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A Comparative Analysis of Open and Laparoscopic Ventral Hernia Repair Techniques

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ABSTRACT

Introduction- Ventral hernias are a common surgical concern, and the choice of repair technique can significantly impact patient outcomes. Two such commonly preferred techniques are Open Ventral Hernia Repair and Laparoscopic technique. This prospective study aims to compare open and laparoscopic approaches for ventral hernia repair, considering various clinical parameters.

Methods- A total of 80 patients were categorized into two groups: Group 1 (open repair) and Group 2 (laparoscopic repair), with 40 patients each. The study was conducted at MKCG Medical College, Odisha, India. The post-operative changes were compared for different parameters. Hematoma formation, postoperative wound infection, seroma occurrence, visual analogue score (VAS) for pain, mesh infection, resumption of diet time, recurrence, and duration before movement were evaluated. Statistical analysis was employed to assess the results.

Results- While no statistically significant differences were observed in hematoma formation, postoperative wound infection, or seroma occurrence, the laparoscopic approach showed a significantly lower mean VAS score, indicating reduced postoperative pain making it a more preferred technique. There were no instances of mesh infection, recurrence, or substantial variations in resumption of diet time or duration before movement in either group.

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Conclusion- This study provides valuable insights into the comparative outcomes of open and laparoscopic ventral hernia repair, supporting the benefits of the laparoscopic approach in terms of reduced postoperative pain and less post operation recovery time.

Keywords- *Open Ventral Hernia Repair, Laparoscopic Hernia Repair, post operative wound infection, visual analogue score, seroma*

INTRODUCTION

Surgery has long been a cornerstone of medical intervention, offering life-saving and therapeutic options. Over time, surgical techniques have evolved, giving rise to two prominent approaches: open surgery and laparoscopic surgery, often referred to as minimally invasive surgery. These two approaches represent distinctive methodologies with varying impacts on patients and outcomes [1]. Open surgery involves larger incisions, direct access to the surgical site, and an extensive view of the operative area. In contrast, laparoscopic surgery employs small keyhole incisions, specialized instruments, and cameras to navigate the internal landscape of the human body [1]. This comparison delves into the critical differences between these surgical methods, touching on aspects such as incision size, recovery time, patient experience, and suitability for different medical procedures. Understanding the contrasts and benefits of each approach is pivotal in modern healthcare, where patient-centered care, reduced hospital stays, and innovative technology play a central role in decision-making for both patients and medical practitioners.

A vertical hernia, also known as an "incisional hernia," represents a common surgical complication that arises when tissue or organs protrude through a weakened abdominal wall in the vicinity of a prior surgical incision [1, 2]. This condition can manifest as a visible lump or bulge in the affected area, potentially causing discomfort, pain, and complications. Vertical hernias are often associated with abdominal surgeries, particularly in patients who have undergone procedures such as

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appendectomies or bowel surgeries. They are classified into “paraumbilical hernia”, “umbilical hernia”, “incisional hernia”, “spigelian hernia” and “epigastric hernia”.

“Incisional hernias” is an adverse outcome of open abdominal surgery. Using a prosthetic mesh reduces the chances of its occurrence [2]. “Paraumbilical hernias” typically arise, while umbilical hernias can be congenital in nature. “Epigastric hernias”, which protrude through the linear alba above the umbilicus, are observed in approximately five percent of the population. These hernias carry a notable risk of incarceration, and surgical intervention is the sole curative option. Most Spigelian hernias are acquired, and they often necessitate surgical treatment due to the increased likelihood of intestinal obstruction [3]. “Ventral hernia repair” is a frequently performed surgical intervention. The majority of ventral hernias encountered are of small size and are classified as umbilical and epigastric hernias. However, a significant proportion, approximately 30%, of these procedures involve the repair of incisional hernias. Furthermore, nearly half of these repairs are conducted using a laparoscopic approach [4].

Laparoscopic hernia repair involves smaller incisions, which minimizes trauma to surrounding tissues and muscles, resulting in less postoperative pain and faster recovery times. The cosmetic benefits of these tiny incisions are significant, as they lead to less visible scarring, an essential consideration for many patients. Reduced postoperative pain and a shorter hospital stay are additional advantages, making it an appealing option for patients and healthcare providers alike, whereas, performing laparoscopic procedures demands a unique skill set that may not be universally available in healthcare settings [5]. Additionally, there are technical challenges associated with certain hernias, particularly complex or larger ones, which may be more effectively addressed through open surgery. The cost of laparoscopic procedures can also be a consideration, as they may involve more expensive equipment and training [6]. In this research, the objective is

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to conduct a comparative and prospective study for Open ventral hernia repair and Laparoscopic hernia repair.

MATERIALS AND METHOD

This comparative and prospective analysis was conducted in MKCG Medical College in Odisha, India. A total of 40 patients participated in the research who came in for ventral hernia repair procedure. The study included patients with age within the range of 20 and 60 who provided informed written consent and had ventral hernias smaller than 10cm in size. Patients who voluntarily opted for surgery for treating the "ventral hernia" were enrolled only. The research excluded patients who had multiple medical conditions that made them at high risk for general anesthesia. It also excluded patients who were admitted to the intensive surgical care unit because of surgical emergencies like "acute intestinal obstruction". 20 patients undergoing Open procedure were considered and 20 patients were taken who were undergoing the Laparoscopic procedure. Both were termed as Group 1(Open ventral hernia repair) and Group 2 (Laparoscopic ventral hernia repair) respectively.

The "Open ventral hernia repair" was done by Retro-Rectus mesh repair procedure and the "laparoscopic repairs" were done by the "intra-peritoneal on lay dual mesh" (IPOM) repair technique. In preparation for the surgical procedure, all patients undergoing the surgery were administered a single prophylactic dose of a first-generation "cephalosporin" antibiotic one hour prior to the operation.

For the Open Ventral Hernia repairs, a precise skin incision was made, tailored to the site and size of the hernia defect. Subsequently, a subcutaneous flap was raised, extending approximately 3 to 5 cm around the hernia defect to provide access to the affected area. The hernia sac was carefully

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identified, and any adhesions were meticulously separated through adhesiolysis. The contents of the hernia were then reduced and was excised. The sheath margins were defined to 4-6 cm from the corner of the hernia wound. To reinforce the weakened area, a polypropylene mesh was placed in a retro-muscular position and attached to the target tissue by using 2/0 polypropylene sutures. The anterior rectus sheath was affixed, and the wound was closed.

For the “Laparoscopic Ventral Hernia repair”, a 30- degree 10-mm laparoscope was considered. Adhesiolysis was performed measuring the incisional cut and a composite mesh was applied to cover the defect by nearly 50 mm on all edges. Mesh was centralization and fixed using the 4 long trans-fascial polypropylene 1/0 suture. Post-operative pain was measured by VAS.

With the help of mean, standard deviation statistical analysis was done. To compare the variables, Chi square was used and for continuous variables Unpaired t test was used. The p-vale<0.05 was termed significant. SPSS 16.0 was used for analysis and results.

RESULTS

The statistical analysis given below revealed that Group 1 and Group 2 had similar findings regarding the average age of participants and the distribution of genders, as summarized in Table 1. Group 1 had an average age of 46.3-years-old and a standard deviation (SD) of 10.01, while Group 2 had a slightly higher average age of 53.2 years old and an SD of 11.2. The p-value of 0.61 indicated that the average age difference between both groups was insignificant. Both groups had a comparable gender distribution, with 62% male and 38% female participants in Group 1, and 70% male and 30% female participants in Group 2. The p-values for gender distribution in both groups were 0.81, further confirming that there were no statistically significant differences in gender representation between the two groups.

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Overall, the data presented in Table 1 demonstrated that the two groups were quite similar when participant's age and gender distribution was compared, which is crucial for ensuring the comparability of the groups in the research study.

Table 1- Age and Gender analysis

	Group 1	*Group 2*	*p-value*
Mean age, SD	46.3±10.01	53.2±11.2	0.61
Male (%)	25 (62%)	28 (70%)	0.81
Female (%)	15 (38%)	12 (30%)	0.81
Total	40	40	-

The data presented in Table 2 compares the surgical outcomes of Group 1 and Group 2. Group 1 had a 13% incidence of hematoma formation, while Group 2 had no reported cases. The p-value of 0.4 shows the insignificant difference in the occurrence of hematoma between both groups. Group 1 had a 6% occurrence of postoperative wound infection, while Group 2 had no cases. The p-value of 0.36 suggests no significant difference in infection rates. Group 1 had a 15% seroma occurrence, while Group 2 had a 6% incidence. The p-value of 0.63 suggests no statistically significant difference in seroma occurrence. Group 1 had a higher mean VAS score of 5.5±1.65, while Group 2 had a lower mean VAS score of 3.43±1.50. The difference in VAS scores was statistically significant ($p = 0.002^*$), indicating that Group 1 experienced more pain compared to Group 2. Mesh infection was absent in both procedures, recurrence, or significant differences in resumption of diet time or duration before movement between the two groups.

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Table 2- Comparison Between both the groups with Parameters

Parameters	*Group 1*	*Group 2*	*P value*
Hematoma Formation (%)	4 (13%)	0	0.4
Post operative wound infection (%)	2 (6%)	0	0.36
Seroma occurrence (%)	6 (15%)	2 (6%)	0.63
(VAS), mean ± SD	5.5±1.65	3.43±1.50	0.002*
Mesh Infection (%)	0	0	-
Resumption of Diet Time	2.01 ±0.20	1.04±0.20	0.33
Recurrence	0	0	-
Duration before movement	1.04±0.20	1.20±0.22	0.41

DISCUSSION

The objective of the research is to statistically compare the surgical procedure of treating Ventral Hernia Repair by Open procedure or by Laparoscopic procedure. With our findings and previous studies, it is evident that Laparoscopic procedure has more benefits and advantages than the Open procedure [6, 7]. It does have demerits like longer surgical hours and more technical training is required, it requires mesh for the procedure whereas for the open surgery it is not needed making Laparoscopic procedure more costly [7, 8]. The results from Table 2 provide insights that are in line with previous research, suggesting the following trends and comparison. In our research, the mean age in both groups is 45 to 55 years old which aligns with the study by Mohamed and Abdelmgeed [9]. In our research, maximum patients in both the groups were male which was also concluded in another study [9].

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While not statistically significant in this study, the absence of hematoma formation and wound infection in laparoscopic repair (Group 2) is consistent with the minimally invasive nature of the procedure. Several prior studies have reported fewer wound complications with laparoscopic techniques, highlighting reduced tissue trauma and infection rates, this agrees with prior research [9, 10]. Seroma formation can lead to discomfort and complications. Group 1 had a 15% seroma occurrence, while Group 2 reported a lower incidence of 6%. Although not statistically significant ($p = 0.63$), the trend suggests potential benefits of laparoscopic repair in reducing seroma occurrence. A study by Zhang et al. suggests the minimum occurrence of seroma in Laparoscopic procedure [10].

In the present study, neither group experienced any instances of mesh infection. Both groups also had no cases of recurrence. 6% surgical site infection occurred was observed in Group 1 patients, while it was absent in the Laparoscopic group that aligns with prior studies [11, 12]. Group 1 reported a significantly higher mean VAS score (5.5±1.65) compared to Group 2 (3.43±1.50), with a statistically significant difference ($p = 0.002$*). This highlights the potential for reduced postoperative pain in laparoscopic ventral hernia repair, aligning with the minimally invasive nature of the procedure. The statistically significant difference in postoperative pain (VAS) favoring laparoscopic repair is supported by prior research [11]. Patients in our research who underwent the Open procedure returned to their activities much later to those who were treated with Laparoscopic procedure, and this was in support of Rubby et al.'s research [5]. Laparoscopic procedures are usually linked to decreased pain which is also proven by our study and previous research [12, 13]. This study had a small sample size, which was one of its limitations. One such other limitation was not following up with the patients without which recurrence chances could not be tallied. Further detailed oriented clinical trials are required for more details.

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CONCLUSION

The outcome of this research suggests that “laparoscopic ventral hernia repair”, as seen in (Group 2), has several advantages compared to open repair (Group 1). Although there were no significant differences in the occurrence of hematoma, postoperative wound infection, or seroma, the laparoscopic approach resulted in less postoperative pain, which is important for patient comfort and recovery. These findings support previous research that highlights the benefits of laparoscopic ventral hernia repair, such as reduced pain and potentially fewer complications. However, it is important to consider these results in the context of patient-specific factors, surgical expertise, and individual clinical considerations when deciding on the most suitable approach for ventral hernia repair.

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