

# Suture Versus Tack Fixation of Mesh in Laparoscopic Umbilical Hernia Repair

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## ABSTRACT

**Background and Objectives:** Mesh fixation in laparoscopic umbilical hernia repair is poorly studied. We compared postoperative outcomes of laparoscopic umbilical hernia repair in suture versus tack mesh fixation.

**Methods:** Patients who underwent laparoscopic umbilical hernia repair were separated by method of mesh fixation: sutures versus primarily tacks. Medical history and follow-up data were collected through medical records. The primary outcome of this study was the recurrence rates of hernias. Postoperative major and minor complications, such as surgical site infection, small-bowel obstruction, and seroma formation, were regarded as secondary outcomes. Additionally, a telephone interview was conducted to assess postoperative pain, recovery time, and overall patient satisfaction.

**Results:** Eighty-six patients were identified: 33 in the suture group and 53 in the tacks group. The number of emergent cases was increased in the tacks group (6 vs 0;  $P = .022$ ). Mean follow-up time was 2.7 years for both groups. Documented postoperative follow-up was obtained in 29 (90%) suture group and 31 (58%) tacks group patients. Hernia recurrence occurred in 3 and 2 patients in the sutures and tacks groups, respectively ( $P$  was not significant). No differences were found in secondary outcomes, including subjective outcomes from telephone interviews, between groups.

**Conclusions:** There are no differences in postoperative complication rates in suture versus tack mesh fixation in laparoscopic umbilical hernia repair.

**Key Words:** Laparoscopic umbilical hernia repair, Mesh fixation, Sutures versus tacks, Umbilical hernia.

## INTRODUCTION

Umbilical hernia repairs (UHRs) represent 14% of all hernia operations in the United States annually<sup>1</sup>; however, there is no consensus on an optimal method of repair. In terms of approach, compared with open repair, laparoscopic repair has been associated with lower complication rates in umbilical,<sup>2</sup> ventral, and incisional hernias.<sup>1,3-5</sup> In terms of reinforcing the abdominal wall and creating a tension-free repair, use of an intraperitoneal mesh was once associated with severe postoperative complications such as obstruction, fistula, sepsis, and recurrence<sup>6,7</sup>; however, with the advent of composite dual-sided meshes, these occurrences have decreased significantly.<sup>6,8-10</sup>

In UHR, the method of mesh fixation has not been studied and is left to the surgeon's preference. Both sutures and tacks have been used in the repair of umbilical hernia. However, they are both associated with specific complications. Transfascial sutures have been speculated to cause increased postoperative pain as the sutures penetrate through several layers of muscle and fascia.<sup>4,5,11-14</sup> Some investigators have suggested that transfascial sutures may cause local ischemia of the muscle<sup>15</sup> or trap intercostal nerve fibers, causing chronic neuropathic pain.<sup>16</sup> Alternatively, suture fixation may be advantageous in providing higher tensile strength, which may lead to lower recurrence rates.<sup>4,17</sup> In the case of tack fixation, significantly decreased operative time has been reported,<sup>18</sup> yet there are also isolated case reports of severe postoperative complications such as small-bowel obstruction and perforation,<sup>19-21</sup> chronic neuropathic pain,<sup>22</sup> and other serious complications from tack displacement.<sup>23,24</sup> Recently, both suture and tack fixation in ventral hernias have been evaluated and shown to have nonsignificant differences in postoperative pain.<sup>14</sup> However, no such analysis has been conducted in UHR.

This study examines postoperative complication rates between suture and tack fixation of mesh in laparoscopic UHR.

## MATERIALS AND METHODS

After obtaining institutional review board approval, a retrospective chart review was performed at the Mount Sinai Medical Center to identify patients who underwent lapa-

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roscopic UHR with mesh between 2003 and 2009. Patients were excluded if they were <18 years of age, or if they underwent other simultaneous procedures. Diagnoses of the umbilical hernias were confirmed through radiological, operative, and perioperative reports.

Patients were divided into 2 groups based on method of mesh fixation: (1) suture group and (2) tacks group. All patients in the suture group were repaired with transfascial sutures placed circumferentially 2 to 3 cm apart with at least a 3-cm overlap between the edges of the mesh and defect. Patients in the tacks group were repaired using stay sutures in each quadrant, and an Endotacker device was used to place tacks ~1 cm apart. The size of the fascial defect was variable, and the type of mesh used was surgeon-dependent.

Patient characteristics, comorbidities, and perioperative data were gathered from medical records. Patients with a history of alcohol abuse were defined as having >5 drinks per a day and tobacco use as >5 cigarettes per a day. Operative data were obtained from surgical notes and anesthesia reports. Follow-up information regarding the development of hernia recurrence and other major (ie, surgical site infection, bowel obstruction) or minor (ie, seroma formation, urinary retention, return to clinic with a complaint of increased pain/constipation/discomfort) complications were obtained through the Mount Sinai Medical Center's electronic medical records—including outpatient follow-up, radiology reports, and emergency department visits. Additionally, a telephone survey was conducted to assess pain scores, time to return to work (recovery time), and overall satisfaction.

Univariate analysis of qualitative variables was performed with the chi-square test or the Fisher exact test if expected cell counts were <5. Univariate analysis of continuous quantitative variables was performed with the 2-sample *t* test. The Welch correction was applied if sample variances were unequal. All analysis was performed with SPSS (SPSS Inc, Chicago, Illinois) and reviewed by a statistician.

## RESULTS

Eighty-six patients were identified and included in this study: 33 in the sutures group and 53 in the tacks group. Both groups were well matched with no significant differences in patient characteristics including age, sex, comorbidities, or past surgical history. In reviewing medical records, the tacks group was found to have a significantly higher number of emergent cases (6 vs 0; *P* = .022). Otherwise, there were also no significant differences in perioperative characteristics such as hernia size (sutures:

4.89 ± 0.58 cm, tacks: 3.68 ± 0.48 cm; *P* = .11), operative time, complications, or length of stay (**Table 1**). The type of mesh used was left to the surgeon's preference; however, most surgeons in both groups used Parietex Composite Polyester Mesh (Covidien, Mansfield, Massachusetts) or Gore Dualmesh (W. L. Gore and Associates, Flagstaff, Arizona).

Complete medical records were found in 29 (90%) patients in the suture group and 31 (58%) patients in the tacks group. Of those patients, hernia recurrence was confirmed by both attending physicians and radiology reports in 3 (10%) patients in the sutures group and 2 (7%) patients in the tacks group (*P* is not significant). In the sutures group, the 3 recurrences developed 1.7 to 2.7 years after UHR, and the body mass indexes of the patients were 34.0, 37.2, and 47.1 at the time of operation. In the tacks group, the 2 recurrences developed within 2.1 to 2.3 years after UHR, and the body mass indexes of the patients were 40.0 and 49.0. In both groups, the fascial defects of these patients were less than 4 cm in size. No significant differences were found between groups in other major (infection, obstruction) or minor (fever within 1 week of operation, return with a chief concern of pain/constipation/discomfort, seroma, urinary retention) postoperative complications (**Table 2**).

Telephone interview was achieved in 16 (48%) patients in the suture group and 30 (57%) patients in the tacks group. There was no difference between groups in postoperative pain at 1 week, 1 year, and 2 years after the surgery. There was also no difference in the time to return to work/normal daily activity (recovery time), patient satisfaction, and duration of pain medication between groups. Subjects in the tacks group showed an increased usage of narcotics for pain relief; however, this increase was not statistically significant. The mean follow-up interval at the time of medical record review and prospective telephone interview was 2.70 years for the suture group and 2.74 years for the tacks group (*P* is not significant).

## DISCUSSION

Although laparoscopic UHR is a widespread and a commonly performed procedure, the method of mesh fixation is poorly studied. Though the primary methods of fixating mesh are with sutures or a tacking device, to our knowledge, this is the first study directly comparing these 2 highly used methods of mesh fixation. A similar study in the setting of ventral hernia repair has also showed no significant difference in postoperative pain between groups, which is consistent with our findings.<sup>14</sup>

**Table 1.**  
Patient History and Perioperative Characteristics

	Sutures Group, n = 33 (%)	Tacks Group, n = 53 (%)	P Values
Past medical history			<i>P</i> = NS
Age, mean ± SEM, y	45.9 ± 2.1	49.4 ± 1.6	
Sex, M/F	10/23	24/29	
Hypertension	12 (36)	16 (30)	
Diabetes	5 (16)	5 (10)	
Coronary artery disease	3 (9)	4 (8)	
Myocardial infarction	1 (3)	1 (2)	
Cerebral vascular disease	1 (3)	1 (2)	
Irritable bowel disease	0 (0)	1 (2)	
BMI, mean ± SEM, kg/m <sup>2</sup>	34.3 ± 1.2	32.8 ± 1.1	
Surgical history			<i>P</i> = NS
Prior abdominal surgery	21 (64)	32 (60)	
Prior UHR	6 (18)	16 (31)	
Social history			<i>P</i> = NS
Tobacco use	6 (18)	13 (25)	
Alcohol abuse	0 (0)	0 (0)	
Steroid use	2 (6)	2 (4)	
Perioperative characteristics			<i>P</i> = NS <sup>a</sup>
Emergent vs scheduled	0 (0.0)	6 (11)	<i>P</i> = .022
Multiple hernias	9 (27)	17 (32)	
LOS, mean ± SEM, d	0.94 ± 0.15	0.94 ± 0.14	
Preoperative incarceration	12 (36)	26 (49)	
Preoperative strangulation	1 (3)	3 (6)	
Preoperative obstruction	0 (0)	3 (6)	
Hernia size, mean ± SEM, cm	4.9 ± 0.59	3.6 ± 0.47	
ASA, mean ± SEM	1.90 ± 0.14	1.98 ± 0.10	
OT, mean ± SEM, min	98.0 ± 6.48	93.59 ± 5.97	
Perioperative complication	0 (0)	0 (0)	
Pregnancy since operation <sup>b</sup>	1 (7)	0 (0)	
Time to follow-up	2.7 ± 0.22	2.74 ± 0.15	

ASA, American Society of Anesthesiologists; BMI, body mass index; LOS, length of stay; NS, not significant; OT, operative time; SEM, standard error of the mean; UHR, umbilical hernia repair.

<sup>a</sup>All variables other than “emergent versus scheduled” in the perioperative group were nonsignificant.

<sup>b</sup>Data collected through patient survey and interview.

Patients were well matched in comorbidities and perioperative characteristics between groups, with the exception of more emergent cases in the tacks group. This may reflect preferential use of tacks in nonscheduled or emergent cases to reduce operative time. In particular, comorbidities associated with vascular disease (ie, diabetes mel-

litus, hypertension) may adversely affect wound healing and increase susceptibility to infection and subsequent hernia recurrence. Additionally, obesity has been associated with longer operating times, larger defects at presentation, and increased risk of recurrence.<sup>12</sup> In our study, body mass index was appropriately matched between

**Table 2.**  
Follow-up Major and Minor Complications—Medical Records<sup>a</sup>

	Sutures Group, n = 29	Tacks Group, n = 31	P Values
Major complications			P = NS
Recurrence	3 (10)	2 (7)	
Infection	1 (3)	1 (3)	
Obstruction	0 (0)	1 (3)	
Minor complications			P = NS
Pain/constipation/discomfort	2 (7)	1 (3)	
Seroma	4 (14)	2 (6)	
Urinary retention	1 (3)	0 (0)	

NS, not significant.  
<sup>a</sup>Values are n (%).

groups, and all recurrences were found in patients who were clinically obese at the time of their operation. Chronic steroid use, heavy tobacco, or heavy alcohol use may also have similar effects on a patient's ability to heal in a timely manner.<sup>25,26</sup> Multiple or prior hernias are a risk factor for hernia recurrence and may suggest a qualitative defect of the fascia (due to connective tissue, vascular disease, or genetics). Additionally, prior abdominal surgery is known to alter the underlying anatomy or make it difficult to visualize landmarks and increase the risk for intraoperative complications. Finally, intra-abdominal adhesions may entrap the bowel and other abdominal structures, causing obstruction, tissue ischemia, and ultimately necrosis and perforation.

There were no differences between groups in postoperative complication rates. Five hernia recurrences were documented: 3 in the sutures group and 2 in the tacks group. Of note, the 5 patients had hernias of approximately the same size and were also clinically obese, which places them at increased risk for recurrence.<sup>27</sup> However, there was no significant difference in recurrences between groups, and this finding is congruent with prior studies conducted in ventral hernia repair.<sup>14</sup> Furthermore, there were no significant differences in other major and minor complication rates.

Regarding the telephone survey, both groups expressed similar pain levels after their operations. The tacks group reported slightly increased narcotic use; however, this difference was not statistically significant. Additionally, because pain scores were similar at 1 and 2 years postop-

eratively, it is unlikely that this had any significant effect on postoperative outcomes. Again, these findings are consistent with earlier case reports and prior speculation of postoperative pain within these groups.<sup>3,5,11-16</sup> Finally, overall satisfaction is similar between groups at follow-up, suggesting acceptable long-term viability of both approaches to mesh fixation.

Our study suggests there is no advantage to either sutures-only or primarily tack fixation of mesh in laparoscopic UHR. In the tacks group, it should be noted that 4 transfascial sutures were used to help orient the mesh and prevent mesh migration along the peritoneal wall. The circumference was then secured with tacks 1 cm apart. Between these 2 methods and a follow-up time of approximately 2.7 years, no advantage to either method is found.

The main limitations of this study stem from its retrospective nature. Data collection could only be as comprehensive as the medical records, and ultimately 10% of patients in the suture group and 42% of patients in the tacks group were lost to follow-up and therefore unable to make a meaningful impact within our study. Additionally, while the defect size in the fascial layer was similar between groups, all recurrences occurred when the defect was  $\leq 4$  cm. Umbilical hernias are frequently small; however, large ( $>10$  cm) hernias are not uncommon, and our findings may not be true in the repair of very large defects. Finally, our telephone survey was limited by patient participation and recall bias. However, this study is the first to compare suture and tack fixation in the repair of umbilical hernias, which is a frequently performed procedure. In the future, a prospective study would help validate our findings and possibly preclude the need for telephone interviews.

## CONCLUSIONS

Postoperative complications of laparoscopic UHR with mesh shows no significant dependence on either suture or tack fixation. This study demonstrates that the use of sutures or tacks in laparoscopic UHR may be used with equal effect.

## References:

1. Erickson KM, Golladay SE, Jacocks A, et al. Abdominal hernias. Medscape. <http://emedicine.medscape.com/article/189563-overview>. Updated May 28, 2013. Accessed January 25, 2011.
2. Lau H, Patil NG. Umbilical hernia in adults. *Surg Endosc*. 2003;17(12):2016-2020.
3. Carbajo MA, Martin del Olmo JC, Blanco JI, et al. Laparoscopic treatment vs. open surgery in the solution of major inci-

sional and abdominal wall hernias with mesh. *Surg Endosc.* 1999;13(3):250–252.

4. Carbajo MA, Martin del Olmo JC, Blanco JI, et al. Laparoscopic approach to incisional hernia. *Surg Endosc.* 2003;17(1):118–122.

5. DeMaria EJ, Moss JM, and Sugerma HJ. Laparoscopic intraperitoneal polytetrafluoroethylene (PTFE) prosthetic patch repair of ventral hernia: prospective comparison to open prefascial polypropylene mesh repair. *Surg Endosc.* 2000;14(4):326–239.

6. Balique JG, Alexandre JH, Arnaud JP, et al. Intraperitoneal treatment of incisional and umbilical hernias: intermediate results of a multicenter prospective clinical trial using an innovative composite mesh. *Hernia.* 2000;4:S10–S16.

7. Marchal F, Brunaud L, Sebbag H, Bresler L, Tortuyaux JM, Boissel P. Treatment of incisional hernias by placement of an intraperitoneal prosthesis: a series of 128 patients. *Hernia.* 1999;3:141–147.

8. Amid PK, Shulman AG, Lichtenstein IL. Tension-free repair of umbilical, epigastric, and incisional hernias. *Contemp Surg.* 1994;44:177–180.

9. Arroyo A, García P, Pérez F, Andreu J, Candela F, Calpena R. Randomized clinical trial comparing suture and mesh repair of umbilical hernia in adults. *Br J Surg.* 2001;88(10):1321–1323.

10. Arroyo SA, Perez F, Serrano P, et al. Is prosthetic umbilical hernia repair bound to replace primary herniorrhaphy in the adult patient? *Hernia.* 2002;6(4):175–177.

11. Berger D, Bientzle M, Müller A. Postoperative complications after laparoscopic incisional and ventral hernia repair: incidence and treatment. *Surg Endosc.* 2002;16(12):1720–1723.

12. Heniford BT, Park A, Ramshaw BJ, Voeller G. Laparoscopic repair of ventral hernias: nine years' experience with 850 consecutive hernias. *Ann Surg.* 2003;238(3):391–399; discussion 399–400.

13. McGreevy JM, Goodney PP, Birkmeyer CM, Finlayson SR, Laycock WS, Birkmeyer JD. A prospective study comparing the complication rates between laparoscopic and open ventral hernia repairs. *Surg Endosc.* 2003;17(11):1778–1780.

14. Nguyen SQ, Divino CM, Buch KE, et al. Postoperative pain after laparoscopic ventral hernia repair: a prospective comparison of sutures versus tacks. *JLS.* 2008;12(2):113–116.

15. Gillian GK, Geis WP, Grover G. Laparoscopic incisional and ventral hernia repair (LIVH): an evolving outpatient technique. *JLS.* 2002;6(4):315–322.

16. Cobb WS, Kercher KW, Heniford BT. Laparoscopic repair of incisional hernias. *Surg Clin North Am.* 2005;85(1):91–103.

17. Eid GM, Prince JM, Mattar SG, Hamad G, Ikramuddin SI, Schauer PR. Medium-term follow-up confirms the safety and durability of laparoscopic ventral hernia repair with PTFE. *Surgery.* 2003;143:599–603; discussion 603–604.

18. Douglas JM, Young WN, Jones DB. Lichtenstein inguinal herniorrhaphy using sutures versus tacks. *Hernia.* 2002;6(3):99–101.

19. Fitzgerald HL, Orenstein SB, Novitsky YW. Small bowel obstruction owing to displaced spiral tack after laparoscopic TAPP inguinal hernia repair. *Surg Laparosc Endosc Percutan Tech.* 2010;20(3):132–135.

20. Ladurner R, Mussack T. Small bowel perforation due to protruding spiral tackers: a rare complication in laparoscopic incisional hernia repair. *Surg Endosc.* 2004;18(6):1001.

21. Peach G, Tan LC. Small bowel obstruction and perforation due to a displaced spiral tack: a rare complication of laparoscopic inguinal hernia repair. *Hernia.* 2008;12(3):303–305.

22. Lantis JC II, Schwaitzberg SD. Tack entrapment of the ilioinguinal nerve during laparoscopic hernia repair. *J Laparoendosc Adv Surg Tech A.* 1999;9(3):285–259.

23. Feliu X, Claveria R, Besora P, Luque D, Viñas X. A calcified foreign body in the bladder due to an unusual complication after laparoscopic incisional hernia repair. *Surg Laparosc Endosc Percutan Tech.* 2011;21(1):e28–e30.

24. Withers L, Rogers A. A spiral tack as a lead point for volvulus. *JLS.* 2006;10(2):247–249.

25. Tonnesen H, Kehlet H. Preoperative alcoholism and postoperative morbidity. *Br J Surg.* 1999;86(7):869–874.

26. Siana JE, Rex S, Gottrup F. The effect of cigarette smoking on wound healing. *Scand J Plast Reconstr Surg Hand Surg.* 1989;23(3):207–209.

27. Sauerlaud S, Korenkov M, Kleinen T, Arndt M, Paul A. Obesity is a risk factor for recurrence after incisional hernia repair. *Hernia.* 2004;8(1):42–46.