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# Laparoscopic Totally Extraperitoneal Groin Hernia Repair and Quality of Life at 2-Year Follow-Up



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- BACKGROUND:** The lack of long-term data on quality of life after groin hernia repair presents a challenge in setting patients' postoperative expectations. This study aimed to describe quality of life outcomes after laparoscopic totally extraperitoneal groin hernia repair with a minimum of 2 years follow-up.
- STUDY DESIGN:** We prospectively evaluated 293 patients who had laparoscopic totally extraperitoneal groin hernia repair in an IRB-approved study. The Short-Form 36-item Health Survey (version 2), Surgical Outcomes Measurement System, and Carolinas Comfort Scale were administered pre- and postoperatively. Pairwise comparisons using nonparametric Wilcoxon signed rank test were made between time points.
- RESULTS:** Mean patient age was  $56 \pm 15$  years and 93% were male; 80% of patients presented with painful hernias and 15% of hernias were recurrent. Mean operative time was  $43 \pm 16$  minutes. No operative complications occurred. Mean duration of narcotic pain medication use was  $2.5 \pm 3.4$  days, and daily activities were resumed and return to work occurred  $5.4 \pm 4.4$  days and  $5.4 \pm 3.9$  days post operation, respectively. Recurrence rate was 2%. The Short-Form 36-item Health Survey outcomes improved from baseline for domains of Physical Functioning, Role Limitations due to Physical Health, and Pain at 2 years post operation; Surgical Outcomes Measurement System outcomes improved for domains of Pain Impact on Quality of Life, Body Image, and Patient Satisfaction ( $p \leq 0.05$ ). The percentage of patients reporting no or mild but not bothersome symptoms on the Carolinas Comfort Scale at 2 years post operation for sensation of mesh, pain, and movement limitations were 98%, 95%, and 97%, respectively.
- CONCLUSIONS:** Measuring both general and procedure-specific quality of life, patients' perceptions of health status improved significantly 2 years after laparoscopic totally extraperitoneal groin hernia repair. (J Am Coll Surg 2016;223:153–161. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)
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Groin hernia repair is the most common surgical procedure performed in the world. The lifetime risk of a groin (inguinal) hernia is 27% in males and 3% in females.<sup>1</sup>

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Surgical repair continues to be the definitive treatment for all symptomatic patients. It is estimated that approximately 12 million inguinal hernia repairs are performed each year worldwide,<sup>2</sup> and approximately 800,000 of these are being performed annually in the United States.<sup>3</sup> Traditionally, these and other groin hernias were repaired using an open approach. Fortunately, this high-volume surgery is associated with low morbidity and mortality and quality and success of herniorrhaphy is increasingly being measured by patient-centered outcomes through quality of life measures in the short and long term.<sup>4</sup> The majority of studies assessing quality of life after open repair have

**Abbreviations and Acronyms**

CCS	= Carolinas Comfort Scale
SF-36	= Short-Form 36-item Health Survey (version 2)
SOMS	= Surgical Outcomes Measurement System
TEP	= totally extraperitoneal

shown improvement when compared with the patients' reported preoperative state.<sup>5-10</sup>

With the advent of laparoscopy in the early 1990s, Arregui and colleagues<sup>11</sup> reported the first laparoscopic inguinal hernia repair in 1992 using a preperitoneal approach for mesh placement. Since then, many surgeons have adopted the laparoscopic technique and it continues to gain favor among patients because of the excellent short-term morbidity and mortality reported. Several studies have shown that laparoscopic repair, when performed by experienced surgeons, results in reduced postoperative pain, earlier recovery, more rapid return to work, and decreased narcotic requirements when compared with open repair.<sup>4,12-16</sup> Despite its proven benefits over open repair, surveys have shown that only a minority of all inguinal hernia repairs done globally are being performed laparoscopically.<sup>17-19</sup> An explanation for this is, as would be expected with any new advances in technology, that laparoscopic techniques require a special skill set and are associated with a steep learning curve.

Therefore, it is necessary to look at the long-term outcomes of experienced surgeons at high-volume institutions to aid in optimally determining patients' long-term quality of life. Authors who have reported on outcomes after laparoscopic inguinal hernia repair typically obtain responses from patients using a generic quality of life assessment tool, such as the Short-Form 36-item Health Survey, version 2 (SF-36), at various time points after laparoscopic inguinal hernia repair, but few have been able to compare more comprehensive long-term data with those of the preoperative period.<sup>13,20-24</sup> Our study describes short- and long-term quality of life outcomes after laparoscopic totally extraperitoneal (TEP) groin hernia repair, using several comprehensive and procedure-specific assessment tools in the preoperative and postoperative period in patients with a minimum of 2-year follow-up. Our goal is to better understand the details and duration of quality of life outcomes so that we can better address patient expectations and provide important information used in the decision-making process for patients undergoing an elective procedure.

**METHODS****Study design**

Beginning in June 2009, our institution initiated enrollment in a prospective database for patients diagnosed with a hernia. All patients that presented to our institution were offered participation, and those that agreed were consented by the surgeon. The database is approved by the IRB at our hospital. For the purpose of this study, only patients undergoing laparoscopic TEP repair of a primary or recurrent unilateral or bilateral groin hernia (indirect, direct, pantaloon, or femoral) were analyzed. Patients who underwent concomitant procedures or had less than 2 years follow-up were excluded.

**Quality of life instruments**

Three quality of life instruments were administered to patients preoperatively and postoperatively at 3 weeks, 6 months, 1 year, and 2 years. The SF-36 consists of 36 items that aggregate into 8 subscales: Physical Functioning, Role-Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role-Emotional, and Mental Health. Each domain is scored on a value of 0 (poor health) to 100 (best health). The Surgical Outcomes Measurement System (SOMS) is a collection of measures designed to assess postoperative recovery and other important surgical outcomes. The SOMS questionnaire measured 34 items for the 7 quality of life domains: Pain on a Visual Analog Scale, Pain Impact, Pain Quality, Fatigue, Physical Functioning, Body Image, and Satisfaction. Lower scores indicate better quality of life for all domains except for Physical Functioning and Satisfaction, for which higher scores indicate greater functioning. The Carolinas Comfort Scale (CCS) was developed as a hernia-specific quality of life instrument. The instrument consists of 23 questions pertaining to pain, movement limitations, and the sensation of mesh. Each question is scored on a 5-point scale, with 0 representing "no symptoms" and 5 representing "disabling symptoms."

**Surgical technique**

All cases were performed by 4 surgeons that specialize in minimally invasive and bariatric surgery at an academic-affiliated hospital system that included 3 sites. Each surgeon had personally performed >100 groin hernia repairs using the TEP approach before the start of the study. There were only slight variations in technique (eg development of preperitoneal space with or without balloon device) among the surgeons; however, the technical aspects have been described previously.<sup>4</sup> The application of tacks to secure the mesh was at the surgeons' discretion,

but was typically limited to cases in which there was a direct hernia defect >2 cm and indirect defects >4 cm. One surgeon routinely used tacks for all hernia sizes early in the study, but has changed to selective use with these criteria. All procedures were performed under general anesthesia and patients received 1 g cefazolin (or clindamycin for penicillin allergic patients) before incision per institutional protocol. Urinary catheters were not routinely placed and used only in specific situations, as described here, per the discretion of the surgeon.

### Statistical analysis

Patient demographics and preoperative, intraoperative, and postoperative data were collected. Categorical variables were reported as frequency counts and percentages. Continuous variables were reported as mean  $\pm$  SD. Pairwise comparisons between preoperative and postoperative time points were performed using nonparametric Wilcoxon signed rank test. Data were analyzed using IBM SPSS Statistics, version 21 (IBM Corp) and a  $p$  value <0.05 was considered significant.

## RESULTS

### Patient demographics

As of October 2015, a total of 1,427 patients agreed to be enrolled in our prospective hernia database. Of these, 293 underwent laparoscopic TEP groin hernia repair and met the inclusion criteria. Four surgeons actively enrolled patients and all cases were performed at NorthShore University HealthSystem. The majority of cases were elective hernia repair, and a surgical resident was typically present during the case. Patient demographic characteristics can be found in Table 1. Mean age was  $56 \pm 15$  years and 93% were male. Mean BMI was  $26 \pm 4$  kg/m<sup>2</sup>. Hernias were unilateral left-sided in 30%, unilateral right-sided in 43%, and bilateral in 27%. In total, there were 372 hernias repaired. Thirty-two percent of hernias were direct, 51% were indirect, and the remaining were either pantaloon or a combination. There were 5 patients in this cohort who had a previous diagnosis of prostate malignancy. Of those, 3 patients had received previous radioactive seed therapy and the remaining 2 had transurethral resection of the prostate.

### Intraoperative data

Mean operative time was  $43 \pm 16$  minutes. Macroporous polyester mesh (Parietex anatomical; Covidien) was used in 70% of cases and macroporous polypropylene mesh (Physiomesh; Ethicon) was used in the remaining 30% of cases. Mesh size was  $15 \times 10$  cm in 94% of cases and  $16 \times 12$  cm in 6% of cases. Tacks were used in

**Table 1.** Demographic Characteristics of Patients in the Study

Characteristic	Data
Patients, n	293
Hernias, n	372
Sex, % male	93
Age, y, mean $\pm$ SD	$56.1 \pm 15.3$
BMI, kg/m <sup>2</sup> , mean $\pm$ SD	$26.2 \pm 3.7$
American Society of Anesthesiologists class, median (range)	2 (1–3)
Smoking status, n (%)	
Never	184 (62.8)
Former	83 (28.3)
Current	25 (8.5)
Hernia location, n (%)	
Left	87 (29.7)
Right	127 (43.3)
Bilateral	79 (27.0)
Hernia type, n (%)	
Direct	119 (32.0)
Indirect	188 (50.5)
Pantaloon	53 (14.2)
Femoral	5 (1.3)
Direct/femoral	4 (1.1)
Indirect/femoral	2 (0.5)
Primary vs recurrent, n (%)	
Primary	328 (85.0)
Recurrent	44 (15.0)
Visible bulge present, n (%)	263 (89.8)
Asymptomatic, n (%)	60 (20.5)
Visual Analog Scale, pain score, mean $\pm$ SD	$2.1 \pm 2.0$

66% of cases and, of these cases, absorbable polyester screw-in tacks (AbsorbaTack; Covidien) were used 80% of the time. A mean of  $5.1 \pm 3.3$  tacks (range 2 to 10 tacks) were placed for a unilateral hernia and  $10.3 \pm 3.3$  tacks (range 4 to 17 tacks) were placed for bilateral hernia. A dissecting balloon was used in 30% of the cases. There were no reported intraoperative complications or conversions to open. Two cases were converted to a trans-abdominal preperitoneal approach, as there was peritoneal violation and this was deemed the safest course of action. Surgical residents were involved in approximately 90% of all cases. Their degree of participation varied based on their skill set and understanding of preperitoneal inguinal anatomy.

### Postoperative data

Mean length of stay (including time of operation) was  $10.9 \pm 23.4$  hours. Mean patients' self-reported pain score at discharge was  $1.9 \pm 1.7$  out of 10. Eighteen

patients returned to the emergency department with a related complication and, of these, there were 8 readmissions. Early postoperative period complications are reported in [Table 2](#).

### Quality of life instrument data

During the study period, the schedule of quality of life instruments was adjusted as new measures became available. Initially, only SF-36 was administered to all patients pre- and postoperatively. In 2011, the CCS hernia-specific quality of life instrument was acquired and was added to the survey set for all patients; however, this was only administered postoperatively due to questions pertaining to mesh sensation. Finally, in 2012, the SOMS was added to our question set. This instrument was administered both pre- and postoperatively; however, the domains of Body Image, Pain Quality, and Satisfaction were only administered postoperatively.

### Short-Form Health Survey 36, version 2

#### Physical Functioning

Mean preoperative Physical Functioning score was  $84.4 \pm 21.6$  and there was no significant change at 3 weeks ( $85.4 \pm 21.0$ ;  $p = 0.694$ ), 6 months ( $93.0 \pm 14.5$ ;  $p = 0.054$ ), or 1 year postoperatively ( $88.6 \pm 22.4$ ;  $p = 0.307$ ). Physical functioning significantly improved from baseline at 2 years postoperatively ( $92.1 \pm 15.1$ ;  $p = 0.010$ ).

#### Role Limitations due to Physical Health

Mean preoperative Physical Health score was  $81.3 \pm 26.3$  and there was no significant change at 3 weeks ( $73.5 \pm 28.5$ ;  $p = 0.167$ ). Role limitations due to physical health improved significantly at 6 months ( $92.3 \pm$

$19.4$ ;  $p = 0.049$ ), 1 year ( $92.4 \pm 18.6$ ;  $p = 0.010$ ), and 2 years postoperatively ( $93.0 \pm 16.0$ ;  $p = 0.012$ ).

#### Role Limitations due to Emotional Problems

Mean preoperative Role Limitations due to Emotional Problems score was  $90.5 \pm 17.1$  and there was no significant change at 3 weeks ( $91.6 \pm 15.3$ ;  $p = 0.270$ ), 6 months ( $90.7 \pm 18.3$ ;  $p = 1.000$ ), 1 year ( $94.0 \pm 11.7$ ,  $p = 0.071$ ), or 2 years postoperatively ( $94.8 \pm 13.8$ ;  $p = 0.076$ ).

#### Energy/Fatigue

Mean preoperative Energy/Fatigue score was  $70.3 \pm 18.3$ , and there was no significant change at 3 weeks ( $66.3 \pm 20.3$ ;  $p = 0.120$ ), 6 months ( $69.3 \pm 18.4$ ;  $p = 0.119$ ), 1 year ( $71.7 \pm 18.7$ ;  $p = 0.830$ ), or 2 years postoperatively ( $71.2 \pm 17.0$ ;  $p = 0.110$ ).

#### Emotional Well-being

Mean preoperative Emotional Well-being score was  $82.3 \pm 13.5$ , and there was no significant change at 3 weeks ( $81.8 \pm 12.9$ ;  $p = 0.845$ ), 6 months ( $83.6 \pm 11.4$ ;  $p = 0.588$ ), 1 year ( $85.3 \pm 11.4$ ;  $p = 0.346$ ), or 2 years postoperatively ( $82.3 \pm 13.6$ ;  $p = 0.081$ ).

#### Social Functioning

Mean preoperative Social Functioning score was  $87.5 \pm 21.4$  and there was no significant change at 3 weeks ( $83.0 \pm 22.3$ ;  $p = 0.466$ ), 6 months ( $95.1 \pm 10.0$ ;  $p = 0.142$ ), or 2 years postoperatively ( $91.6 \pm 18.1$ ;  $p = 0.988$ ). Social functioning improved significantly from baseline at 1 year postoperatively ( $93.1 \pm 14.9$ ;  $p = 0.019$ ).

#### Pain

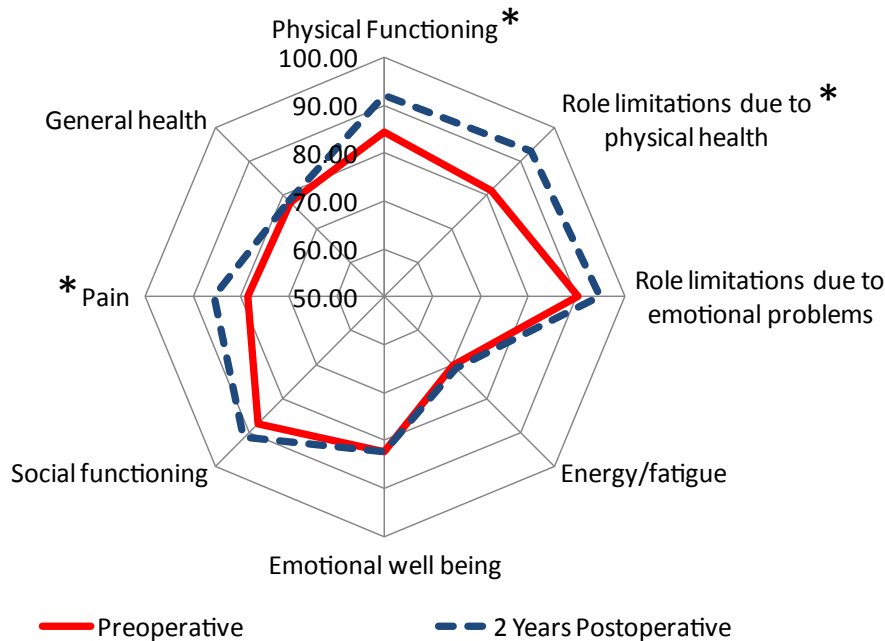
Mean preoperative Pain score was  $78.4 \pm 19.4$  and decreased significantly (ie pain got worse) at 3 weeks postoperatively ( $68.1 \pm 23.4$ ;  $p = 0.010$ ). There was no significant difference from baseline at 6 months postoperatively ( $83.1 \pm 15.9$ ;  $p = 0.118$ ). Pain score improved significantly from baseline at 1 year ( $86.7 \pm 15.9$ ;  $p = 0.006$ ) and 2 years postoperatively ( $85.5 \pm 16.3$ ;  $p = 0.007$ ).

#### General Health

Mean preoperative General Health score was  $77.7 \pm 18.3$  and there was no significant change at 3 weeks ( $79.8 \pm 17.1$ ;  $p = 0.660$ ), 6 months ( $80.7 \pm 16.3$ ;  $p = 0.209$ ), 1 year ( $77.0 \pm 19.7$ ;  $p = 0.338$ ), or 2 years postoperatively ( $78.1 \pm 18.0$ ;  $p = 0.063$ ) ([Fig. 1](#)).

**Table 2.** Early Postoperative Period Complications

Variable	Data
Length of stay, h, mean $\pm$ SD	$10.9 \pm 23.4$
Visual Analog Scale, pain score at discharge, mean $\pm$ SD	$1.9 \pm 1.7$
Emergency department visit, n (%)	18 (6.1)
Readmissions within 30 d, n (%)	8 (2.7)
Complications, n (%)	
Seroma	25 (8.5)
Hematoma	13 (4.4)
Wound infection	7 (2.4)
Urinary retention	21 (7.2)
Hernia recurrence, n (%)	8 (2.2)
Postoperative day, mean $\pm$ SD	
Narcotic pain medication stopped	$2.5 \pm 3.4$
Return to activities of daily living	$5.4 \pm 4.3$
Return to work	$5.4 \pm 3.9$



**Figure 1.** Two-year quality of life after laparoscopic totally extraperitoneal groin hernia repair as measured by the Short-Form 36 Health Survey, version 2. \* $p < 0.05$ .

### Surgical Outcomes Measurement System

Pain Impact on Quality of Life score improved significantly from baseline ( $10.0 \pm 5.0$ ) at 2 years postoperatively ( $7.5 \pm 3.9$ ;  $p = 0.025$ ). All other measured domains trended toward significant improvement. Patients were highly satisfied with their quality of life at all postoperative time points. At 2 years postoperatively, patients reported mean Satisfaction scores of  $9.3 \pm 2.2$ . Additionally, patients reported minimal concerns with the Body Image domain as evidenced by mean score of  $4.3 \pm 1.8$  (Fig. 2).

### Carolinas Comfort Scale

This instrument was not administered preoperatively. At 3 weeks postoperatively, the percentages of patients indicating nonbothersome symptoms were 96% for sensation of mesh, 89% for pain, and 89% for movement limitations. At 6 months postoperatively, the percentage of patients indicating nonbothersome symptoms were 98% for sensation of mesh, 95% for pain, and 96% for movement limitations. At 1 year postoperatively, the percentage of patients indicating nonbothersome symptoms were 99% for sensation of mesh, 97% for pain, and 98% for movement limitations. At 2 years postoperatively, the percentage of patients indicating nonbothersome symptoms were 98% for sensation of mesh, 95% for pain, and 97% for movement limitations (Fig. 3).

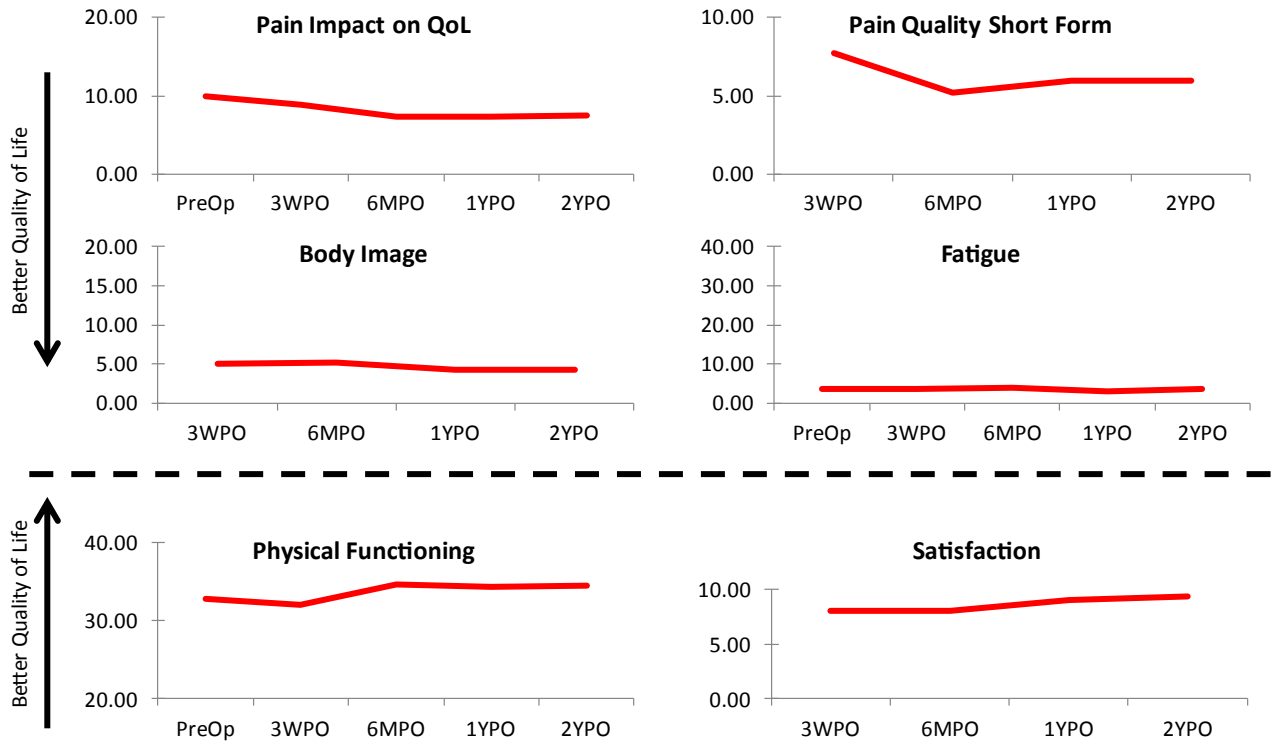
### DISCUSSION

As advances in technology improve procedural outcomes, traditional comparative metrics such as morbidity and mortality often fail to differentiate between the most optimal surgical techniques. This study found that laparoscopic TEP groin hernia repair improves patient quality of life significantly, as evidenced by 2 generic and 1 procedure-specific quality of life instruments. Additionally, the procedure can be performed safely with minimal morbidity and low recurrence rates.

Many quality of life tools exist and have been used to evaluate surgical patients. The SF-36 was designed by the Medical Outcomes Study to assess the health status of a wide variety of patients aged 14 years and older.<sup>25</sup> The SF-36 was originally tested and validated in patients with chronic disease, such as arthritis, asthma, and chronic fatigue, but not surgical patients.<sup>26,27</sup> Despite this, the SF-36 is now commonly used in various patient populations, including surgical patients. In this prospective study, several SF-36 domains significantly improved postoperatively after laparoscopic TEP groin hernia repair. At 2 years postoperatively, the domains of Physical Functioning, Role Limitations due to Physical Health, and Pain all demonstrated significant improvement ( $p < 0.05$ ).

One of the weaknesses of SF-36 might be its lack of specificity with regard to specific surgical diseases and postoperative states. To address these flaws, we began to





**Figure 2.** Quality of life (QoL) as measured by the Surgical Outcomes Measurement System. MPO, months after operation; PreOp, before operation; WPO, weeks after operation; YPO, years after operation.

use the SOMS as part of our quality of life assessment strategy for our groin hernia patients starting in October 2012. The SOMS is a collection of measures designed to assess postoperative recovery and other important outcomes in surgery. We previously implemented the use of SOMS to evaluate laparoscopic cholecystectomy patients at our institution and it proved to address patient outcomes more suitably, due to its tailored postoperative questions and scales, than the commonly used SF-36.<sup>28</sup> Most recently, we are in the process of validating SOMS as a quality of life outcomes assessment tool in patients undergoing various types of abdominal wall hernia repairs.

The SOMS instrument is an extension of the NIH-funded Patient-Reported Outcomes Measurement Information System (<http://www.nihpromis.org>).<sup>29</sup> Patient-Reported Outcomes Measurement Information System uses large sets of items to assess a given symptom or functional area. A subset of these were further refined and tested for use as complementary outcomes in surgical recovery trials.<sup>30</sup> Item content for SOMS was developed with input from postoperative patients, surgeons, and surgical nurses. In this study, several SOMS collections significantly improved postoperatively, including Pain Impact on Quality of Life, Pain Quality, and Satisfaction

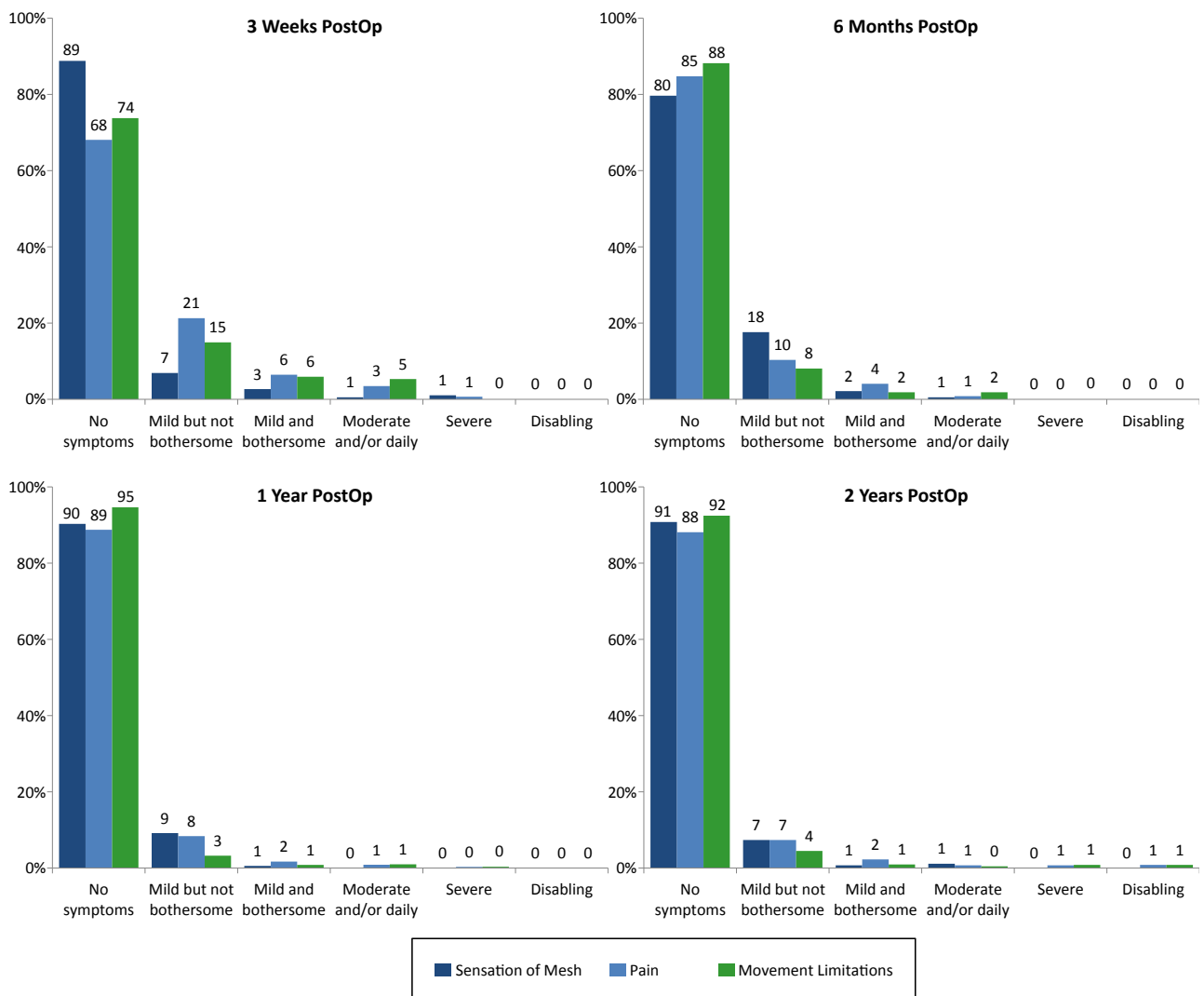
( $p < 0.05$ ). At 2 years postoperatively, in response to the question, "In the past 7 days, are you satisfied with the results of your operation," 90% of patients indicated "Completely" and the remaining 10% indicated "Yes, for the most part." There were no patients at any time points who indicated "Not at all." With respect to cosmesis after the procedure, the mean Body Image score (range 4 to 11; 4 indicates never concerned about body image) was  $4.3 \pm 1.8$  at 2 years after the procedure. At every time interval after the procedure, patients reported a high level of satisfaction with their body image.

To assess procedure-specific quality of life after laparoscopic TEP groin hernia repair, we administered the CCS. The CCS is a validated procedure-specific assessment tool for patients undergoing hernia repairs and has been shown to be effective for assessing patient-perceived symptoms and satisfaction for mesh hernia repairs.<sup>31</sup> This instrument appeared highly sensitive to the patients postoperative state, as evidenced by the vast differences in reported symptoms during the short-term recovery period (3 weeks postoperatively) and the longer-term period (6 months and longer). For example, at 3 weeks after the procedure, the percentages of patients indicating nonbothersome symptoms were 96% for sensation of mesh, 89% for pain, and 89% for movement limitations. This

can be restated to say that 4% of patients were still experiencing bothersome sensation of mesh, 11% pain, and 11% movement limitations. By 6 months after the procedure, only 2% of patients reported the sensation of mesh, 5% pain, and 4% for movement limitations. The levels reported at 6 months postoperatively remained relatively stable during the study period out to 2 years postoperatively.

So far, we have focused our discussion on patient-centered outcomes, as was our primary goal. But looking at the technical outcomes of our cohort as they relate to recurrence rates and complications, we continue to show the importance of reporting the experience of high-volume centers. Our results found that the majority of complications in our cohort were due to seroma

(8.5%), hematoma (4.5%) and urinary retention (7.2%). These relatively minor complications have consistently been reported as the “cons” of the TEP approach and, to some extent, are likely unavoidable because of the preperitoneal dissection involved. Previous authors have reported rates of urinary retention ranging from 1% to 22%.<sup>32-34</sup> In our study, only 7% of patients had urinary retention. Our protocol requires that patients at least attempt to void in the preoperative holding area within 1 hour before surgery, which decompresses the bladder and obviates the need for a Foley catheter in most routine cases. Catheters are selectively placed after the patient has been sedated in the operating room in those unable to void, with previous prostate interventions, or lower abdominal incisions in which we might anticipate a



**Figure 3.** Carolinas Comfort Scale. Percentage of patients indicating symptoms after laparoscopic totally extraperitoneal groin hernia repair. PostOp, postoperative.

difficult preperitoneal dissection. This can explain, in part, the lower rates of retention than those seen in other series, and we have not incurred any bladder injuries to date.

The primary goal of any hernia operation should be to alleviate symptoms and prevent recurrence. Reported recurrence rates throughout the years can provide some insight on the technically challenging aspects of the procedure. Early reports showed rates as high as 25%, but more recent data from experienced surgeons suggest that rates are likely in the range of 1% to 4%. Our experience found the overall recurrence rate to be 2.2%. It is worth noting that, in the middle of our study, in an effort to decrease long-term postoperative pain, we switched to lighter-weight mesh (Physiomesh) from the polyester mesh (Parietex anatomical) used previously. Carolinas Comfort Scale scores at 1 year did confirm decreased pain scores; however, we also saw significantly higher rates of recurrence during that period. Our group's tendency to avoid the use of tacks, combined with the presumably longer duration of tissue in-growth using a Monocryl-laminated mesh (Ethicon), might have led to increased migration and ultimately to more recurrences (4.6%). We used those data to make a practice-wide conversion back to polyester mesh and, since then, the rate of recurrence has decreased to 1.1%.

Limitations of this study include the fact that the patients of 4 different surgeons were included and the procedure was not standardized among them. Degree or method of preperitoneal dissection can cause varying rates of urinary retention and seroma/hematoma. Urinary retention, in general, is difficult to accurately capture and recall bias must also be considered. Also, the accuracy of hernia recurrence overall is limited, given that others have shown that recurrences are often missed when self-reported and not formally examined by a specialist.<sup>14,35</sup> To alleviate this, we regularly review the patients' medical record for examinations performed at our institution; however, there are still likely patients who do not follow up in our system. Another limitation is that the 3 quality of life instruments included in this study were not administered for the entire study period. As mentioned earlier, we initially administered the SF-36 survey only, but then added on the CCS and SOMS later on. All patients included in this study had at least 2 years of follow-up from their date of surgery, however.

## CONCLUSIONS

Laparoscopic TEP repair of groin hernias results in low recurrence and morbidity rates, and substantial improvements in quality of life, including physical functioning,

role limitations due to physical health, pain and pain impact on quality of life. Patients report a high satisfaction rate with the procedure and have minimal concerns about cosmesis. Fewer than 2% of patients report bothersome symptoms in the groin relating to sensation of mesh, 5% for pain, and 3% for movement limitations at 2 years postoperatively. Although no single all-encompassing quality of life tool exists, we demonstrate the importance of using multiple quality of life assessment tools to obtain the most robust patient-centered outcomes data so that we can better guide patient expectations.

## Author Contributions

Study conception and design: Gitelis, Joehl, Linn, Haggerty, Denham, Ujiki

Acquisition of data: Gitelis, Patel, Deasis

Analysis and interpretation of data: Gitelis, Patel, Lapin, Ujiki

Drafting of manuscript: Gitelis, Patel

Critical revision: Gitelis, Patel, Deasis, Joehl, Lapin, Linn, Haggerty, Denham, Ujiki

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## Discussion



**DR RIFAT LATIFI** (Tucson, AZ): This is a prospective study of almost 300 patients who had laparoscopic total extraperitoneal inguinal hernia repair evaluated by quality of life instruments such as Short Form 36 Version 2 (SF36), Surgical Outcomes Measurement System (SOMS), and Carolinas Comfort Scale (CCS) administered pre- and postoperatively. Clearly, this is another example that the more you do, the better you get at it. I congratulate the authors for insisting on finding out from patients themselves how they are doing by using validating instruments. We should all do this with our high-volume procedures because we will learn a few things on how to improve the overall care.

What was the main rationale for you to switch the type of mesh you used, and how do you think this will affect your long-term outcomes? I can tell you that with a recurrence rate of less than 2%, I don't know if you can improve your outcomes any more, but I would like to hear your thoughts.

Help me understand the complication rate a little bit better. Although you report few individual complications, when you add all of them together, it comes to about 25% of patients who had some sort of complications. Can you dissect this a bit more and tell us if there is a relationship between the type of mesh and the complications that you reported?

Finally, was there any difference in the complications between types of dissection, which you alluded to in your manuscript but did not present here, because some of the dissections were done by balloon and some of them were done without balloon?

**DR MICHAEL UJIKI** (Evanston, IL): Regarding the rationale for the mesh change, a few years ago Physiomes (Ethicon) came