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Quick Response Code:

Website: www.herniasurgeryjournal.org

DOI: 10.4103/ijawhs.ijawhs_70_24

Patient-reported short-term results of laparoscopic groin hernia repair: A multicenter prospective observational study from Japan

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Submitted: 26-Sep-2024
Revised: 11-Dec-2024
Accepted: 27-Dec-2024
Published: 26-Mar-2025

Abstract

INTRODUCTION: Hernia outcome reports in Asia remain sparse compared to Western counterparts. This multicenter prospective observational study aimed to assess the short-term outcomes of laparoscopic groin hernia repair in Japan.

METHODS: This study included adult patients undergoing laparoscopic groin hernia repair surgery for primary unilateral hernias at participating institutes from March 2021 to November 2022. Patients with previous surgery in the lower abdomen or with scrotal hernia were excluded. At the ward or during follow-up clinic visits, the patients were given a printed copy of the questionnaire that we developed to assess pain intensity, daily life interference, and surgical outcomes. This was administered before surgery, at 1 week, 1 month, and 3 months postoperatively, which they then completed and submitted. The primary outcome was complication rate at the end of the 3-month postoperative period.

RESULTS: A total of 1,467 cases from 21 institutes were registered. The response rate at the end of 3 months after the surgery was 87.1%. Nearly 70% of the surgeries were performed by surgeons with an experience of over 500 cases. The average operation time was 74.6 ± 27.6 min with a negligible rate of intraoperative complications. No complications above Clavien–Dindo Grade II were reported. Short-term outcomes indicated low rates of chronic pain (0.16%) and seroma (1.7%) and high patient satisfaction (98.27%).

CONCLUSION: Our study provides valuable insights into the short-term outcomes of laparoscopic groin hernia repair from multiple institutes in Japan, demonstrating favorable results with low complication rates and high patient satisfaction.

TRIAL REGISTRATION: The study was registered in UMIN-CTR (https://www.umin.ac.jp/ctr/index-j.htm registration number: UMIN000043184).

Keywords:

Laparoscopic groin hernia repair, patient satisfaction, short-term outcome

Introduction

Outcome assessment is a pivotal indicator of surgical quality and patient satisfaction in hernia surgery.[1] Recognizing this, international guidelines for groin hernias underscore the significance of rigorous outcome reporting as it serves as a cornerstone for understanding the postoperative trajectory of patients undergoing diverse groin hernia surgeries.[2] These guidelines advocate the establishment of hernia registries that encapsulate comprehensive follow-up data, thereby facilitating a nuanced understanding of treatment efficacy and patient experience. In recent years, there has been a notable shift toward the incorporation of

How to cite this article: Poudel S, Ikeda Y, Tazaki T, Susumu S, Nitta T, Yoshioka S, *et al.* Patient-reported short-term results of laparoscopic groin hernia repair: A multicentered prospective observational study from Japan. Int J Abdom Wall Hernia Surg 2025;8:13-20.

patient-reported outcomes, reflecting a broader recognition of patient perspectives in the evaluation of the efficacy of surgical interventions.[1]

Although several hernia registries operate primarily in Western nations and generate robust evidence that forms the backbone of contemporary evidence-based practices in hernia surgery, there is a notable lack of comparable data from Asia.[3,4] This influences the formulation of treatment guidelines that may inadvertently perpetuate publication bias and failure to adequately represent populations with unexplored data. Existing studies from Asia are predominantly confined to single-center studies with limited sample sizes, thereby constraining the generalizability of the findings and impeding the formulation of region-specific guidelines.[5-8]

In Japan, transabdominal preperitoneal (TAPP) repair was first performed by Matsumoto *et al*.[9] in December 1991 and was reported in 1993. Totally extraperitoneal (TEP) repair was also introduced around the same period. The number of laparoscopic groin hernia repairs has been steadily increasing, and a recent report indicates that more than half of groin hernia repair cases in Japan are now performed laparoscopically.[10] In light of these considerations, the need for the comprehensive reporting of hernia outcomes in diverse geographical contexts arises. Hence, this multicenter prospective observational study aimed to examine the short-term outcomes of uncomplicated laparoscopic groin hernia repair in multiple centers in Japan.

Materials and Methods

Patients

All adult patients aged over 20 years who were scheduled for elective laparoscopic groin hernia repair surgery for primary unilateral hernias in the participating institutes were recruited for this study. Only those who provided informed consent during the study period were included. The study began in March 2021 and concluded in November 2022. However, the start date at each institution varied based on when they joined the study and obtained IRB approval at their respective institutions. Patients with a history of open surgery in the upper abdomen, tacking performed in the danger zone, emergency surgery, inguinoscrotal hernia, irreducible hernia, and lower abdominal surgery such as prostatectomy and cystectomy, except for uncomplicated appendicitis and contralateral hernia repair, were excluded from this study.

Participating institutes were openly invited during national hernia-related meetings. Each institute was assigned a unique two-digit institutional code, and every patient was assigned a four-digit patient code by their respective institution. The six-digit code, which was acquired by combining the institutional and patient codes, was the patient identification number for this study.

Questionnaire

The research group developed four separate questionnaire surveys for the patients based on the core outcomes in inguinal hernia repair,[11] a previously validated inguinal hernia questionnaire designed to be completed by the patients before the surgery, and at 1 week, 1 month, and 3 months postoperatively. To minimize patient burden and improve response rates, each questionnaire was limited to a single page. The preoperative questionnaire investigated the intensity of their inguinal pain, whether they were taking regular analgesics, the degree to which the pain interfered with their work, and their quality of life with regard to pain. The questionnaires for 1 week and 1 month after the surgery investigated the intensity of their wound pain and inguinal pain, number of analgesics administered, degree to which pain interfered with their daily life, presence and location of subcutaneous hematomas, presence and intensity of numbness in the groin region, and the current status of their daily life with regard to pain. The questionnaire at 3 months included the same questions, except for the subcutaneous hematoma, and included questions on the presence of swelling in the groin region and the overall patient satisfaction with the surgery. When the patient complained of swelling, the surgeons were required to perform a physical examination and, if necessary, imaging tests to identify the cause. The findings were then documented in the questionnaire by the surgeon.

The pain intensity was recorded using the face pain scale, which is easier for patients to understand.[12] Questions from the Short Form 12[13] were used to assess the current status of the patients' daily lives. All questionnaires were printed out and provided to the patients in the ward or during the follow-up clinic visit. These were completed by the patients on paper and handed out to the staff. If the patient was not able to make a postoperative visit, staff members other than the operating surgeon could make a telephone call to the patient and ask the questions. The responses were then entered into an online survey platform (Surveymonkey website), accessible only to the chief investigator. All the data from the participating institutes were recorded in this platform. The participating institutes were provided the data from their institutions upon request to the chief investigator. Any discrepancies in the entered data were confirmed at the individual institutes. Surgeons were also required to enter the patient data, operator data, and operative data directly into the online platform. The patient data included age, sex, height, weight, and hernia diagnosis. The New Japan Hernia Society classification was used for hernia classification.[14] It generally follows

the European Hernia Society classification[15] but includes a separate category for unclassified hernias, such as the interparietal hernia, which cannot be categorized as L, M, or F. Additionally, it identifies "hernia-like lesions" where no hernial sac is found, but lesions that mimic hernias, such as chord lipoma, Nuck canal cyst, and spermatic hydrocele, are present.[14] Surgeon-related data included the postgraduate year, whether the surgeon was qualified based on the Endoscopic Surgical Skill Qualification System of the Japan Society for Endoscopic Surgery, and the number of laparoscopic groin hernia surgeries performed. Operative data included the surgical procedure performed, port style, management of the hernial sac, type and size of the mesh used, type and number of tackers used, use of local anesthesia in the wound and inguinal region, operation time, intraoperative complications, and postoperative complications.

Outcome

The primary outcome of this study was the complication rate up to 3 months after surgery. Complications were compiled according to the Clavien–Dindo Classification.[16] Complications above Grade II were considered significant. Secondary outcomes included the incidence of postoperative chronic pain, change in pain up to 3 months after surgery, incidence of postoperative subcutaneous bleeding and hematoma, incidence of seroma, and patient satisfaction with surgery. The operational data of men and women as well as TAPP and TEP repairs were compared. The pain intensity was compared between the operation and port styles. The incidence of clinically significant seromas was also compared between the operation and sac management styles.

A Facial Pain Scale score of >2 was considered significant. Patients who complained of moderate interference with work more than 50% of the time were considered to have experienced significant interference. According to the international guidelines for groin hernia, chronic pain is defined as pain that moderately interferes with work for more than 50% of the time in 3 months.[2] Since a well-established definition of seroma for inguinal hernia was not available, we decided to adopt the Morales–Conde classification for laparoscopic ventral hernia repair.[17] An anonymous survey among the groin hernia experts involved in this study agreed that Type II and III could be considered clinically significant seromas, and the following criteria were determined to define clinically significant seroma for our study:

- Swelling is present 3 months after the surgery based on the imaging studies or the physical examination of the surgeon and their diagnosis of a seroma;
- Imaging studies were not considered compulsory; however, scrotal hematoma and recurrence were ruled out; and
- Seroma causing discomfort or requiring intervention such as aspiration regardless of the postoperative period.

Statistical analysis

Data are presented as the mean (standard deviation). Student *t* test was used to compare data between the two groups. The chi-square test and the Fisher's exact test were used to compare categorical data. Missing data due to failure to turn in the survey were addressed using an available case analysis approach. Only the data that were available for each outcome measure at each time point were included in the analysis. For each individual questionnaire, at least 50% of the questions needed to be answered for the data to be included in the analysis. For each variable or outcome, the analysis was conducted based on the number of participants with data available at that time point.

To ensure our study accurately reflected laparoscopic groin hernia repair practices in Japan, we performed a sample size calculation using standard methods for determining the required sample size for surveys. At the time of the study, the annual number of laparoscopic groin hernia repairs in Japan was 41,000. The required sample size was calculated with a confidence interval of 95% and an acceptable error rate of 3%. The required sample size was 1,040 patients. The assumed 3-month follow-up rate at 3 months was 80%. This resulted in a final sample size of 1,300 cases. All statistical analyses were performed using the SPSS version 26 software (IBM Corp., Armonk, NY, USA).

Results

In total, 1,467 cases from 21 institutes throughout Japan were included in this study. The details of the participating hospitals and case numbers are presented in Table 1. The responses to the questionnaire at 1 week, 1 month, and 3 months were 1439 (98.1%), 1409 (96.1%), and 1277 (87.1%), respectively. Non-responding patients were lost to follow-up and did not visit the clinic and did not respond to telephone calls from the institutions. Characteristics of the patients, surgeons, and operative data are summarized in Table 2. Average body mass index (BMI) of the patients was 23.6 ± 8.9. Nearly 70% of the surgeries in this study were performed by surgeons with prior experience of more than 500 laparoscopic groin hernia repairs [Table 2]. A single incision was the most common port style followed by a 12-5-5 mm port style. The hernial sac was managed by transecting it and abandoning the peripheral sac in 63% of cases. A 3D Max mesh is the most commonly used mesh. A recommended mesh size of larger than 15 cm × 10 cm was used in nearly 90% of cases. The average operation time was 74.6 ± 27.6 min, and intraoperative complications were observed in nine (0.6%) cases. Blood vessels were injured in four cases, whereas the other complications, such as

Table 1: Participating hospitals

Name of Hospital	Number of cases
Steel Memorial Muroran Hospital	65
Gi Surgical Clinic Okayama	457
Shiroyama Hospital	13
Yao City Hospital	32
Koseikai Hospital	61
JA Hiroshima General Hospital	284
Hokkaido Medical Center	8
Kakogawa Medical Center	47
Itoigawa General Hospital	27
East Tokushima Medical Center	39
Daiichi Towakai Hospital	24
Hirotsu Abdominal Clinic	50
JCHO Oosaka Hospital	33
Teine Keijinnkai Hospital	2
Sagamihara Kyodo Hospital	10
Nishinomiya Municipal Central Hospital	19
Tokushima Red cross Hospital	40
Yotsuya Medical Cube	5
Oda Clinic Day surgery center	94
Gi Surgical Clinic Kyoto Branch	2
Gi Surgical Clinic Hanshin Branch	155
	1467

Table 2: Patient demographic data

Item	Data (n = 1449)
Patient data	
Age	65.4 ± 13.8
Sex Male	1293 (89.2%)
BMI	23.6 ± 8.9
Right: Left	723:726
Hernia classification	
No hernia	3
Combined	133
L:M:F	1068:440:73
Unclassified	1
Hernia like lesion	25
Surgeons' Data	
Postgraduate year	20.3 ± 6.7
JSES ESSQ	
Yes: No	549:899
Prior LIHR experience	
Less than 10 cases	36 (2.5%)
11–50 cases	147 (10.1%)
51–100 cases	107 (7.4%)
101–500	139 (9.6%)
More than 500 Cases	1020 (70.4%)
Operation data	
TAPP:TEP:Robot	727:720:2
Port placement	
SILS	614 (42.4%)
SILS+1	61 (4.2%)
5+Needle	13 (0.9%)
5-5-5	267 (18.4%)
12-5-5	491 (33.9%)
Other	3 (0.2%)
Mesh 3D Max	1074 (74.4%)
Mesh Length above 15 cm	1296 (89.4%)
Mesh Width above 10 cm	1362 (94.0%)
Sac Encircle	911 (63.0%)
Operation time (min)	74.4 ± 27.7
Intraoperative complications	9 (0.6%)
Tacking	
Absorbable	510 (35.2%)
Non absorbable	659 (45.5%)
No tacking	279 (19.3%)
Number of tacks	5.1 ± 1.7
Local anesthesia in wound	1321 (91.2%)
Local anesthesia in inguinal region	182 (12.8%)

Data presented as number of patients (%) for categorical data and Mean ± standard deviation for continuous data.
BMI = Body mass index, Hernia Classification L = Lateral, M = Medial, F = Femoral, JSES ESSQ = Japan Society for Endoscopic Surgery Endoscopic Surgical Skill Qualification System, LIHR = Laparoscopic inguinal hernia repair, TAPP = Transabdominal preperitoneal, TEP = Totally Extraperitoneal, SILS = Single Incision Laparoscopic Surgery

peritoneal tear and emphysema, were minor. All the complications were managed intraoperatively. Tacking was not used in 284 cases (19.4%), and non-absorbable tacking was used in 45% of cases. For cases where tacking was employed, an average of 5.1 ± 1.7 tacks were used. Among cases without tacking, 241 (84.9%) were repaired using the TEP procedure. Local anesthesia was used in the wound region in 91.3% of cases and in the inguinal region in 12.6% of cases. Differences between male and female patients are summarized in Table 3. Women had a lower average BMI, whereas men were more likely to have medial hernias, and women were more likely to present with femoral hernias. More women underwent repairs using mesh smaller than 15 cm × 10 cm.

There were no cases of intraoperative or postoperative complications above Clavien–Dindo Grade II. At the end of 3 months after the surgery, 6 (0.47%) and 16 (1.25%) patients complained of pain above 2 in the groin region and in the wound, respectively [Table 4; Figure 1]. Six (0.47%) patients complained that the pain moderately or severely interfered with their daily lives. However, only two (0.16%) patients overlapped in both groups and satisfied the criteria for chronic pain [Table 5]. However, all these patients had returned to normal activities and were able to attend clinic visits as usual by the end of 3 months. At 1 week after the surgery, 724 (50.45%) patients did not require analgesics to manage their postoperative pain. Patients used analgesics for an average of 3.1 ± 4.8 times.

A majority of patients undergoing the TEP procedure complained of wound pain at 1 week ($P < 0.001$) and 1 month ($P < 0.001$) than those undergoing the TAPP procedure. However, there was no difference in wound pain at 3 months or groin pain at 1 week, 1 month, or 3 months postoperatively. The number of analgesic medications taken was significantly lower in the TEP procedure (TEP: 1.4 ± 2.9 times, TAPP: 4.9 ± 5.6 times;

$P < 0.001$). Surgery time in the TEP procedure was significantly lower than that in the TAPP procedure (TEP: 66.6 ± 22.2 min, TAPP: 82.2 ± 30.0 min; $P < 0.001$). Even for the experts who had an experience of more than 500 cases, the surgery time for the TEP procedure was significantly lower than that of the TAPP procedure (TEP: 65.2 ± 19.3 min, TAPP: 69.4 ± 20.2 min; $P < 0.001$).

Table 3: Difference between men and women

Item	Men (*n* = 1309)	Women (*n* = 158)	*P* value
Age	65.2 ± 13.4	66.6 ± 16.4	0.23
BMI	23.5 ± 9.2	21.6 ± 3.3	0.01*
Left: Right	656:653	81:77	0.07
Hernia classification			<0.01*
Lateral	947 (72.3%)	137 (86.7%)	
Medial	429 (32.8%)	14 (8.9%)	
Femoral	53 (4.0%)	21 (13.3%)	
Operation type			0.05
TAPP	653 (49.9%)	92 (53.2%)	
TEP	654 (50.0%)	66 (41.8%)	
Robot	2 (0.1%)	0 (0.0%)	
Mesh length above 15 cm	1195 (91.3%)	112 (70.9%)	<0.01*
Mesh width above 10 cm	1248 (95.3%)	132 (83.5%)	<0.01*
Operation time	74.3 ± 27.2	76.7 ± 30.7	0.3

Data presented as number of patients (%) for categorical data and Mean ± standard deviation for continuous data.
BMI = Body Mass Index, TAPP = Transabdominal Preperitoneal, TEP = Totally Extraperitoneal

Table 4: Pain data at 3 months

Face pain scale	Wound pain	Groin pain
0	1077 (84.34%)	1129 (88.48%)
1	132 (10.34%)	121 (9.48%)
2	52 (4.07%)	20 (1.57%)
3	10 (0.78%)	4 (0.31%)
4	6 (0.47%)	2 (0.16%)
5	0 (0.00%)	0 (0.00%)

After 3 months, 180 (14.1%) patients still complained of numbness in the groin region. However, three (0.23%) patients complained that numbness interfered with their daily lives. Groin swelling was observed in 22 (1.7%) patients at the end of the 3 months after the surgery. Among them, 18 were diagnosed with seromas, whereas the others were not diagnosed. No hematoma or recurrence was observed after 3 months. One week after the surgery, subcutaneous bleeding was observed in 87 (5.99%) patients. Among these, 69 were present in the wound and 11 each in the groin region and scrotum. At the end of the 3 months after the surgery, 14 (1.1%) patients experienced difficulty performing moderate activities such as household chores and 15 (1.2%) experienced difficulty climbing stairs [Figure 2]. In the previous week, 11 (0.86%) patients were almost always unable to perform work and normal activities, and 10 (0.79%) were almost unable to perform some of the activities [Figure 2]. However, at the end of the 3 months after the surgery, almost all patients (1,273 patients, 98.27%) were satisfied with the surgical care they received.

Discussion

In this prospective multicenter observational study, we demonstrated the short-term outcomes of laparoscopic groin hernia repair in selected institutes in Japan. The response rate at 3 months was high (87%). Although the number of cases in this study is still small compared with that given in the registry data from Western countries, our study compiles data from 21 centers in Japan and boasts the largest number of cases of laparoscopic groin hernia repair published in Japan. Our data indicate that performing laparoscopic inguinal hernia repair in these centers in Japan is safe, with no intraoperative and postoperative complications

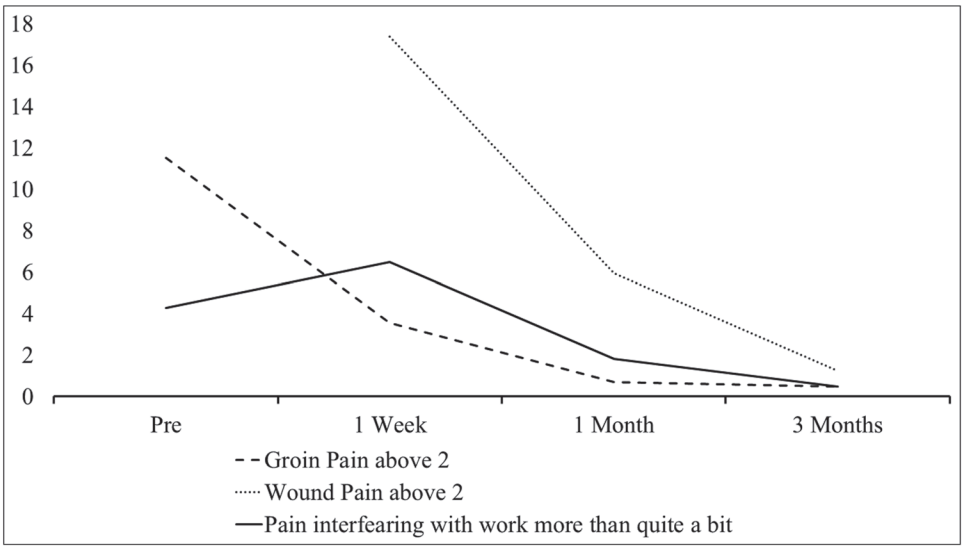

Figure 1: Changes in pain in wound, inguinal region, and pain interfering with work. The graph depicts the total percentage of respondents with the mentioned response

Table 5: Characteristics of the patients with pain interfering daily life at 3 months after the surgery

Case no	Age	Gender	BMI	Hernia Type	Surgery	Port style	Mesh weight	Fixation	Groin Pain				Wound Pain			Pain bothering daily life 3 months
									Preop	1 week	1 month	3 months	1 week	1 month	3 months	
1	59	Male	19.3	L1	TAPP	5-5-5	LW	Non absorbable	0	NA	2	0	NA	1	0	Extremely
2*	86	Male	22.0	M2	TAPP	12-5-5	LW	Absorbable	0	4	4	0	4	4	4	Severely
3	76	Male	25.8	L3	TAPP	12-5-5	LW	Non absorbable	5	1	2	2	1	1	2	Severely
4	42	Male	30.8	L3	TEP	SILS	HW	Non absorbable	4	2	2	1	2	1	0	Extremely
5	64	Male	23.6	M3	TEP	SILS	HW	Non absorbable	1	5	1	2	5	2	2	Extremely
6*	72	Male	26.3	L2	TEP	SILS	HW	None	0	3	1	4	3	3	4	Extremely

*Patients satisfying criteria for Chronic Pain

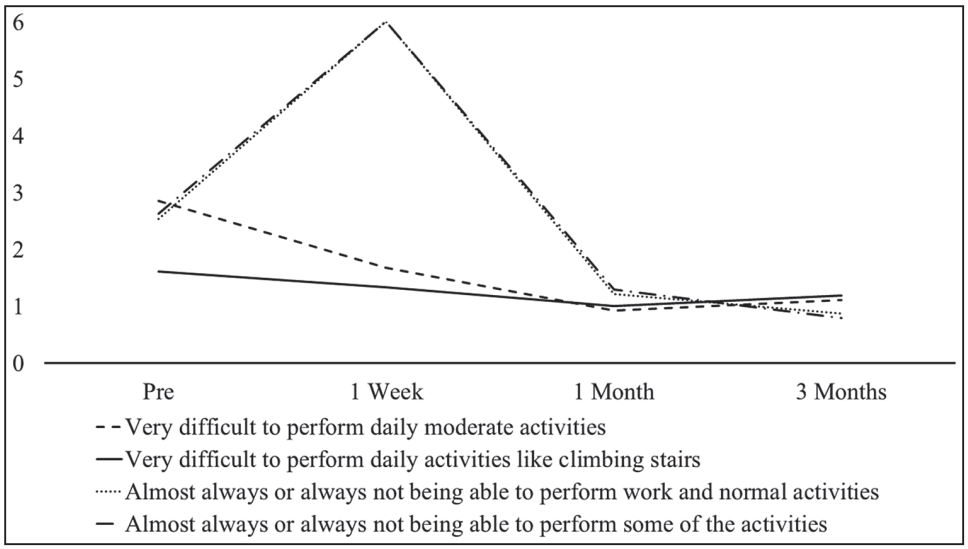

Figure 2: Changes in limitation of various activities after the surgery. The graph depicts the total percentage of respondents with the mentioned response

above Clavien–Dindo Grade II, and a chronic pain rate of 0.16% at the end of the 3 months after the surgery. The overall satisfaction rate of the patients was very high.

The response rate of our study was exceptionally high, reaching 87% at the end of 3 months. We attribute this success primarily to the following factors. First, our questionnaire was very concise, ensuring that it did not exceed one page per patient. Second, we ensured that the questions were simple and easy to understand, even incorporating the use of a Face Pain Scale, which older patients found particularly straightforward to complete. Lastly, the study's 3-month follow-up period was aligned with the patients' postoperative clinic visits, facilitating a high response rate.

Our data showed that the number of patients who satisfied both criteria for chronic pain at the end of the 3 months after the surgery was very low (0.16%). The reported incidence of chronic postoperative pain after laparoscopic inguinal hernia repair is 6%–7%.[18] Our study did not include any single case of nerve injury during the procedure. In the TAPP procedure, it is common in Japan to start the first peritoneal incision from the lower lateral portion of the internal inguinal ring, where the layers of the peritoneum are relatively loose and it is easy to enter the layer just below the peritoneum.[19] Care was taken not to damage the fatty tissue lying on top of the nerves in the groin region during the TAPP and TEP procedures. This may have contributed to the low rate of chronic pain, particularly in the groin. Another report from Japan reported that 1.1% of patients complained of severe pain during movement.[19] In the present study, all the patients had returned to their normal daily lives. Among the six patients who complained that pain was severe or extremely bothersome in their daily lives, only one patient complained of groin pain scoring above 2 on the Face Pain Scale. Two patients rated their groin pain at

0. For patients who complained of pain affecting their daily lives, other factors unrelated to surgery were responsible. The number of patients with pain was too low, so we could not perform any statistical analyses of the risk factors for pain. A more detailed Japanese study examining various aspects of postoperative pain using validated tools is required.

Seroma was found in 1.5% of patients. The reported incidence of seroma formation ranges from 2.9% to 37.9%.[20-22] We need to acknowledge that our study excluded cases of large inguinoscrotal hernias, which is a risk factor for seroma formation. Additionally, we diagnosed the presence of seroma 3 months after the surgery, and only physical or radiological examination was performed if the patient complained of persistent swelling. A few studies have concluded that transection of the hernial sac significantly increases the seroma rate in laparoscopic groin hernia repair.[22-24] Ruze *et al*.[22] reported a seroma rate of 6.6% at 3 months after the surgery in the transected group. Pan *et al*.[23] reported a total seroma rate of 18%. Although a direct comparison between these datasets cannot be made as the criteria for the diagnosis of seroma differ, the seroma rate is quite low, even though the sac was transected in 63% of the patients in our study. Hayakawa *et al*.[19] reported a similar operative technique and found a seroma rate of 0.8%. In hernias, excluding inguinoscrotal hernia, our data showed that transection of the hernial sac does not play any role in seroma formation.

A meta-analysis of comparative studies in the International Hernia Guidelines showed that the median operative time of TAPP repair was 57 min and that of TEP repair was 62.3 min.[2] The mean operative time (66.6 min) in the TEP procedure from our data was comparable to the published international data. However, even when we considered only the data from surgeons with an experience of over 500 cases, the operative time of 69.4 min for the TAPP procedure in our dataset was, on average, approximately 12 min longer than that in the internationally published data. However, the complication rate observed in our study was lower than that previously reported. In our study, there were no cases of hematoma or severe complications of visceral injury, which are reported to occur at a rate of 0.1%–0.3%.[25] Overall, although the operative time is longer, laparoscopic inguinal hernia repair in these centers in Japan is safe and feasible.

International guidelines for groin hernia repair recommend avoiding tacking except for large medial defects.[2] In our dataset, around 20% of cases were performed without tacking. The vast majority (approximately 80%) of these cases were repaired using the TEP approach. To accurately reflect the current state of laparoscopic groin hernia repair in Japan, the study protocol did not mandate specific practices regarding tacking, except for excluding cases involving tacking in the danger zone. Our findings indicate that, although Japanese surgeons are gradually adopting the practice of not using tacking in laparoscopic groin hernia repairs, the majority of cases still do not adhere to international guidelines.

This study had several limitations. Most surgeries in this study were performed by surgeons with prior experience in more than 500 cases. We need to consider that these data represent the outcomes achieved by expert surgeons and do not accurately reflect the distribution of types of hernia surgery in Japan. Most TEP procedures in this study were performed using a single port. Although it is not the most common method of performing the TEP procedure in Japan, the preference of surgeons in this study skewed the data. We used the Face Pain Scale, which is mainly used for pediatric patients, instead of the Visual Analog Scale commonly used in these studies to quantify pain. The number of questions in the survey was also limited to one page, and we did not use validated tools, such as the Inguinal Pain Questionnaire.[26] This was primarily done to facilitate survey completion by the patients, resulting in a high response rate among those enrolled in our study. The current study focused only on the short-term outcomes of groin hernia repair. In the future, it is imperative to learn from Western countries and establish a long-term follow-up system. To achieve this, the Japan Hernia Society should collaborate with the government and partner with the industry to establish a nationwide registry for long-term follow-up data, integrated into the healthcare system.

Conclusions

In conclusion, our study provides valuable insights into the short-term outcomes of laparoscopic groin hernia repair in multiple centers in Japan, which demonstrated favorable results with low complication rates and high patient satisfaction. While certain disparities with international data exist, our findings underscore the importance of the regional context in assessing surgical outcomes and highlight areas for further investigation and optimization of hernia repair practices.

Author contributions

All authors are in agreement with the content of the manuscript and have participated sufficiently in the following: conceptualization and design of the work, acquisition of data, analysis and interpretation of the data, writing – original draft, writing – review and editing, and final approval of the version for publication.

Ethical policy and institutional review board statement

This prospective observational study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. The research proposal was approved by the institutional review board (IRB) of the Hokkaido University (approval number: Med 20-039, dated on Mar 31st, 2021). Individual IRB approval from the participating institutions was left to the discretion of the institutions. However, individual IRB approval was obtained from institutions that required separate IRB approval.

Declaration of patient consent

All participants were informed of the study objectives and provided written consent. The participants were also informed of their right to withdraw consent. All information pertaining to identification of the individuals was stored only in the hospital servers and was not shared with the investigators.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Financial support and sponsorship

This work was supported by the Japanese Society for the Promotion of Science KAKENHI [Grant Number 21K17221].

Conflicts of interest

There are no conflicts of interest.

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