



Laparoscopic inguinal hernia repair in elderly patients: single center experience in 12 years

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Background: To evaluate the clinical outcome of laparoscopic inguinal hernia repair (LIHR) in elderly patients.

Methods: The clinical data of 3,203 cases (3,847 hernias) underwent LIHR from January 2001 to December 2013 were analyzed retrospectively. There were 1,677 transabdominal preperitoneal (TAPPs) in 1,475 cases, 2,154 total extraperitoneal (TEPs) in 1,718 cases and 16 intra-peritoneal onlay mesh (IPOMs) in 10 cases. All procedures were performed by the same surgical team and the choice of techniques was made by the surgeons. The follow-up period ranged from 23 to 60 months (median 43 months).

Results: The hernias in elderly patients aged over 60 years accounted for 69.4%. These patients had more bilateral hernia, direct hernia and complex hernia than patients younger than 60 years ($P=0.000$, 0.000), more grade III hernia and grade IV hernia ($P=0.000$). There were more TEP and IPOM procedures in elderly patients ($P=0.000$), of which IPOMs were all used in recurrent hernias. There were more heavy-weight meshes used in elderly patients ($P=0.000$). No significant differences were found in operation time, visual analogue scales (VAS), postoperative hospital stay, cases returned to normal activities in 2 and 4 weeks between the two groups ($P>0.05$). There were no significant differences in recurrence rate and overall complication rate between the two arms ($P>0.05$), of which, there were more urinary retention in elder cases ($P=0.008$). No significant differences were found in seroma, transient paresthesia and ileus between two groups ($P>0.05$).

Conclusions: LIHR is a safe and efficient technique in elderly patients. With reasonable application, LIHR can achieve good clinical outcome.

Keywords: Laparoscopy; inguinal hernia; hernia repair; elderly patient

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Introduction

Groin hernia is a common disease in elderly population. With the aging of society in China, there will be more elderly patients who need surgical approach for inguinal

hernia. Laparoscopic inguinal hernia repair (LIHR) has characteristics such as less pain, quicker recovery, etc. However, the pneumoperitoneum and general anesthesia may have some risks for elderly patients. At present, there are few reports about LIHR in elderly patients. Our study

Table 1 General materials between two groups

Variables	Cases	Sex		BMI ($\bar{x} \pm s$, kg/m ²)	Location of hernia (hernias)		Hernia			Type of hernia (hernia)%			Classification of hernia (hernia)%			
		Male	female		Unilateral	Bilateral	Oblique	Direct	Recurrent	Compound	Femoral	Grade I	Grade II	Grade III	Grade IV	
Group A	979	845	134	22.8±2.7	851	128	1,107	803 (72.5)	169 (15.3)	77 (7.0)	44 (4.0)	14 (1.3)	40 (3.6)	540 (48.8)	450 (40.7)	77 (7.0)
Group B	2,224	2,133	91	23.2±2.8	1,708	516	2,740	1,492 (54.5)	662 (24.2)	244 (8.9)	303 (11.1)	39 (1.4)	69 (2.5)	1,121 (40.9)	1,306 (47.7)	244 (8.9)
Statistical quantity	-	$\chi^2=95.834$	$t=-1.532$	$\chi^2=43.398$	-	-	-	-	$\chi^2=119.701$	Z=-5.099	-	-	-	-	-	-
P value	-	<0.05	>0.05	<0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

has retrospectively analyzed the clinical data of 3,203 cases of inguinal hernia treated in Ruijin Hospital of Shanghai Jiaotong University School of Medicine from January 2001 to December 2013 to analyze the clinical outcomes of LIHR on senile inguinal hernia.

Methods

General materials

The retrospective cohort study was used in this research. We collected the clinical data and pathological data of 3,203 patients with inguinal hernia, including 2,978 cases of males and 225 cases of females, with age of 63±15 years, BMI of 23.0±2.8 kg/m². Among 3,203 patients in 8 cases were less than 20 years old, 144 cases aged 20 to 29 years old, 177 cases aged 30 to 39 years old, 186 cases aged 40 to 49 years old, 464 cases aged 50 to 59 years old, 957 cases aged 60 to 69 years old, 909 cases aged 70 to 79 years old, 340 cases 80 to 89 years old, 18 cases aged over 90 years old. In total, 3,203 cases of inguinal hernia patients with a total amount of 3,847 hernias, in which there were 1,548 cases of right hernia, 1,011 cases of left hernia, 644 cases of bilateral hernia. Among the 3,847 hernias, there were 2,295 oblique hernias, 831 direct hernias, 321 recurrent hernias, 347 compound hernias and 53 femoral hernias. Based on Nyhus classification (1), there were 109 (2.8%) grade I hernias; 1,661 (43.2%) grade II hernias; 1,756 (45.6%) grade III hernias, and 321 (8.3%) grade IV hernias. All patients were informed about the study, and consents had been signed before the study.

The 979 cases (1,107 hernias) of patients of groin hernia aged less than 60 years were set to group A, 2,224 cases (2,740 hernias) of patients aged more than 60 years were set to group B. There was no significant difference in BMI between two groups (P>0.05). There were significant differences in sex, location of hernia, type of hernia and classification of hernia between two groups (P<0.05) (Table 1).

Surgical methods

All the surgeries were completed by the same group of surgeons, the surgical procedures decided by surgeons according to the circumstances of patients. Transabdominal preperitoneal (TAPP) and total extraperitoneal (TEP) were performed according to the “Chinese guideline of Laparoscopic Surgery for Inguinal Hernia” (2). We used

Table 2 Comparison of the operation condition

Variables	Cases/ hernias	Operation (cases)			Mesh (cases)		Operation time ($\bar{x} \pm s$, min)		
		TAPP	TEP	IPOM	Light weight	Heavy weight	Unilateral	Bilateral	Total time
Group A	979/1,107	567	538	2	751	356	27±9	42±10	29±10
Group B	2,224/2,740	1,110	1,616	14	1,455	1,285	27±10	44±12	31±13
Statistical quantity	–	$\chi^2=37.976$			$\chi^2=70.022$		t=–0.106	t=–1.768	t=–4.445
P value	–	0.000			0.000		0.915	0.077	0.000

TAPP, transabdominal preperitoneal; TEP, total extraperitoneal; IPOM, intra-peritoneal onlay mesh.

the hernia patches of 10 cm × 15 cm Prolene (Covidien®), Vipro II (Ethicon®), Ultrapro (Ethicon®) or 3D Max (Bard®) in TAPP and TEP. For the intra-peritoneal onlay mesh (IPOM), we used Toy-Smoot technology, with the hernia patch of Proceed (Ethicon®) or Composix E/X (Bard®). With 10 mm EMS (Ethicon®) or 5 mm PROTACK (Covidien®).

Follow-ups

Methods such as outpatient service, telephone and question forms were used to complete the follow-up. Recurrence rate, complications and recovery time for unrestricted activity were included. The total follow-up time was 5 years after the surgery.

Statistical analysis

SPSS18.0 was used for analysis. Normal distribution of the measurement data was presented as $\bar{x} \pm s$. *t*-test or analysis of variance was used for the comparison between two groups. χ^2 test was used for enumeration data. Nonparametric rank sum test was used for ranked data. There was a statistically significant when P value was less than 0.05.

Results

The overall operation and follow-up situation

All 3,203 patients (3,847 hernias) underwent the LIHR. Among all the cases, 1,475 cases (1,677 hernias) of TAPP, 1,718 cases (2,154 hernias) of TEP and 10 cases (16 hernias) of IPOM, among which there were 6 cases with TAPP for one side, IPOM for another. The average operation time was 31±12 minutes. The operation time was 27±9 min for 2,559 unilateral hernia cases and 44±12 min for 644 bilateral

hernia cases. In total, 3,203 cases of inguinal hernia patients were hospitalized for an average time of 1.5±1.2 days. All patients were followed up for 23 to 60 months with a median time of 43 months.

Comparison of the operation condition between two groups

There was no significant difference in operation time between two groups while there was significant difference in operative type and patch type between two groups ($P>0.05$) (Table 2).

Comparison of the postoperative outcomes between two groups of patients

There was no significant difference in visual analogue scales (VAS) for the first day after operation, postoperative hospital stay, the number of patients whose unrestricted activities was recovered at 2 or 4 weeks after operation between two groups ($P>0.05$) (Table 3).

There was neither significant difference in the recurrence rate, serious complication, serum swollen, and paresthesia nor intestinal paralysis between two groups ($P>0.05$). The difference was significant in the incidence of urinary retention ($P<0.05$). There were three serious complications in group B: trocar site hernia, injury of intestine and intestinal obstruction which needed surgical interventions (Table 4).

Discussion

LIHR is a safe and effective surgical technique whose efficacy has already been confirmed by systematic review and meta-analysis published by the Cochrane Center (3). But most of the LIHR needs general anesthesia and

Table 3 Comparison of the postoperative outcomes

Variables	Cases	VAS at POD1 ($\bar{x} \pm s$, scores)	Postoperative hospital stay ($\bar{x} \pm s$, days)	Recovery to unrestricted activities (cases)	
				2 weeks	4 weeks
Group A	979	2.4±1.1	1.5±1.1	973	978
Group B	2,224	2.3±1.0	1.5±1.3	2208	2222
Statistical quantity	–	t=1.419	t=-0.126	$\chi^2=0.113$	–
P value	–	>0.05	>0.05	>0.05	>0.05*

*F-statistic. VAS, visual analogue scales; POD, post-operative day.

Table 4 Comparison of recurrence rate and complications

Variables	Hernias	Recurrence rate	Serious complication	Seroma	Urinary retention	Paresthesia	Ileus
Group A	1,107	1 (0.1)	0	49 (4.4)	6 (0.5)	5 (0.5)	1 (0.1)
Group B	2,740	11 (0.4)	3	132 (4.6)	44 (1.6)	16 (0.6)	2 (0.1)
Statistical quantity	–	$\chi^2=1.556$	–	$\chi^2=0.269$	$\chi^2=6.956$	$\chi^2=0.254$	–
P value	–	>0.05	>0.05*	>0.05	<0.05	>0.05	>0.05*

*F-statistic.

pneumoperitoneum, thus parts of surgeons are concerned about LIHR for elderly patients.

The characteristics of inguinal hernia and indications of LIHR for elderly patients

The elderly patients are high-risk population of inguinal hernia. The prevalence of inguinal hernia of the elderly over 60-year-old is 1.13% in Shanghai (4). In this study, patients over 60-year-old had a higher proportion of inguinal hernia. The abdominal tissues, especially the transversal fascia, were weaker in elderly patients, which led to a higher occurrence of direct hernia, compound hernia and bilateral hernia.

Inguinal hernia tension-free repair is divided into two categories by the difference of layer of repairing and different principles: (I) anterior repair, also known as pre-muscular repair, whose object is to strengthen the posterior wall of the inguinal canal; (II) posterior repair, also known as preperitoneal repair, whose purpose is to strengthen the entire myopectineal orifice. The latter manipulation repairs a wider range in patients whose abdominal transverse fascia is weak, or intra-abdominal pressure increases (5). Elderly patients have a higher proportion of direct hernia, compound hernia, bilateral hernia because of relaxation of abdominal transverse fascia, while chronic bronchitis,

constipation, benign prostatic hyperplasia and other diseases which make increased intra-abdominal pressure more common.

Therefore, preperitoneal repair is an appropriate surgical approach. Preperitoneal repair can be done by open surgery (such as Kugel, MK, Gilbert, etc.) or LIHR (such as TAPP, TEP), the purpose of the selection of LIHR is not mainly in pursuit of “minimally invasive”, but to perform a “real posterior approach” by using “laparoscopic instruments” with the image magnified by the “direct vision” (6). If we only consider of the clinical features of inguinal hernia, LIHR is more suitable for weak transverse fascia in elderly patients.

Safety and efficacy of LIHR for the elderly patients

Cardiovascular complications, respiratory complications and other systemic complications are common in the elderly patients. Whether the patients can tolerate the general anesthesia and pneumoperitoneum is the most concern of surgeons. In this study, the elderly patients have been excluded the contraindications of general anesthesia and laparoscopic before surgery. We reduced pneumoperitoneal pressure and controlled operation time during surgery. And there were no postoperative systemic complications in this study. Like all laparoscopic procedures, making a

strict evaluation for the elderly patients preoperatively and following the indications for surgery make LIHR a safe surgery for the elderly patients.

In this study, there were 12 cases of recurrent after surgery, of which 11 cases occurred in elderly patients. Even so, the recurrence rate of the elderly patients after LIHR is still at a low and controllable level which does not affect the development of LIHR. The reason of hernia recurrence, part of it is that some elderly patients have histories of prostate surgery, which makes the patch hard to be in place. Increasing intra-abdominal pressure, huge hernia defect and complete relaxation of transverse fascia make the coverage of patch not enough (6). On the other hand, the recurrence is related to the surgeon's learning curve, some studies have reported that a single surgical approach needs a learning curve of about 60 cases of operation (7). In our experience, to master the LIHR, the learning curve needs more than 200 cases of operation (8). In this study, the first 1,400 patients were analyzed for the learning curve, each 200 cases were grouped in chronological order, the recurrence rate and the cumulative incidence of complications of the first group were 1.73% and 16.9%, while the recurrence rate of the rest six groups was between 0% to 0.43%, the cumulative incidence of complications was between 5% to 9.4%. There was significant difference between the first group and latter six groups, while there was no statistical difference between the latter six groups ($P>0.05$). If we removed the impact of learning curve, the recurrence rate of the elderly patients should have further declined.

Like young patients, complications after inguinal hernia surgery for elderly patients are seroma, urinary retention, intestinal paralysis and temporary neuropsychiatric abnormalities. However, the elderly patients have high incidence of postoperative urinary retention, which is mainly associated with prostatic hyperplasia, rather than due to the surgery. In this study, patients were not conventionally indwelled catheters preoperative. We indwelled the catheter when there was a postoperative urinary retention and all these cases were removed 1 day after surgery, which did not cause much impact. In addition, all the patches were implanted far away from the incision in the surgery of LIHR, postoperative pain was mild and patient activity was not restricted. Even in elderly patients, there was no incision sclerosis, patch infection, deep vein thrombosis, pulmonary infection or other complications. It was noteworthy that in this study, 3 cases of serious complications occurred in elderly patients, including 1 case

of trocar site hernia occurred after TAPP. After the replacement of 10 mm trocar by the 5 mm trocar, such complication did no longer occur. One case of obstruction was due to the peritoneum not completely nailed in TAPP, which made the adhesion between patch and intestine. We can use sutures to close the peritoneum to avoid this complication. One case of intestinal injury occurred in recurrent hernia by TEP, there was adhesion between bowel and hernia sac. We injured the bowel when we dissect the hernia sac. It could be avoided with using TAPP. We could reach a conclusion that the incidence of serious complications was associated with surgical techniques, but not directly related to the patient's age.

Surgical options for elderly patients

Both TAPP and TEP are preperitoneal repairs which have same principles. It has been reported that there is no difference of surgical outcomes between two techniques (9). But there still exists some differences in terms of surgical approach: TEP establishes surgical space extraperitoneally without entering the abdominal cavity, which maintains the integrity of the peritoneum. So technically, TEP seems more reasonable. TAPP establishes pneumoperitoneum inside the abdominal cavity giving more operation space to surgeons. This approach makes it easier to handle the surgical technique and is more convenient to observe the presence of insidious hernia and hernia contents. But it needs to open and close the peritoneum. Some studies have reported that TEP is the first choice of LIHR (10).

Some surgeons may worry that for the elderly patients, especially those with loose subcutaneous tissue and extraperitoneal pneumoperitoneum in TEP is more likely to cause CO_2 diffusion, which may lead to a higher probability of hypercapnia, acidosis and subcutaneous emphysema compared with TAPP. In this regard, we had conducted a randomized controlled trial whose results showed that there was no significant difference between TEP and TAPP in PCO_2 , PETCO_2 , HCO_3^- and pH value before, during and after the establishment of pneumoperitoneum (11). In this study, there was no complication caused by extraperitoneal pneumoperitoneum in elderly patients over 80 years old. Therefore, we concluded that: TEP is a safe choice for elderly patients and it is the first choice of surgical approach. But TAPP is a better choice for patients with long disease history, formal abdominal surgery (especially bladder and prostate surgery), irreducible hernia, complete scrotal hernia and recurrence after preperitoneal patch

implantation. In addition, 16 hernias in the elderly patient group had a surgery of IPOM and these patients had multiple recurrences. We don't recommend IPOM for the treatment of primary hernia.

Selection of the patch in LIHR for elderly patients

Some studies showed that there was no significant difference in the recurrence of hernia after surgery, hematoma (seroma), infection and early pain between light weight mesh and heavy weight mesh. And light weight mesh can reduce the sensation of foreign body and chronic pain in the groin area (12). Therefore, the choice of light weight mesh seems more appropriate. However, in this study, we used more heavy weight mesh than light weight mesh in elderly patients, which is related to a higher morbidity of direct hernia, compound hernia and grade III hernia. Heavy weight mesh is less likely to move in these patients with loose abdominal transverse fascia. While for patients with oblique hernias or small hernia defects, we can also give priority to the light weight mesh.

In conclusion, LIHR is a safe and effective option for the elderly patients with inguinal hernia. Making a reasonable choice of surgical approach and material of patch can achieve a beneficial clinical result for the elderly patients.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/ales.2017.04.04>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Ethical Committee of Shanghai Ruijin Hospital and written

informed consent was obtained from all patients.

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