Research Article

Laproscopic repair of inguinal hernia by trans-abdominal pre- peritoneal repair (tapp) technique

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Abstract

Background: The evolution of scientific knowledge in microbiological field has provided an opportunity to explode new methods of therapy, which have changed and improved surgical practice remarkably during 20th century. Surgical infection, particularly surgical site infection (SSI), has always been a major complication of surgery and trauma and has been documented for 4000-5000 years. **Cases:** 800 patients have been studied in this study. Department of microbiology helped us in conducting this study. Every Patient who underwent clean and clean contaminated surgery was studied.
Keywords: Laproscopy, hernia.

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INTRODUCTION

A hernia is defined as a protrusion of part of the contents of the abdomen through the inguinal region of the abdominal wall[1]. A hernia is the abnormal protrusion of a peritoneal lined sac through the musculo-aponeurotic covering of the abdomen. Weakness of the abdominal wall either congenital or acquired in origin results in inability to contain the visceral contents of the abdominal cavity within their normal confines. 75% of all abdominal wall hernia occur in the groin. Indirect: direct = 2:1 Right sided inguinal hernia are more common than left sided with male: female ratio 7:1[2]. Inguinal hernia incidence rate is approximated 1 in 544.[3] About >50% of male population above 75 years is affected.[4] Repair of inguinal hernia is one of the commonest surgical procedures performed worldwide. Success of groin hernia repair is measured by the permanence of operation, fewest complications, minimal cost, earliest return to normal activities and lowest recurrence. This success largely depend upon surgeon's understanding of anatomy and physiology of surgical area, as well as knowledge of how to use the currently available techniques and materials most effectively.[5] With the advent of laparoscopy , the groin hernia repair by trans-abdominal pre-peritoneal repair has become more comfortable repair which is simple with less tissue damage and earliest return to normal activities with negligible post operative pain[6] Thus a patient with a recurrent hernia or bilateral hernia or a manual labourer who desires early return to work may better be served by laparoscopic approach.[7] A prolene mesh is placed inside the groin muscle in the pre-peritoneal layer in laparoscopic trans –abdominal pre-peritoneal repair of hernia which seems a more logical position to prevent peritoneal contents bulging out of a muscle defect than placing a mesh on the outside of the defect as in traditional method, thus reducing recurrence rate and making laparoscopic repair of inguinal hernia most effective method of repair of hernia.[8] This study include the study of 50 cases of laparoscopic TAPP repair of inguinal hernia and to analyse post operative outcome of these patient with respect to post operative pain, analgesic requirement, early mobilization, hospital stay, return to activity of daily living and use of laparoscopy to diagnose and treat other clinically undiagnosed hernia and other ancillary procedure.

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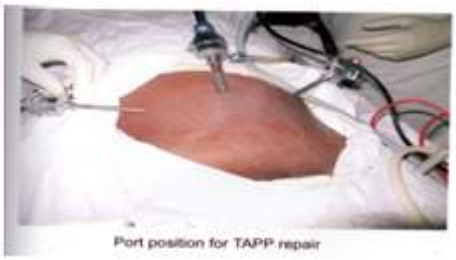
AIMS AND OBJECTIVES

To study post operative pain, analgesic requirement ,early mobility, hospital stay, return to activities of daily living, rate of recurrence, conversion to open, role of laparoscopy with respect to incidence of clinically undiagnosed conditions with repair of contra-lateral hernia if present, role in recurrent hernia.

MATERIAL AND METHODS

- This is a clinical analytical research study of laparoscopic repair of inguinal hernia by TAPP.
- All necessary infrastructure required for laparoscopic TAPP repair of inguinal hernia (30 degree telescope, ccd camera, light source, CO2 insufflator etc.) were used.
- The risk, benefits and alternative to laparoscopic repair were explained in detail including known risk of recurrences of laparoscopic repair and consent was taken in each patient. The age group of 20-70 years were considered in study with mean age of 45 years.
- 5th day and 8th day follow up were instructed for suture line inspection and for suture removal respectively. Later each patient was followed every month for 6 month on OPD basis then 6 months for next 2 years.
- Patient with complications were excluded.



Port position for TAPP repair

Deploying Mesh (M-mesh)

Table 2: Side of hernia

Side of hernia	TAPP (n=50)	%
Right side	28	56
Left side	18	36
Bilateral	4	8
Total	**50**	**100**

30 Telescope

Laparoscopy trolley

RESULTS

A total of 56 hernia were repaired in 50 patients. There was 50 male patients in this study and no female, the mean age was 45 years and range was from 17 to 70 years. The age distribution is shown in this table.

Table 1: Age distribution

Age	No. of patients	%
10-20	4	8.00
21-30	12	24.00
31-40	12	24.00
41-50	10	20.00
51-60	7	14.00
61-70	5	10.00
Total	**50**	**100**

Thus in our study group there were in total 50 patients. The maximum population is in age group of 20-50 years which constitutes major working population of our country. In 56 repairs of inguinal hernias in our study, 4 were bilateral, 2 hernias were diagnosed and repaired during the procedure of TAPP and repaired at the same time. Out of 50 patients right side of hernia were present in 28 patients, left side in 18 patients and bilateral hernia in 4 patients.

View of peritoneum after closure

Thus in our study 56% had right sided hernia, 36% has left sided hernia and 8% has bilateral hernia.

Table 3: Type of hernia

Type of hernia	No. of patients	%
Indirect	41	82
Direct	2	4
Bilateral indirect	1	2
Bilateral direct	2	4
Bilateral recurrent	3	6
Re-recurrent	1	2
Total	**50**	**100**

Unilateral indirect inguinal hernia was present in 41 patients, direct inguinal hernia was present in 2 patients, recurrent hernia present in 4 patients, out of which 1 was bilateral recurrent hernia. Bilateral hernia were present in 4 patients, out of which direct hernia were 2 and indirect hernia was 1 and recurrent hernia was 1. 1 patient was operated twice for recurrence, first by herniorraphy, second time by hernioplasty and third time by TAPP.

Table 4: Total no. of type of hernia repaired

Type of hernia	No. of patients	%
Total indirect	43	76.78
Total direct	6	10.71
Total recurrent	7	12.5
Total	**56**	**100**

Thus 77% patients have indirect hernia, 10% have direct hernia, 12.5% with recurrent hernia. According to NYHUS classification every patients are categorized as follows:

Table 5: Type of hernia according to NYHUS classification

Type of hernia	No. of patients	%
I	38	76
II	4	8
III a direct	4	8
III b indirect	-	-
III c femoral	-	-
IV a direct	4	8
IV b indirect	-	-
IV c femoral	-	-
IV d (a+b+c)	-	-
Total	**50**	**100**

Thus in our study there were no patient of femoral hernia. Study constitutes 76% of patients of indirect hernia of type 1 which constitutes the young adult population.

Post-operative pain and analgesia

Post operative pain was evaluated by patients visual analog scale. It represented in tabular form.

Table 6: Post operative VAS in patients

VAS	No. of patients	%
2-3	9	18
3-4	34	68
4-5	6	12
>5	1	2
Total	**50**	**100**

Thus only 2% of patients experienced severe incapacitating pain after TAPP repair of hernia in our study, while maximum 68% of patients experienced moderate pain which is not incapacitating for day to day activities and patients could resume to the work of daily activity at the same day or at the most next day of surgery. In our study only one patient had chronic groin pain. During routine follow-up 1 patients developed swelling in groin region which required aspiration twice on OPD basis, medications and it resolved. The mean VAS in study group is 3.35, the mean VAS on the day of operation in study is 4.37, on post-operative day one it is 3.7 and post operative day two it is 1.1, post operative day five it is 0.75with 0.15 on day 8.

Table 7: Mean VAS according to post-operative days

	POD-0	POD-1	POD-2	POD-5	POD-8
VAS	4.37	2.7	1.1	0.75	0.15

Thus the patients had on an average moderate pain which could not incapacitate their day to day life on the day of operation. The mean of VAS 2.7 on post operative day 1: mild pain, on post operative day2, maximum patients had no pain and extremely mild pain at the end of day 8 in 2 patients. The mean of VAS IN STUDY GROUP IS 3.35.

POST-OPERATIVE ANALGESIC REQUIREMENT

In this study, patients were given 1 doses of intramuscular injection of diclofenac sodium on the day of operation. Thereafter tablet diclofenac was given as and when the patient asked for the same and number of tablet diclofenac sodium required were noted.

Table 8: Distribution of patients requiring post-operative analgesia

Post-operative day	No. of patients requiring analgesia	% of patients requiring analgesia
POD-0	40	80
POD-1	15	30
POD-2	8	16
POD-5	4	8
POD-8	2	4
POD-30	1	2

Thus in our study the post operative analgesia was required in 40 patients. 80% patients required post-operative analgesia on the day of operation while only 30% required same on post-operative day 1. Only 16% patients required post-operative analgesia on day 2. Only 2% patients required medication for chronic dull groin ache. The average no. of doses of analgesic required to each patient is 3.75 days. In this study group, all patient were started with oral diet on same day of operation, only in one case of laparoscopic appendectomy with TAPP where patients complained of vomiting, patient was kept nil by mouth for 36 hours.

Post-operative hospital stay

The average post operative hospital stay of each patient is noted in every case. On an average considering the day after surgery as post-operative day 1. Patient were usually discharged in our set-up on POD-2 morning. The distribution of the hospital stay of various patients is documented as above:

Table 9: Distribution of post-operative hospital stay of patients

Post-operative hospital stay	No. of patients	%
1-2 days	26	52
2-3 days	12	24
3-4 days	7	14
4-5 days	3	6
>5 days	2	4
Total	**50**	**100**

Thus in our study post operative stay is 1-2 days in 52% of patients i.e., more than 50% patients were discharged on POD-2. So they could resume work early. Similarly 26% of patients were discharged on POD-3. Only 2% of patients stayed in hospital after POD-5.Post-operative stay of two patients was more than 7 days due to certain complications like port site infection.

Assessment of patients for time required to return to activity and work

Table 10: assessment of time to return to activities of daily living

Time required to activities	No. of patients	%
POD-1	45	90
POD-2	5	10
Total	**50**	**100**

In our study the 90% patients returned to activities of daily living by POD-1, only constituting the 10% of patients returned to activities of daily living on POD-2. These were due to various factors like retention of urine, testicular pain and old age patients with co-morbid conditions.

Table 11: Return to activity of work

Time to return to work	No. of patients	%
POD-4	1	2
POD-5	1	2
POD-6	3	6
POD-7	15	30
POD-8	18	36
POD-9	2	4
POD-10	7	14
POD-11	1	2
POD-15	2	4
Total	**50**	**100**

To return to work means patients resuming to work like joining office work or light jobs, thus mean of 40% patients could resume to their work as early as 7-8th post-operative day. The return to work in case of patients who were 60 years and above consists of return to housework, yard work and gardening. Thus from our study it can be concluded that, when there is working people class with inguinal hernias, TAPP provides and constitutes the best repair for them. There were 2 patients who did not return to activity of daily living earlier, 1 due to testicular pain and other due to formation of seroma.

Time required

The duration of time required for the repair of TAPP is calculated from the time of incision till the dressing of patients.

Table 12: Operative time

Operating time	No. of patients	%
40-45	18	36
45-50	7	14
50-55	5	10
55-60	14	28
60-65	1	2
65-70	2	4
>70	3	6
Total	**50**	**100**

The mean time required for operation in our study was 49.6 minutes.

Complications

No intra-operative complications like vascular injury occurred in our study. Other complications like nerve injury, injury to vas deference, injury to bowel and injury to urinary bladder did not occur in our study.

Table 13: Complications after TAPP

Complications	No. of patients	%
Port site infection	2	4
Seroma	1	2
Testicular pain	4	8
Groin pain	2	4
Early recurrence	1	2

Thus out of 50 patients only 13 develops minor complications. There was no major life threatening complications. One patient developed seroma formation where he presented with swelling in the inguinal region and aspiration was done twice on O.P.D basis and medications were given. He improved well. One patient developed chronic pain in groin during his follow-up period after 1 month. 2 patients had port site infection, out of them one was diabetic who was managed by adding higher antibiotics, testicular pain was treated with analgesics. One patients developed redness around suture line.

DISCUSSION

Table 15: Comparison of post-operative analgesics required in P. Shrenk R study and present study

Day	Present study (% of patients)	P.Shrenk R (% of patients)
POD-0	80	38
POD-1	30	18
POD-2	16	8

The post operative doses of analgesic requirement is higher in our study than P. Shrenk R *et al*.

Post-operative hospital stay

The median range of post operative stay after TAPP in our study is 2 days with range from (1-7 days)

Table 16: Comparison of post-operative hospital stay in Zerien *et al* [78] and present study

Length of stay (days)	Zerein *et al* (n=121)	Present study
<24 hrs	108	0
1-2	8	26
2-3	4	12
3-4	0	7
4-5	0	3
5-7	1	2
>7	0	1

Thus in our study no patient discharge on same day of operation. 52% patients discharged after POD-1

Time to return to work and activity

Table 17: Time to return to work and activity

Days	Return to activity		Return to work	
	Bradford Cornell[12]	Present study	Bradfork Cornell	Present study
1-3	24(40)	50(100)	3(7.5)	0
4-5	9(15)	0	2(5)	2(4)
6-7	8(13.33)	0	6(15)	18(36)
8-14	14(28)	0	13(32.5)	28(56)
15-21	3(5)	0	11(27.5)	1(2)
22-27	1(1.66)	0	1(2.5)	1(2)
>28	1(1.66)	0	12(30)	0
6 weeks	-	0	0	0
>2 months	-	0	0	0

In this study group there are 50 patients and 68% of patients belong to age group 20-50. All patients are male. This constitutes major working population of India, so surgical outcome of these patients significantly influences economy and health care delivary system of India. 56% of patients had right sided hernia and 36% patients had left sided hernia with 84% patients had indirect hernia and 8% had direct hernia.

Post-operative requirement of analgesia

in our study about 80% of patients required post-operative analgesia on the day of operation but only 30% patients required post-operative analgesic on POD-1 and 16% required on POD-2. Only 2% patients required post-operative analgesia after 3 days. Comparing of our study with R. Bradford Cornell study in Cornell study almost 40% patients returned to activities of daily living on post-operative day 1 and 47.5% patients returned to activities of daily work with rangeof 7-8 days period. In present study almost all patients returned to daily living activities on POD-1 and nearly 92% patients return to activity of daily work by post-operative day 6-10.

Operative time

	Present study (min)	Bradford Cornell
Unilateral	49.6	81
Bilateral	60	110

Additional procedure performed

18% patients had the other additional procedures performed during TAPP in present study. In 61 patients (8.9%) of additional abdominal procedures performed at the time of herniorraphy in 686 patients of Fitzgibbons *et al* study.

Table 18: Comparison of additional procedures performed during TAPP in present study and Fitzgibbons study[58]

Procedures performed	Fitzgibbons *et al*[58]	Present study
Umbilical herniorrhaphy	17	0
Adhesiolysis	11	2
Cholecystectomy	7	0
Gynaecology	6	0
Vasectomy	5	0
Varicocele ligation	4	2
Lymph node biopsy	4	0
Liver biopsy	2	0
Orchidectomy	2	1
Ventral herniorraphy	1	0
Meckels diverticulectomy	1	0
Resection of infarcted appendix epiploic	1	0
Appendectomy	0	2
Excision of cord lipoma	0	1
Omental biopsy	0	1

Complications

The complications were arbitrarily divided in to following three groups.

- Those related to laparoscopic procedure.
- Those related to patients.
- Those related to hernioplasty.

Complications related to laparoscopy includes evidence of bleeding from major blood vessel injury, abdominal wall hematoma, bowel perforation caused by grasper and bladder injury, CO2 embolism cardiac arrest.

Table 19: laparoscopic complication – Fitzgibbons *et al* study

Complications	No. of patients
Bleeding (no transfusion required)	22(33.2%)
Bleeding (transfusion required)	2 (0.3%)
Abdominal wall hematoma	8 (1.2%)
Trocar site hernia	5 (0.7%)
Hypercapnia	2 (0.3%)
Bowel perforation	1 (0.1%)
Bladder injury	1 (0.1%)

In our study, there are no intra-operative laparoscopic complication.

Table 20: Comparison of post-operative complication with present study and Fitzgibbons *et al* study

Patient complication	Fitzgibbons *et al* (n = 686)	Present study (n = 50)
Ileus	4 (0.6%)	-
Aspiration pneumonia	1 (0.1%)	-
Right lower quadrant adhesions	1 (0.1%)	-
Adhesive small bowel obstruction	1 (0.1%)	-
Myocardial infarction	1 (0.1%)	-
Impotence	1 (0.1%)	-
Paralysed diaphragm	1 (0.1%)	-

Table 21: Comparison of hernioplasty complications in present study and Fitzgibbons *et al*

Complications	Fitzgibbons *et al* (n=686)	Present study n = 50
Transient groin pain	30 (3.5%)	2 (4%)
Persistent groin pain	14 (1.6%)	-
Transient leg pain	29 (3.3%)	-
Persistent leg pain	11 (1.3%)	-
Seroma / no aspiration	21 (2.4)	-
Seroma / aspiration	9 (1%)	1 (2)
Groin hematoma	13 (1.5%)	-
Transient cord / testicular pain	8 (0.9%)	4 (8%)
Orchitis / epididymitis	8 (0.9%)	-
Hydrocoele	8 (0.9%)	-
Persistent cord / testicular pain	5 (0.6%)	-
Wound infection	2 (0.2%)	2 (4%)
Prosthesis infection	1 (0.1%)	-
Transaction of vas deferens	1 (0.1%)	-
Early recurrence	-	1 (2%)

Thus overall in our study the rate of complication of major life threatening complications are nil. As no. 7 patients included in Fitzgibbons *et al* study (n=686) is significantly more as compared to our study (n=50), complications noted in Fitzgibbons study seems to be more.

Table 22: Comparison of sex and age distribution in present study with Zieren *et al* study

	Zieren *et al* [10] (n = 80)	Present study (n=50)
Mean age (years)	43	36.8
Female	8	0
Male	72	50

Table 23: Comparison of type of hernia according to Nyhus classification in present study with Zieren *et al* study

According to Nyhus type of hernia	Zieren *et al* (n=80)	Present study (n=50)
Type -1	10 (13)	38 (76)
Type -2	16 (20)	4 (8)
Type -3a	28 (35)	4 (8)
Type -3b	26 (32)	0 (0)
Type 4	0 (0)	4 (8)

Table 24: Comparison of present study with Zieren *et al* study

	Zieren *et al*	Present study (n=50)
Post-op pain	4.8	3
Post-op analgesia required (days)	2 (4)	3
Hospital stay (days)	3 (2)	2
Return to daily activity	3 (2)	2
Return to work	16 (8)	8
Operative time	61	49.6
Intra-operative complication	2 (3)	0
Post-operative complication	15 (18)	15 (26)
Additional procedure performed	0	12 (24)
Anaesthesia used	GA	GA/SA
Recurrence	0	1
Conversion to open	0	1

Thus comparison present study with Zieren *et al* [58] study, our results are comparable.

SUMMARY AND CONCLUSION

In our study of 50 patients all were in age group 20 -50 years. Right sided inguinal hernia is more common than left sided hernia. Indirect hernias are more common than direct hernia. Out of 50 patient included in study,4 patient had bilateral recurrent hernias. After pre-anaesthetic check up, patients were admitted and posted for Trans-abdominal Pre-peritoneal repair of inguinal hernia. In our study group there are patients more than 60 years of age with premorbid condition like hypertension ,bronchial asthma. One patient was operated for hernia twice. The

patients with previous operative history are six patients, one patient for epigastric hernia, other patient for laparotomy reason for the same not known due to lack of records. Four patients were operated for appendectomy by Mc Burney's incision previously. All patients are classified according to nyhus classification, where 76% patients belong to Nyhus type 1. All patient were evaluated for post operative pain analysis by visual analog scale during their hospital stay and during follow up .Maximum(68%)patients has pain of VAS 3.5 mean during stay which suggest mild to moderate pain with maximum pain on the day of operation. The dose of analgesia requirement is mean 2 doses are required in 50 patients and that to on the day of operation. subsequently the dose of analgesia required by patient decrease. Average hospital stay was 2 days. Thus, it proves that patient can return to activities of daily living early as well as resume their daily work early. Mean time required for operation is 49.6 min. This depends on the factors whether bilateral hernia repair is done or not or whether any ancillary abdominal procedure is performed at the same time. There are total 9 added procedures performed during the TAPP, 2 appendectomy, 2 varicocele ligation, 1 orchidectomy, 2 adhesiolysis, 1 excision of cord lipoma and 1 omental biopsy. Subsequently, 2 undiagnosed contra-lateralhernias were operated in same sitting to reduce the expenses of further admission. There were no major life threatening complications in our study, there were no complication due to laparoscopy in any patients. Minor complication in the form of port site infection, stitch abscess, testicular pain, groin pain and retention of urine were noted in 22% patients. There was one recurrence in study group and one conversion to open.

CONCLUSION

The data presented in our study provides strong evidence to support the contention that the laparoscopic Trans-abdominal pre-peritoneal repair (TAPP) of inguinal hernia is an effective way to treat an inguinal hernia. Trans-abdominal pre-peritoneal repair of inguinal hernia (TAPP) has the following potential advantage:

- Less post-operative pain and discomfort.
- Reduced recovery time allowing an earlier return to activity,
- With reduced hospital stay
- Reduced doses of post-operative analgesics.

More precise, acceptable and anatomically sound repair of a recurrent hernia, because the repair is performed in tissue that has not been dissected previously and at pre-peritoneal level. TAPP of inguinal hernia is beneficial in avoiding un-necessary groin exploration in patients with occult inguinal hernia.

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