

## **Comparison of open and laparoscopic inguinal hernia repair in octogenarians at a single center**

### **Abstract**

**Aim:** Although the advantages of laparoscopic inguinal hernia repair in the general population have been shown, its role in octogenarians has yet to be elucidated. This retrospective study compared laparoscopic and open inguinal hernia repair in octogenarians; the experience was summarized to aid in selecting surgical and anesthesia options in this age group.

**Materials and methods:** The data of octogenarians who underwent laparoscopic (n = 81) or open (n = 121) inguinal hernia repair in our center from January 2017 to December 2019 were collected. Statistical analysis variables included basic epidemiological data of patients, anesthesia methods, surgical procedures, comorbidities, postoperative pain, complications, recurrence, and other data.

**Results:** There were no significant differences between the two groups in terms of sex, body mass index, recurrent hernias, comorbidities, postoperative complications, and recurrence. The American Society of Anesthesiologists (ASA) class and the proportion of scrotal hernias in the open group were higher than those of the laparoscopic group, whereas the proportion of bilateral hernias in the laparoscopic group was higher than that in the open group. The postoperative pain scores of the laparoscopic group were lower than those of the open group. The proportion of patients with ASA class III–IV was highest in patients receiving local anesthesia, and the proportion of bilateral hernias was higher in the patients receiving general anesthesia than that in those receiving local or spinal anesthesia.

**Conclusion:** In octogenarians, both laparoscopic and open inguinal hernia repair are safe and feasible, but an appropriate surgery and anesthesia plan should be determined according to the patient's specific conditions.

**Keywords:** inguinal hernia, repair, octogenarian, laparoscopic, open

## **Introduction**

Inguinal hernia repair is one of the most common elective surgeries with an increasing incidence in the elderly community.<sup>1</sup> A nationwide register-based study in Denmark revealed that patients aged 75–80 years constituted one of the major groups for inguinal hernia repair.<sup>2</sup> In addition, the incidence of inguinal hernia is higher among the elderly because of the progressive loss of tissue strength during aging.<sup>3</sup> It is important to recognize that incarcerated and strangulated hernias have more serious implications in the elderly, thus supporting early elective hernia repair in this population.<sup>4</sup> However, elective repair of inguinal hernias in the elderly is different because of a perception of increased operative risks.<sup>5</sup>

The World Health Organization defined adults aged 65 years or older as elderly.<sup>6</sup> In this age period, various physical functions of elderly patients began to degenerate to varying degrees, and the incidence rate of inguinal hernia also showed a significant increase. The number of people older than 80 years is growing even faster than the number of people older than 65.<sup>6</sup> Globally, there were only 54 million people aged  $\geq 80$  in 1990, and that number nearly tripled to 143 million in 2019. Globally, the number of persons aged 80 or over is projected to nearly triple again to 426 million in 2050.<sup>6</sup> The concomitant diseases of inguinal hernia patients at this age are more complex, and the surgery tends to be prolonged, with more patients with irreducible or even incarcerated groin hernia. The diagnosis and treatment strategy of octogenarians are slightly different from those of other elderly patients with inguinal hernias.

There are two methods for inguinal hernia repair: the open approach and the laparoscopic approach. Although the laparoscopic approach has been shown to have less postoperative pain and chronic pain and a faster recovery time in the general population, this technique has several limitations. The laparoscopic technique not only requires a long learning curve for the surgeon, but also requires that the patient must be placed under general anesthesia.<sup>4</sup>

Currently, there are no specific guidelines for the management of inguinal hernias in

octogenarians. The purpose of this study was to compare the outcomes of laparoscopic and open inguinal hernia repair in octogenarians to help form surgical guidelines for these patients.

### **Materials and methods**

A retrospective chart review was performed of patients who underwent elective inguinal hernia repair at the Department of Hernia and Abdominal Wall Surgery, Shanghai East Hospital, from January 2017 to December 2019. Patients younger than 80 years old were excluded. Emergency cases with incarcerated or strangulated hernias were also excluded. The diagnosis and repair of the inguinal hernia were confirmed by the operative notes.

The study was approved by the Medical Ethics Committee of Shanghai East Hospital and was conducted in accordance with the Declaration of Helsinki. Owing to the retrospective nature of the study, written informed consents from the enrolled patients was not required.

### **Data collection**

The medical records were reviewed for the patients' age, sex, body mass index (BMI), hernia characteristics, history of lower abdominal surgery, and concomitant diseases. The operative records were reviewed for the operative approach, American Society of Anesthesiologists (ASA) class, and anesthetic technique. Perioperative observation indicators included hematoma, seroma, surgical site infection, and venous thromboembolism (VTE). The patients were asked to return to the outpatient clinic at two and eight weeks after discharge. After eight weeks, the patients were contacted by telephone and asked to respond to a questionnaire. If there were any abnormalities, the patient was instructed to return to the clinic. Postoperative pain was assessed according to the Visual Analog Scale (VAS) from 0 (no pain) to 10 (worst imaginable pain) at 24 h (VAS-24h) and 48 h (VAS-48h) after surgery. Chronic pain was defined as groin pain that persisted for more than three months after surgery and was indicated

by a response of “yes” or “no.” A seroma or hematoma was screened by physical examination and confirmed by B-scan ultrasonography. All patients were followed up for at least 6 months.

### **Surgical technique**

The open procedures involved Lichtenstein and modified Kugel repairs. The laparoscopic procedures were performed by the standard totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) approaches. The type of repair, operative technique, and use of mesh were left to the discretion of the surgeon. General anesthesia or spinal anesthesia was administered by the anesthesiologist and local anesthesia was administered by the surgeon. All inguinal hernia repairs were carried out by hernia surgeons with expertise in both open and laparoscopic approaches.

### **Statistical analysis**

All data analyses were conducted using IBM SPSS Statistics for Windows, version 23.0 (IBM Corporation, Armonk, NY, USA). Univariate exploratory analysis was performed using Person’s chi-squared test or Fisher’s exact test for categorical variables and T test for continuous variables. The rank data were calculated with the rank-sum test. A probability value of  $\leq 0.05$  was considered statistically significant.

### **Results**

A total of 202 patients who underwent elective inguinal hernia repair were enrolled in this study. Laparoscopic repairs were performed in 81 patients and open repairs in 121 patients. The technique for laparoscopic hernia repair included the TAPP approach in 11 patients and the TEP approach in 70 patients. The technique for open inguinal hernia repair was Lichtenstein repair in 23 patients and modified Kugel repair in 98 patients. There were no conversions.

The patients’ demographics and hernia characteristics are shown in Table 1. There were no statistically significant differences in sex, BMI class, incidences of recurrent hernia, chronic obstructive pulmonary disease, coronary heart disease, or diabetes,

histories of lower abdominal surgery, stroke, or malignant tumor, or use of antiplatelet therapy between the open and laparoscopic groups.

The mean age of the patients in the open group was higher than that of the laparoscopic group ( $p < 0.01$ ). There were significantly more ASA class III–IV cases in the open group than in the laparoscopic group ( $p < 0.05$ ). The proportion of bilateral hernias was higher in the laparoscopic group than that in the open group ( $p < 0.01$ ), whereas the proportion of scrotal hernias was higher in the open group than that in the laparoscopic group ( $p < 0.01$ ). In the laparoscopic group, there were four cases of recurrent hernia, and the TAPP repair was used in all of them. In the open group, there were eight females, and the modified Kugel repair was used in all of them.

The postoperative pain in the two patient groups is shown in Table 2. Both the VAS-24h and VAS-48h scores were significantly lower in the laparoscopic group than those in the open group ( $p < 0.05$ ), but there was no significant difference in the incidence of chronic pain between the two groups.

The postoperative complications in the two groups are shown in Table 3. There was no significant difference in the incidence of hematoma and seroma between the two groups. Only one patient in the laparoscopic group, who underwent the TEP procedure, developed an infraumbilical trocar site infection; it did not affect the mesh and was cured after drainage. Because many elderly patients reported serious symptoms of prostate hyperplasia, some of them were given a preventive urethral catheterization before the operation. Therefore, this study did not compare the incidence of postoperative urinary retention. There were no cases of VTE in the two groups. No recurrence was observed in either group during the follow-up period. There was no significant difference in the incidence of any adverse event between the two groups.

The comparison of different anesthetic techniques is shown in Table 4. The proportion of patients with ASA class III–IV was the highest in the local anesthesia group ( $p < 0.01$ ), and the proportion of bilateral hernias in the general anesthesia group was higher than those in the other two groups ( $p < 0.01$ ). The proportion of antiplatelet

therapy use was the highest in the local anesthesia group, and the difference between the three groups was significant ( $p < 0.01$ ). No statistical differences among the three groups were seen for the other indicators. However, there were no cases in which bilateral or recurrent hernia repair was performed under local anesthesia, and no cases of antiplatelet therapy were operated under spinal anesthesia.

## **Discussion**

Inguinal hernia is a growing health care issue in rapidly aging societies. Although guidelines for the diagnosis and treatment of inguinal hernia have been established, there are no specific guidelines for octogenarians yet.

A series of studies have confirmed that laparoscopic inguinal hernia repair can be safely performed in octogenarians with an ASA class of I–II, and that it will not significantly increase the incidence of complications and mortality.<sup>3,4,7,8</sup> In our study, although the age difference between the laparoscopic group and the open group was significant, the difference between the mean ages was only 2.26 years. We believe that age is not the only factor that affects the choice of open or laparoscopic surgery. Other factors, including ASA class, bilateral hernia or not, recurrent hernia or not, and scrotal hernia or not, also need to be taken into consideration. We prefer the comprehensive consideration system of surgery for octogenarians based on ASA class.

The experience of our center is that for octogenarians with ASA class I–II or with bilateral hernia, we would consult an anesthesiologist for evaluation before surgery. If there are no contraindications to general anesthesia, then laparoscopic surgery under general anesthesia is preferred. In this way, patients can enjoy the advantages of laparoscopic inguinal hernia repair with presumed anesthetic and surgical safety. For patients with recurrent hernias, taking into consideration that the operation is more complicated, the operative time is longer, and the risk of postoperative complications is higher, we prefer open surgery. If the anterior muscular repair was performed previously, we prefer the modified Kugel repair; if the preperitoneal repair was

performed previously, we prefer the Lichtenstein repair. However, for recurrence after traditional tension repair or Lichtenstein repair, laparoscopic surgery can also be performed if the patient's physical condition permits general anesthesia. In this study, four patients with recurrent hernia accepted laparoscopic surgery, all of which were performed by the TAPP procedure. The main reason was that the TAPP procedure has a large operative space and unexpected events during the operation can be easily dealt with. For patients with scrotal hernias, taking into consideration the higher risk of postoperative hematoma and seroma formation, we prefer open surgery so that the distal hernia sac can be properly treated during the operation. There are two options: completely remove the hernia sac or open the front wall of the hernia sac. Both options are easier to perform in an open surgery.

Although studies have shown that laparoscopic hernia repair can be recommended for bleeding-risk patients with coagulopathy or anticoagulant or antiplatelet therapy, the proportion of open surgery is significantly higher than that of laparoscopic surgery in these patients.<sup>9, 10</sup> For patients receiving antiplatelet therapy, in order to effectively deal with wound bleeding during the operation, we also prefer open surgery. If wound bleeding is obvious during the operation, the Lichtenstein repair is recommended. In addition, with the exception of previous open prostate and bladder surgery, previous abdominal surgery is no longer considered as a contraindication for laparoscopic inguinal hernia repair.<sup>11, 12</sup> Our results are consistent with these studies.

Anesthesia is another important factor in determining the surgical plan for octogenarians. There are many anesthesia methods that can meet the needs of inguinal hernia surgery, including general anesthesia, spinal anesthesia, regional nerve block anesthesia, and local anesthesia. But for octogenarians, each anesthesia has its drawbacks. The effect of general anesthesia on the pulmonary function and cognitive function of elderly patients is a problem that surgeons and anesthesiologists must carefully consider.<sup>13, 14</sup> We have noticed that there are a few research reports on the implementation of the TEP or TAPP procedure under spinal anesthesia, but it may not be safe and is not widely accepted.<sup>15-17</sup> Spinal anesthesia is a common method used

for open inguinal hernia repair in China. But sometimes the tractive reaction is obvious during surgery. When the level of anesthesia is too high, it affects the function of the circulatory and respiratory systems, and the risk of postoperative urinary retention is high.<sup>18, 19</sup> Local anesthesia and regional nerve block anesthesia are ideal choices for patients with severe systemic diseases undergoing open surgery. Such anesthesia helps patients get out of bed soon after surgery, and the chance of urinary retention is significantly reduced.<sup>20, 21</sup> However, the anesthetic effect during the operation is not complete, which reduces patient comfort and satisfaction.

In order to minimize the impact of the anesthesia on octogenarians, our experience is more inclined to the choice based on the ASA class: for elderly patients with serious concomitant diseases and ASA class III–IV, local anesthesia is preferred; for patients with ASA class I–II or patients with bilateral hernias, general anesthesia is preferred; for patients with severe pulmonary disease and irreducible hernias, spinal anesthesia is the better choice.

This study was only a single-center retrospective study with a small number of cases. The choice of anesthesia and surgical plan mostly depended on the surgeon's own experience and judgment. We hope to share more data and experience with our colleagues in order to promote guidelines for octogenarians.

## **Conclusions**

In octogenarians, both laparoscopic and open inguinal hernia repair are safe and feasible, but an appropriate surgery and anesthesia plan should be determined according to the specific conditions of the patient.

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## Tables

Table 1. Patients' demographics

	Laparoscopic surgery ( n = 81 )	Open surgery ( n = 121 )	<i>P</i> value
Age (years)	82.74 ± 2.38	85.00 ± 3.16	<0.01
Male/female	75/6	113/8	ns
BMI class (I/II/III/IV)	5/63/12/1	14/83/23/1	ns
ASA class (I–II/ III–IV)	71/10	89/32	<0.05
Bilateral hernia, n (%)	32 (39.5%)	9 (7.4%)	<0.01
Recurrent hernia, n (%)	4 (4.9%)	8 (6.6%)	ns
Scrotal hernia, n (%)	1 (1.2%)	17 (14.0%)	<0.01
Concomitant disease			
History of lower abdominal surgery, n (%)	20 (24.7%)	27 (22.3%)	ns
	43 (53.1%)		ns
Coronary heart disease, n (%)	6 (7.4%)	64 (52.9%)	ns
Diabetes, n (%)	3 (3.7%)	15 (12.4%)	ns
History of stroke, n (%)	3 (3.7%)	9 (7.4%)	ns
COPD, n (%)	3 (3.7%)	11 (9.1%)	ns
Malignant tumor, n (%)	14 (17.3%)	12 (9.9%)	ns
Antiplatelet therapy, n (%)		29 (24.0%)	

Abbreviations: ns, nonsignificant; BMI, body mass index; ASA, American Society of Anesthesiologists; COPD, chronic obstructive pulmonary disease

BMI class : I: <18.5; II: 18.5~24.9; III: 25~29.9 ; IV: ≥30

Table 2 : Postoperative pain

	Laparoscopic surgery (n = 81)	Open surgery (n = 121)	<i>P</i> value
VAS-24 score	2.67 ± 1.35	3.26 ± 1.59	<0.05
VAS-48 score	1.28 ± 0.94	1.69 ± 1.20	<0.05
Chronic pain, n (%)	3 (3.7%)	7 (5.8%)	ns

Abbreviations: VAS-24, visual analog scale pain at 24 h after surgery; VAS-48, visual analog scale pain at 48 h after surgery; ns, nonsignificant

Table 3. Postoperative complications

	Laparoscopic surgery ( n = 81 )	Open surgery ( n = 121 )	<i>P</i> value
Seroma, n (%)	10 (12.3%)	9 (7.4%)	ns
Hematoma, n (%)	2 (2.5%)	3 (2.5%)	ns
SSI, n (%)	1 (1.2%)	0	-
VTE, n	0	0	-
Recurrence	0	0	-
Any adverse event, n (%)	13 (16.0%)	16 (13.2%)	ns

Abbreviations: ns, nonsignificant; SSI, surgical site infection; VTE, venous thromboembolism

Table 4. Comparison of different anesthetic techniques

	General anesthesia ( n=129 )	Spinal anesthesia ( n=52 )	Local anesthesia ( n=21 )	<i>P</i> value
Male/female	118/11	49/3	21/0	ns
BMI class (I/II/III/IV)	12/96/20/1	4/36/11/1	3/14/4/0	ns
ASA class (I–II/ III–IV)	108/21	41/11	11/10	< 0.01
Bilateral hernia, n (%)	37 (28.7%)	4 (7.7%)	0	< 0.01
Recurrent hernia, n (%)	6 (4.7%)	6 (11.5%)	0	ns
Scrotal hernia, n (%)	11 (8.5%)	6 (11.5%)	1 (4.8%)	ns
Concomitant disease				
History of lower abdominal surgery, n (%)	32 (24.8%)	10 (19.2%)	5 (23.8%)	ns
Coronary heart disease, n (%)	67 (51.9%)	29 (55.8%)	11(52.4%)	ns
Diabetes, n (%)	13 (10.1%)	6 (11.5%)	2 (9.5%)	ns
History of stroke, n (%)	7 (5.4%)	4 (7.7%)	1 (4.8%)	ns
COPD, n (%)	8 (6.2%)	4 (7.7%)	2 (9.5%)	ns
Malignant tumor, n (%)	10 (7.8%)	3 (5.8%)	2 (9.5%)	ns
Antiplatelet therapy, n (%)	22 (17.1%)	0	14 (66.7%)	<0.01

Abbreviations: BMI, body mass index; ASA, American Society of Anesthesiologists; COPD, chronic obstructive pulmonary disease