice group (range 1-8).

In present study the mean stay in the hospital after operation was 4 days (2-10days)±2.30 in Group A and

3.64 days (2-9) ±2.19 in Group B. Stays differs in the patient due to complications like wound site infections, Seroma formation or hematoma or due to patients choice. Obtained result was statistically insignificant (P=0.79). Hence, our results agreed the other studies.

Danielsson et al concluded that patients who had a mesh repair returned to work after a mean of 18 (8) days (range 2-36). This was significantly shorter than after the Shouldice repair for which the corresponding figures were 24 (13) (range 1-60) P = 0.038.

Hetzer FH et al found the patients with the tension-free repair returned to fulltime work two weeks earlier than those of the Shouldice group (25 Vs 41 days).<sup>3</sup> This difference is statistically significant and an important result of the study. More than 80 % of the Lichtenstein patients did return to full-time work in the first 4 weeks after surgery. This result was similar tothe one in the study by Kark.<sup>12</sup>

In present study mean days of return to usual activity was 26.04 days with minimum of 15 days to maximum of 45 days with SD of 7.90 in Group A. Mean days of return to usual activity was 19.40 days with minimum of 14 days to maximum of 29 days with SD of 4.52 in Group B. There were slightly earlier return to usual activity in Group B which was statistically insignificant (P=1.0) and agreed the other studies.

Chronic pain (pain after a month onward), often interfering with daily life, is a significant problem after inguinal hernia repair with the reported incidence of up to 60%. Iatrogenic nerve lesions are probably the most important cause of chronic pain but may be regarded as an unavoidable consequence of 315 open anterior repair (M. Butters) (M Bay-Neilsen). The Shouldice group in this study had an overall rate of chronic pain in 5% which was higher than the 1.28% in the Lichtenstein repair group.

Van-veen et al found, after a median follow-up of 129 months, none of the patients in either the non-mesh or the mesh group suffered from persistent pain and discomfort interfering with daily activity.<sup>15</sup> Some patients reported paroxysmal pain during intensive activity not interfering with daily activity (such as sports or gardening), which did not last longer than 1 day. This type of paroxysmal pain occurred in 10% of the patients in the non-mesh group and 14% of patients in the mesh group. The type of hernia repair was not significantly correlated with paroxysmal pain during intensive activity not interfering with daily activity (P=0.31). In the non-mesh repair group, 7 patients (9%) suffered from numbness in the groin region compared with 14 patients (19%) in the mesh repair group (P =0.047). Chronic groin pain was not correlated with the level of experience of the surgeon (P=0.449).

In present study also, there was chronic pain slightly more in Shouldice group than in Lichtenstein group in first month after surgery which became nil in both groups by the six month after surgery, states no significant difference and agreed the other studies.

## **CONCLUSION**

Hernia is a common problem and indirect hernia is more common and commonly seen in early age groups than direct hernia which are commonly seen in extremes of age (3.6:1.1). Operating time of Lichtenstein is less than Shouldice repair which was significant in present study (P=0.005). Postoperative pain is same in both groups. Postoperative complications as wound site Infection, Seroma, Hematoma are not significant in both types of repair. Mean duration of hospital stay is same in both groups and return to usual activity in both groups are found to be statistically insignificant (P=1.0). There was absence of chronic pain after six month of operation. No recurrence was seen in either group, as the follow up period was limited to 6 months only.

So, comparing present results of both groups, Lichtenstein repair were found to be better as it is simple procedure and is less time consuming than Shouldice repair. However, Shouldice repair was found to be cost effective which could be an important consideration in developing countries. It may be noted that there was no difference in the recurrence rate or complication.

Furthermore, moreover theoretically surgeons refrain from doing Lichtenstein mesh repair in strangulated hernia because of increase chance of infection. Hence Shouldice repair could be a more attractive proposition in such cases.

# Recommendations

As follow up period is of 6 months in the present study due to the period constraints. However, a follow up (5-10 years) of hernia repair should be longer to show the true recurrence rate.

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Institutional Ethics Committee

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