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Less Early Postoperative Pain with Totally Extraperitoneal Repair Compared to Open Glue Mesh Fixation in Inguinal Hernia Surgery

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Abstract:

Introduction: TEP and Open Glue Mesh Fixation are the repair process for the inguinal hernia, with comparable outcomes in terms of pain, recovery and other complications. The study objectives is to compare the postoperative outcomes and the effectivity between the TEP and the open glue mesh fixation process.

Method: This is a prospective comparative study with total 60 patients selected with the inguinal hernia. Randomly patients were placed in the two surgical groups TEP and the open Open Glue Mesh Fixation. Different demographic data, the details of the operations and the NRS pain and the use of the analgesic, the complications and the recovery rate were assessed and recorded. Data analysis was done by SPSS 27.0 with t-test, Mann–Whitney U, chi-square, and mixed-model analysis ($p<0.05$).

Result: The TEP group (Group B) showed significantly lower pain scores than the Lichtenstein group (Group A) from Day 0 to Day 7, with a p-value of 0.002 on Day 2, 0.001 on Days 3, 4, 5, and 6, and 0.005 on Day 7. By Day 21, the TEP group's pain score was 1.9, significantly lower than the Lichtenstein group's 2.5 ($p=0.002$). The TEP group also required fewer analgesics on Days 1 (5.3 vs. 3.5), 2 (4.5 vs. 3.9), 4 (3.9 vs. 2.9), 6 (4.2 vs. 2.5), 7 (2.5 vs. 1.8), and 14 (2.9 vs. 1.15) with p-values ranging from 0.015 to 0.017. These findings highlight faster pain relief and quicker recovery in the TEP group.

Conclusion: The study concluded that the TEP group experiences significantly reduced pain throughout the postoperative period, particularly in the immediate and early stages.

Keywords: Totally Extraperitoneal (TEP) Repair, Inguinal Hernia, Postoperative Pain, Analgesic Use, Recovery Rate

Introduction

Transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) are the most common method for the laparoscopic procedure [1]. Entry in the intraperitoneal region is not required in case of the TEP repair, thus the rate of the intra-abdominal injury is less in comparison to the TAPP repair. TEP is very efficient repair technique which needs operative measure and should be processed by general anaesthesia process and mostly preferred in case of Nordic countries [2, 3]. The cost of hospital in case of the TEP is high, due to the requirement of the general anaesthesia method and the requirement of the disposable [4]. The recurrent hernia or the mesh hernia are very rarely found [5]. The comparative study data findings between the Lichtenstein or the open glue mesh fixation method and the TEP repair process is very crucial among the young individuals for reviving their physical work and to avoid the delay in work in the postoperative stage [6]. Most common is the abdominal wall hernia, which accounts for about 1.7% and 4% for the old people above 45 years of age. While mostly around 75% are the abdominal wall hernias, risk accounts for 27% in case of men and 3% among women [7]. Inguinal hernia is very common, with 10 per 100,000 of the UK population, while in US it is 28 per 100,000 [8]. Around 70,000 repair surgery of

the inguinal hernia have been done in England. Males are more predominant accounting for 95% in primary care centre, the incidence rate is 11 per 10,000 individuals of age between 16 to 24

years of age and it is rising from 200 to 10,000 people of age 75 years or above [9]. Inguinal hernia is a lUmp like structure in the groin that gets vanished with a light pressure or when the individual is lying, but results in mild to moderate level of discomfort in the body with activity. The treatment needs surgery without any severe pain [10]. The inguinal canal initiates from the ring and get ended at the superficial ring, which contains the spermatic cord among men and the ligament in case of women. The wall integrity is based on the inguinal canal orientation, the transversalis fascia and the sphincter of the internal ring [11]. The lateral hernia originates from the internal inguinal ring, and passes in the processus vaginalis in the inguinal canal, with or without the superficial ring [12], while the medial hernia which herniate in the transversalis fascia present in the Hesselbach's triangle [13]. Risk associate is the irreducibility or the incarceration, which can lead to dangerous strangulation or the emergent case of obstruction. The intermittent hernia is reducible which occurs due to straining or the standing, which can be pushed in to the abdomen, while if it gets stuck outside of the abdomen, the hernia will be irreducible. The reducible hernia is a long-term condition and on the basis of the specific symptoms there are clinical diagnosis associated. The recurrent hernia is unilateral or bilateral in nature and is associated with subsequent recurrency [14]. There are direct and indirect type of inguinal hernia, if the hernia is directly get bulged in the posterior wall of the inguinal canal, then it is termed as the direct hernia. While, if the hernia passed inside of the inguinal ring in the side of the spermatic cord, after the course of the inguinal canal, then it is termed as the indirect hernia [15]. Different complications are associated with the inguinal surgery, including the mortality rate, the complication in the wounded site and the infection at the surgical site and the late complication include the recurrence of hernia, chronic pain and the infertility. According to a study, 0.02% of patients below 60 years of age have faced mortality rate and 0.48% or people have mortality after the surgery [16]. This is a comparative study of the outcome related to the total extraperitoneal repair (TEP) and the open glue mesh fixation related to the Inguinal Hernia surgery.

Methodology

Research design

The study is a prospective study, conducted for a period of one year in our hospital and the study duration was from October 2017 to September 2018. The study aimed to conduct comparison of the outcomes of the two-repair process, Totally Extraperitoneal Repair and Open Glue Mesh Fixation. The patients with age between 18 to 80 years and those who are suffering from the unilateral primary inguinal hernia are included for the study. The patients having some surgical process at the lower abdominal area, bilateral hernia, large scrotal hernia, or femoral hernia are excluded. All patients were selected based on specific inclusion and exclusion criteria and were selected on proper verbal and written approval from the ethical committee of the hospital. Total sample size selected for the study are 60 and were grouped into two groups, the TEP group as group A and the group B the Lichtenstein group. Expert surgeons have selected the patients from the waiting list based on the criteria.

Inclusion criteria

- The age between the 18 to 80 years of people were included.
- The patients with specific diagnosed primary inguinal hernia were included for the study.
- Patient with proper verbal and written consent was selected for the study.

Exclusion criteria

- Patients with diagnosed lower abdominal surgery including the laparotomy was excluded.
- Highly risked population for the operation stage according to the ASA grade > III was excluded.
- Patient with diagnosed bilateral inguinal hernia and large scrotal hernia was excluded.

- Also, if patient was diagnosed with the Femoral hernia was excluded for the study.

Procedure

Senior expert 6 surgeons have been assigned for the performance of the both open and the TEP process of repair. In case of the TEP process, three ports were made, first port was a 10-mm view port across the midline portion below the umbilicus region and the second port was two 5-mm working ports which was done just below the 10-mm port. The balloon like dissector was made for the creation of the preperitoneal reagion. This dissection was made medially up to the pubic bone, which was in the lateral direction from the anterior superior iliac spine and it is inferior to the spermatic cord. This dissection is a few centimeters under the pubic bone. A polypropylene mesh which was measured about 12 t0 15 cm was utilised to cover the orifice of the hernia and was not covered with trackers or glue. In case of the TEP repair system, 4 to 5 ml of the bupivacaine (MarcainVR 5 mg/ml, AstraZeneca, Cambridge, UK) was administered locally in the skin for the anaesthesia. The open procedure is termed as the Lichtenstein. Tension-free hernioplasty was done by utilising a 9 to 13 cm of a fresh and trimmed mesh (OptileneTM). The sac in case of the indirected hernia was resected and also inverted in the abdomen. If it is large sac like hernia, the hgernia is inverted in to the absorbable 2–0 sutures (VicrylTM polyglactin, Johnson & Johnson Medical N.V., Machelen, Belgium). The mesh was set between the conjoint tendon, the inguinal ligament, the pubic bone, and the internal oblique aponeurosis. Identification of the ilioinguinal, genitofemoral, and iliohypogastric nerves wes done and get preserved. The fixation of the mesh have been performed by utilising the n-butyl-2-cyanoacrylate tissue glue (HistoacrylVR , B. Braun). The open repair is done by the anaesthesia and is made up of mixtures of bupivacaine (MarcainVR 5 mg/ml) and lidocain with adrenaline (10 mg/ml þ 10 mg/ml, Orion, Kuopio, Finland) in a ratio of 1 : 1. A bolus of 0.5–1.0 mg of alfentanil was administered intravenously (RapifenVR , AstraZeneca) and no prophylactic antibiotics were used. All of the participants were said to return to their daily works postoperatively. 7 days of sick leave were advised for all. Ibuprofen or paracetamol was prescribed for all during the postoperative pain. Arcain (VR 5 mg/ml, AstraZeneca, Cambridge, UK) was administered locally in the skin.

Outcome

All the demographic data and different predisposing factors and pain scores relate dot the hernia was recorded in the preoperative phase. All the data regarding the operation time, the type and size of the hernia were detected, duration of the hospital stay and the complications related to the perioperative and immediate state have been recorded. PROMs were used for the pain evaluation and recovery post-surgery. A pen diary has been given to all patients after the hospital discharge. The postoperative pain of all patients has been reported when they are at rest and during the exercise and during the cough. The level of pain was recorded for two times per day for 1-week post-surgery, which is followed by in the days 14, 21, and 30. The numerical rating scale (NRS) of 0 to 10 was used and assessed. The use of all doses and analgesic was measured and recorded. The record of every patient has been assessed in the computer and screened for 1 month in the post-surgery.

Statistical analysis

All data have been analysed with the SPSS for Windows, Release 27.0 (IBM SPSS, Chicago, Illinois, USA). Continuous data have been represented by means, and evaluated by the Student's t test (two-tailed) in case of the parametric data and for the non-parametric data, the Mann–Whitney U test was performed. The Categorical variables were evaluated by the use of the Pearson's chi-squared test and Fisher's exact test. The pain scores were analysed by the mixed model analysis and the $P < 005$ was maintained for the statistical significance.

Result

Table 1 compares various variables between two groups, Group B (n=40) and Group A (n=20). The mean age for Group B is 55.5 ± 2.5 years, while

Group A has a mean age of 52.3 ± 5.5 years, with a p-value of 0.18 indicating no significant age difference. The sex ratio is identical in both groups (20:20 in Group B, 10:10 in Group A), and the p-value of 0.903 shows no difference. Both groups have the same BMI of 23, and the p-value of 0.957 suggests no significant BMI difference. Smoking prevalence is 62.5% in Group B and 60% in Group A, with a p-value of 0.854 indicating no significant difference. The average duration of symptoms is 2.1 ± 2.55 months in Group B and 2.67 ± 2.98 months in Group A, with a p-value of 0.852, indicating no significant difference. There were 3 combined hernias in Group B and 1 in Group A, but this difference was not statistically significant (p=0.25). Preoperative pain scores were similar between the groups (2.25 ± 3.5 in Group B vs. 2.50 ± 3.5 in Group A, p=0.78). Regarding analgesic use, 62.5% of Group B and 60% of Group A needed analgesics 1–4 times per month, with no significant difference in preoperative analgesic requirements. Absence from work due to hernia was 7 in Group B and 5 in Group A, with a p-value of 0.454 showing no significant difference. Outpatient surgery was more common in Group B (25 cases vs. 5 in Group A), but the p-value of 0.245 indicates no significant difference. The mean operating time was 29.2 ± 31.2 minutes in Group B and 1.15 ± 2.25 minutes in Group A, with a p-value of 0.353 suggesting no significant difference. The hernia orifice size was slightly larger in Group B (1.5 ± 3.1 cm vs. 1.15 ± 2.5 cm in Group A, p=0.252), and the type of hernia (lateral or medial) showed no significant difference between the groups.

Table 1: Different variables and their number and mean values for the two groups with their p values

Variable	Group B (n=40)	Group A (n=20)	P value
Age (years)	55.5±2.5	52.3 ± 55.5	0.18
Sex ratio (M:F)	20:20	10:10	0.903
BMI (kg/m²)	23	23	0.957
Smoker	25(62.5%)	12(60%)	0.854
Duration of symptoms (months)	2.1±2.55	2.67±2.98	0.852
Combined hernia	3	1	0.25
Preoperative pain	2.25±3.5	2.50±3.5	0.78
Pre-op need of analgesics – Not needed	3	2	
Pre-op need of analgesics – 1–4 times/month	15	9	
Pre-op need of analgesics – 1–6 times/week	5	4	
Pre-op need of analgesics – Daily	2	3	
Absence from work due to hernia	7	5	0.454
Outpatient surgery	25	5	0.245
Operating time (min)	29.2±31.2	1.15±2.25	0.353
Hernia orifice size (cm)	1.5±3.1	1.15±2.5	0.252
Type of hernia – Lateral	24	8	0.568
Type of hernia – Medial	16	12	

The table 2 represents the postoperative pain scores between the two groups, which reveals that the TEP group experiences reduced pain in comparison to the Lichtenstein group in the immediate and early postoperative stage from day 0 to day 7. The preoperative pain is also comparable between the two groups. From day 14 to day 30, there is evidence of the pain reduction, TEP have less mean scores. At the 21 day, TEP group experienced less pain, having the p value of 0.002, meaning temporal reversal. TEP repair indicates the short-term recovery and relief of pain and quick postoperative recovery in comparing to the other group.

Table 2: The postoperative mean scores at different days for the two groups and their p values

Days	Group B (Mean Pain)	Group A (Mean Pain)	P-value
Preop	2.8	2.9	0.409
Day 0	5.5	3.9	0
Day 1	4.5	3.7	0
Day 2	4.9	3.2	0.002
Day 3	3.5	2.8	0.001
Day 4	3.9	2.6	0.001
Day 5	2.5	2.5	0.001
Day 6	2.5	2.7	0.001
Day 7	2.5	1.5	0.005
Day 14	1.9	1.5	0.01
Day 21	1.9	2.5	0.002
Day 30	2.2	1.9	0.002

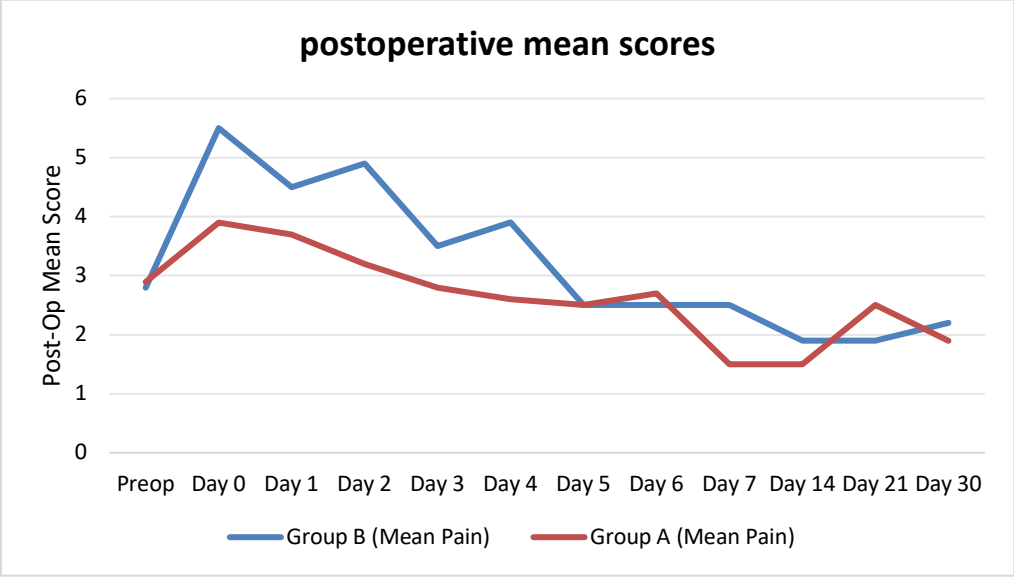

Figure 1: The postoperative mean scores at different days for the two groups

The table 3 is representing the mean pain scores at different postoperative durations, which shows that the TEP group of patients have reduced pain in comparison to the other groups of patients. significant changes have been observed in TEP group at the Day 1, Day 2, Day 4, Day 6, Day 7, and Day 14 which is statistically significant also, which provides faster reduction in pain and fast recovery. At the day 0 and day 5, low pain was observed and in case of Day 21 and Day 30, no level of pain is evident. At the day 3, the patients on the Lichtenstein group, had received low pain,

thus the data reveals that the TEP process of repair provide efficient pain outcomes in comparison to the Lichtenstein group.

Table 3: Mean of the number of analgesics taken by the patients of both the groups

Time point	Group B (Mean)	Group A (Mean)	P-value
Day 0	3.9	2.9	0.085
Day 1	5.3	3.5	0.015
Day 2	4.5	3.9	0.017
Day 3	3.6	4.2	0.108
Day 4	3.9	2.9	0.022
Day 5	3.2	2.98	0.06
Day 6	4.2	2.5	0.014
Day 7	2.5	1.8	0.04
Day 14	2.9	1.15	0.017
Day 21	2.5	2.14	0.247
Day 30	1.87	1.15	0.678

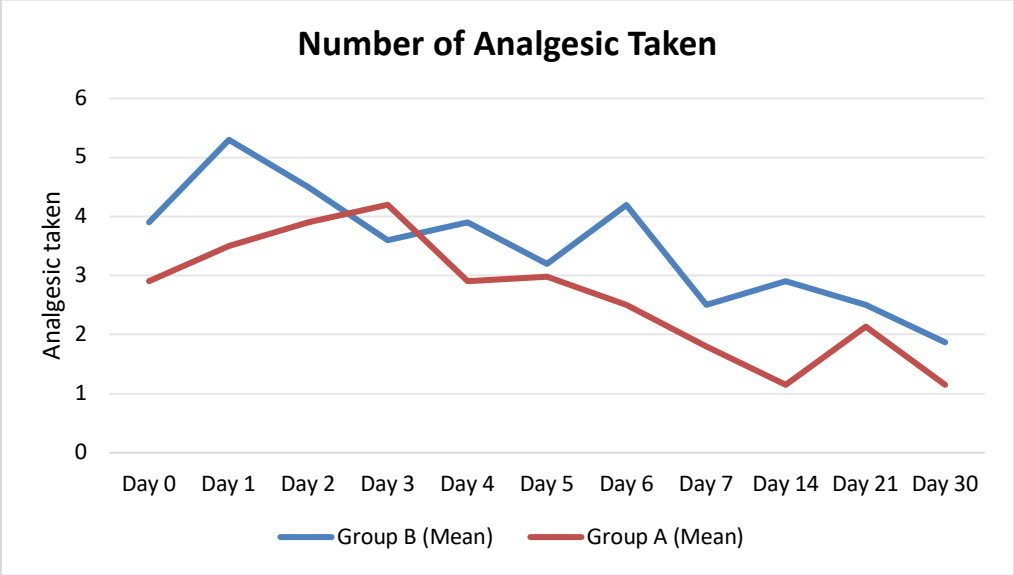

Figure 2: Number of analgesics taken by the patients of each group (day wise)

Discussion

The randomized clinical trial study, the comparison between the TEP repair and open glue mesh fixation in case of the inguinal hernia surgical process, reported the patients those who have underwent with TEP have significant reduced postoperative pain within the initial week after the surgery, comparing with the open mesh technique. The analgesics requirement also gets reduced in case of the TEP group with fast recovery rate, which provides the quick return to daily work. The study highlights no difference in the complication of the rate of recurrency between the two groups, while TEP is more efficient for the level of comfort and early rate of recovery with prolonged safety and better outcomes [17]. Another RCT study have reported the comparison between the two groups for the inguinal hernia surgery, demonstrated that the patients in the laparoscopic group are observed to have less pain after the surgery and also required less number of analgesic doses in the pre-recovery period. Also, the rate to get revive in normal daily activity is high comparing to the Lichtenstein

group of people. The laparoscopic technique has large duration of operation, while the complications remain similar for both. The study emphasized the TEP is efficient for reducing the discomfort after the surgery and also provide quick recovery [18]. The systematic review study has revealed the TEP repair have less pain associated and faster rate of recovering to daily activities comparing to the repair by the Lichtenstein process. While both of the repair process has high rate of recurrence, also quite effective for preventing the hernia. The TEP repair process showed reduced level of infections in the wound and less complications but large duration of operation. TEP is effective for the short-term recovery and is ideal as it is minimally invasive repair process [19]. The RCT study comparing between the two groups, demonstrated that the laparoscopic repair during the postoperative pain and faster recovery to daily activities comparison to the open mesh repair process. The laparoscopic repair process is associated with long operation time and associated with severe complications like the visceral and the vascular injuries. While both of the group have recurrence rate and equally effective for preventing hernia. Short term recovery benefit has been obtained by the laparoscopic surgery, while the other one is safe, effective and simple process [20]. The study has compared the TEP and TAAP and have explained that both of the approaches have reduced pain and quick recovery to daily activities in comparison to the Lichtenstein technique. The life score is high in case of the postoperative period, and the outcomes include the high recurrence rates. The study findings have revealed the benefits of the laparoscopic repair which is minimally invasive process, providing short term recovery process and surgical comfort [21,22]. The prospective RCT have compared the outcomes after the surgery and the life quality between the TEP and the Open Glue Mesh Fixation process for the inguinal hernia surgery. The study has explained the less pain associated with the TEP and fast recovery to normal work with more effective life quality in comparing to the Open Glue Mesh Fixation group. The rate of recurrence is equal for both of the groups which provide equal effectivity in preventing the hernia. The paper reveals that the TEP provides potential recovery and comfort comparing to other long term surgical process [20-23]. The review study has demonstrated that the TEP and the TAPP both of these processes are safe having reduced rate of recurrence. The repair process by the laparoscopic procedure is associated with the less pain in the postoperative phase and also have fast recovery rate to the daily work activities. There are some specific factors like the type of hernia, the bilateral or the recurrent type and the expertise of the surgeons, which will affect the choice of the technique. The study demonstrated that the minimally invasive approach is effective for the quick and fast recovery [22].

Conclusion

The study concluded that the TEP group experiences significantly reduced pain throughout the postoperative period, particularly in the immediate and early stages. The TEP group shows lower pain scores from Day 0 to Day 7, with a significant reduction in pain at Day 21 ($p=0.002$). In terms of analgesic consumption, the TEP group also required fewer pain medications on several key days, notably on Day 1, Day 2, Day 4, Day 6, and Day 14, highlighting quicker pain relief and faster recovery compared to the Lichtenstein group. These results suggest that TEP repair provides more efficient pain management and a quicker postoperative recovery. The Postoperative outcome has revealed that the patients who have underwent with the TEP have observed with reduced pain scores during the immediate and early postoperative stage from day 0 to day 7. The consumption of the analgesic also gets reduced in case of the TEP group, which reveals the better comfort and recovery during the postoperative phase. The pain gets reduced after 2 weeks, while TEP shows better outcomes up to day 14. Pain relief have been evident in the day 21 and day 30. The duration of operation and the risk form the recurrence is comparable which confirms the efficiency of the TEP. The total data findings have been demonstrated the TEP is efficient for the post-operative outcomes for better pain relief and the recover, in compared to the other group.

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