

# Length of hospital stay in laparoscopic transabdominal preperitoneal repair compared to open Mesh repair in patients with inguinal hernia: a randomized controlled trial

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## Submitted

January 28, 2022

## Accepted

February 19, 2022

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**Citation:** Abid H, Khan M, Khan S. Length of hospital stay in laparoscopic transabdominal preperitoneal repair compared to open Mesh repair in patients with inguinal hernia: a randomized controlled trial. J Rehman Med Inst. 2022 Jan-Mar;8(1):12-5.

## ABSTRACT

**Introduction:** One of the challenges faced by surgeons during repair of inguinal hernias is to adopt an approach with minimum complications of infection, chronic pain, and recurrence of hernia. Along with traditional techniques, modern methods of Laparoscopic Repair and Open Mesh Repair have been introduced and need further evaluation.

**Objective:** To compare the mean length of hospital stay in laparoscopic trans abdominal preperitoneal repair versus open Mesh repair in patients undergoing inguinal hernia repair with Mesh.

**Methods:** A total of 334 patients of male gender with Inguinal hernias of any side and ASA score I and II were included in the study. History of Immunosuppression, concomitant other types of abdominal hernias, and recurrent hernias, were excluded. 167 patients were in Group A or laparoscopic trans abdominal preperitoneal repair group while 167 patients were in Group B or open Mesh repair. Data regarding length of hospital stay from both groups was recorded on especially designed proforma. Data were analyzed by SPSS 22 for descriptive and comparative statistics, keeping  $p < 0.05$  as significant.

**Results:** Age range in this study was from 18 to 50 years. In group A, the mean age was  $40.173 \pm 6.19$  years and mean duration of procedure was  $37.658 \pm 6.36$  minutes; in group B, the mean age was  $38.443 \pm 5.10$  years and mean duration of procedure was  $61.748 \pm 11.65$  minutes. Majority of patients belonged to ASA-I in both groups. Moreover, majority of patients had right sided hernia in both groups. Mean length of hospital stay was  $31.760 \pm 11.25$  hours in group A and  $58.922 \pm 11.98$  hours in group B ( $p < 0.001$ ).

**Conclusion:** Laparoscopic approach for hernia repair had better outcome than open Mesh repair in terms of shorter duration of hospital stay.

**Keywords:** Inguinal hernia, Laparoscopic trans abdominal preperitoneal repair, Open Mesh repair, Length of hospital stay.

*The authors declared no conflict of interest. All authors contributed substantially to the planning of research, data collection, data analysis, and write-up of the article, and agreed to be accountable for all aspects of the work.*

## INTRODUCTION

Inguinal hernia repair remains challenging for the surgeon because of its short-term and long-term complications such as infection and chronic pain, and the fear of its recurrence.<sup>1</sup>

Several operative techniques have been described. The traditional techniques are tissue-based repair or tension-free repair using an open approach.<sup>2</sup> In recent times, the laparoscopic repair of inguinal hernia has been described using either a totally extraperitoneal or a transabdominal preperitoneal (TAPP) approach.<sup>3,4</sup> Several studies have established tension-free Mesh repair as the gold standard in open inguinal hernia repair,<sup>5</sup> while others show laparoscopic repair to be safe and efficient. It offers patients the advantages of minimally invasive surgery, while recurrence rate does not differ from that of classic open tension-free Mesh technique. It can be used as a first-line option for repair of unilateral primary inguinal hernias.<sup>6</sup> Many randomized, controlled trials have been conducted to compare open and laparoscopic procedures. Lichtenstein herniorrhaphy, the open procedure used in most trials, applies a Mesh on the pre-muscular layer and not in the preperitoneal space, unlike the totally extraperitoneal or TAPP laparoscopic technique. This difference in Mesh location caused discrepancies in comparing the two approaches, because of which the results may not give an exact distinction between the two.<sup>7</sup>

Kugel developed a preperitoneal tension-free technique combining the utility of open operation technique with the advantages of minimal access procedures (smaller incision, preperitoneal Mesh placement, avoidance of neuropathic pain).<sup>8</sup> Transinguinal preperitoneal (TIPP) repair using a Modified Kugel (MK) patch is a classic open anterior preperitoneal technique for tension-free herniorrhaphy, performed through the preperitoneal space by means of the internal ring for indirect hernias or Hesselbach's triangle for direct and femoral hernias.<sup>1</sup>

In a study, Manjunath DA, et al, showed that mean length of hospital stay in laparoscopic trans abdominal preperitoneal repair was  $37.2 \pm 12.1$  hours versus  $38.2 \pm 13.6$  hours ( $p > 0.05$ ) in open Mesh repair in patients with inguinal hernia.<sup>9</sup>

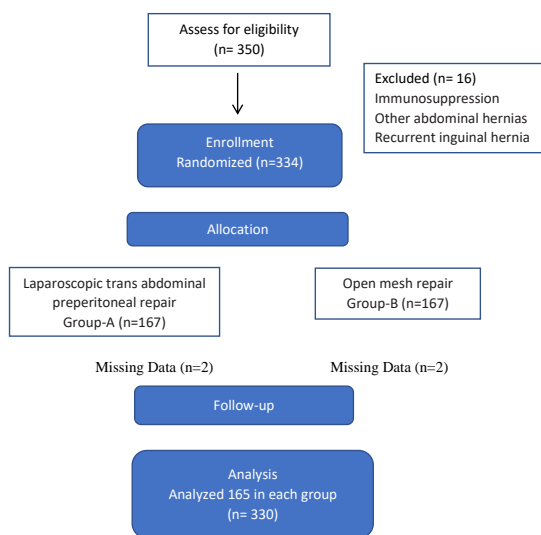
In another study, Sarhan AE, et al, showed that mean length of hospital stay in laparoscopic trans abdominal preperitoneal repair was  $1.4 \pm 0.57$  days versus  $1.7 \pm 0.53$  days ( $p < 0.001$ ) in open Mesh repair in patients with inguinal hernia.<sup>1</sup>

A Cochrane review concluded that laparoscopic hernia repair has no difference to open Mesh repair, but it was soon contradicted by multicenter trials.<sup>11,12</sup> Moreover one study has shown no difference in hospital stay after these two procedures while another showed a difference in mean hospital stay as shown in previous studies.<sup>9,10</sup> Although there is lot of existing literature in this subject, but due to its variability in results further research is needed. The present study was therefore planned to compare the mean length of hospital stay in laparoscopic trans abdominal preperitoneal repair versus open Mesh repair in patients with inguinal hernia. Results of the study will help to select better technique in patients with inguinal hernia in the local population.

## MATERIALS & METHODS

This randomized controlled trial was conducted in a tertiary care setting over a period of two years (September 10, 2018, to October 10, 2019). All male patients aged 18-60 years, scheduled for inguinal hernia repair, were included in the study. Patients with recurrent inguinal hernia, associated with other ventral hernias, or immunocompromised patients were excluded.

Patients fulfilling the inclusion criteria were randomized by block design and it was 1:1 for laparoscopic trans abdominal preperitoneal repair versus open Mesh repair i.e., every next coming patient of hernia repair was included to next group. Both groups had a final 165 patients as shown in flow chart Figure 1.



**Figure 1: Flow chart of participant selection based on CONSORT.**

A detailed explanation about the participation in the study was given to the patient and an informed consent was obtained explaining the risks and benefits of both procedure in detail. All the patients were operated under general anesthesia by a consultant surgeon having minimum of 5 years of experience and well versed with both laparoscopic and open hernia repair. This

study was approved by Institution research and ethical board review (IREB#194-SUR-2018).

In Group A, the sac was reduced; the peritoneum was separated from vas and gonadal vessels. Preperitoneal space was dissected beyond the midline on the medial aspect, beyond the anterior superior iliac spine exposing the psoas muscle on the lateral aspect, inferiorly up to symphysis pubis and the level of obturator foramen and superiorly up to the level of the arcuate line. The polypropylene Mesh was trimmed to fit the contours of the dissected preperitoneal area. Mesh was fixed with intracorporeal sutures using 1-0 polypropylene. Care was taken to avoid suturing in the triangle of Doom and the triangle of pain. Mesh was fixed only at the Cooper's ligament.

In Group B, the medial portion of the Mesh was rounded to the shape of the medial corner of the inguinal canal. A slit was made at the lateral end of the Mesh, creating a wider tail above the cord and narrow one below and the cord positioned between the two tails of the Mesh. The Mesh was sutured to the aponeurotic tissue over the pubic bone overlapping the bone with 2-0 polypropylene suture medially, with inguinal ligament inferiorly and to the conjoined tendon above. Laterally, two tails of the Mesh were sutured to inguinal ligament thus creating a new internal ring. The excess Mesh was trimmed laterally leaving 3-4 cm beyond the internal ring. Perfect hemostasis was ensured. External oblique aponeurosis was sutured with 2-0 prolene. The subcutaneous fat was sutured with 2-0 catgut and skin was approximated using staples/sutures. Data regarding length of hospital stay from both groups was recorded by researcher himself on especially designed proforma.

Despite exhaustive literature search, no local or international study was available which has primarily compared the difference in port site pain in between two groups. Sample size was calculated with 95% Confidence Level with power = 80% and  $\alpha = 5\%$  (two sided). By using Mean  $\pm$  SD (length of hospital stay) =  $1.4 \pm 0.57$  days in laparoscopic trans abdominal preperitoneal repair and  $1.7 \pm 0.53$  days in open Mesh repair, sample size of 334 was selected. There were 167 patients in Group A (laparoscopic trans abdominal preperitoneal repair group) while 167 patients were in Group B (open Mesh repair group).

Data were analyzed with statistical analysis program (SPSS version 22). Frequencies and percentages were computed for qualitative variables like ASA score and side of hernia. Mean  $\pm$  SD was obtained for quantitative variables like age, duration of procedure, and length of hospital stay. Both groups were compared for length of hospital stay. The differences in the mean length of hospital stay of the two groups was statistically tested using the Student's T test. Stratification was done regarding age, ASA score, side of hernia and duration of procedure to see the effect of these variables on length of hospital stay. Post stratification using T test for both groups,  $p \leq 0.05$  was considered statistically significant.

## RESULTS

During the study period, 350 patients were evaluated to finally select 330 patients (165 each group), as shown in Figure 1. Both the groups were comparable for the baseline variables (Table 1)

with mean age of  $40.17 \pm 6.19$  years in group A vs.  $38.44 \pm 5.10$  years in group B. All patients were followed up till discharge.

Table 1 shows the distribution of obtained results for the two groups. Significant differences are seen for Duration of procedure ( $p=0.001$ ), Length of hospital stay ( $p<0.001$ ) and Postoperative pain control ( $p=0.001$ ).

**Table 1 Showing comparison of different variables between the groups (n=165 each group).**

Variables	Group A	Group B	p-value
Age (years)	$40.17 \pm 6.19$	$38.44 \pm 5.10$	0.35
Duration of procedure (minutes)	$37.66 \pm 6.36$	$61.75 \pm 11.65$	0.001
ASA score			0.56
ASA I	123 (73.7%)	141(84.4%)	
ASA II	44 (26.3%)	26 (15.6%)	
Site of Hernia			
Left	48 (28.7%)	53 (31.7%)	0.42
Right	119 (71.3%)	114 (68.3%)	0.21
Length of hospital stay (hours)	$31.76 \pm 11.25$	$58.92 \pm 11.98$	<0.001
Mean postoperative pain (VAS)	$2.3 \pm 1.24$	$5.3 \pm 2.24$	0.001

Stratification by length of hospital stay in both groups regarding age, ASA score, side of hernia, and duration of procedure was done and revealed significant differences (Table 2).

**Table 2: Stratification of variables for length of hospital stay (n=165 each group).**

Variables	Group A	Group B	p-value
Age (years)			
18-35	$36.29 \pm 12.14$	$56.82 \pm 11.68$	<0.001
36-50	$30.28 \pm 10.59$	$59.79 \pm 12.04$	<0.001
Duration of procedure (minutes)			
$\leq 40$	$31.63 \pm 11.21$	$55.58 \pm 11.46$	<0.001
$>40$	$32.21 \pm 11.53$	$59.35 \pm 12.02$	<0.001
ASA score			
ASA I	$32.00 \pm 11.35$	$58.38 \pm 11.93$	<0.001
ASA II	$31.09 \pm 11.07$	$61.85 \pm 12.09$	<0.001
Site of hernia			
Left	$30.00 \pm 10.50$	$60.68 \pm 12.09$	<0.001
Right	$32.47 \pm 11.51$	$58.11 \pm 11.90$	<0.001

## DISCUSSION

Until a few decades ago, the standard method for inguinal hernia repair was suturing fascial structures around the hernia defect, until Lichtenstein et al, introduced tension-free repair, which gained widespread recognition worldwide and surgeons mastered the technique rapidly.<sup>13</sup> Successful hernia treatment should offer high patient satisfaction, low cost, low recurrence rate, and rapid

return to work.<sup>14</sup> However, the question about the most appropriate technique still confuses the community of surgeons. There are advantages and disadvantages to laparoscopic repair.<sup>15</sup> Clinically silent contralateral hernia and other intra-abdominal pathologies are easier to detect with the TAPP approach.<sup>16</sup> The laparoscopic TAPP procedure carries some disadvantages such as possible organ injury at the time of trocar entry, port site hernia, and adhesions.<sup>17</sup> Despite excellent long-term outcome after TAPP repair, the use of laparoscopy in hernia repair is still limited.<sup>18</sup> Several studies compared the laparoscopic and open techniques for inguinal hernia repair employing either approaches.<sup>19</sup> Open preperitoneal tension-free repair started with Wantz, but because it is complicated, it is less frequently used.<sup>20</sup> Most of these studies compared laparoscopic and Lichtenstein tension-free techniques with different Mesh locations, Mesh types, and different types of anesthesia. In our study, we used two different techniques, both tension free, with different approaches but similar Mesh location. The Mesh was placed in the preperitoneal space between the peritoneum and the transversalis fascia and secured over the myopectineal orifice using intra-abdominal pressure, covering the Hasselbach triangle, the internal inguinal ring, for treating the three most common types of groin hernia: indirect, direct, and femoral hernia. In this study, both open and laparoscopic approaches were effective and safe for preperitoneal repair of inguinal hernia; the mean length of hospital stay was  $31.76 \pm 11.25$  hours in group A and  $58.92 \pm 11.98$  hours in group B ( $p<0.001$ ). Contrary to our findings, Manjunath et al,<sup>9</sup> showed that mean length of hospital stay in TAPP was  $37.2 \pm 12.1$  hours versus  $38.2 \pm 13.6$  hours ( $p>0.05$ ) in open Mesh repair.<sup>9</sup>

The duration of inguinal hernia repair with the TAPP technique has been reported between 30 and 65 minutes, and that with the open procedure to be 30 to 55 minutes.<sup>17,21,22</sup> The operation time in our study was significantly shorter with the laparoscopic approach ( $37.66 \pm 6.36$  minutes vs.  $61.75 \pm 11.65$  minutes with the open approach,  $p<0.001$ ). According to our findings, other significant advantages of the TAPP procedure over open repair were shorter hospital stay and earlier recovery. One of the advantages of the laparoscopic approach over the open approach is less pain postoperatively. In our work, VAS was significantly lower in the TAPP group than in the open group, which could be attributed to the fact that groin dissection using the open anterior approach causes more trauma and possible injury to the peripheral nerves. Meta-analysis of multiple randomized controlled trials of TAPP repair showed a return to normal activities 3 days earlier than open repair.<sup>22</sup> We tried to reduce the number of staples applied and avoid nerve injuries, which helps in reduction of postoperative pain. One of the causes of chronic pain in the open procedure is the presence of the stiff outer ring.

## CONCLUSION

Laparoscopic approach has better outcome in terms of short duration of hospital stay and postoperative pain control.

## RECOMMENDATION

The authors recommend preferential use of TAPP for inguinal hernia. Further studies with large sample size and longer follow-up duration are needed to prove our results.

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