



Hernia prevention: practice patterns and surgeons' attitudes about abdominal wall closure and the use of prophylactic mesh

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Abstract

Purpose The penetration of hernia prevention techniques into surgical practice remains unknown.

Methods A survey about knowledge/attitudes on hernia prevention was sent to the members of hernia societies.

Results The 497 respondents were mostly from the US (47%) or Europe (40%). Most reported practicing, but not measuring their suture-to-wound length closure of > 4:1 (63%) and practicing but not measuring the number of stitches (58%). Reasons for not using short stitch closure were: does not apply to patient population (19%), not familiar enough with methods to correctly execute (25%), takes too long (13%), not reimbursed (4%), concerned about closure-related complications (27%), and other (22%). Regarding prophylactic mesh, respondents stated they were not familiar with literature (11%), familiar with literature but would not use (24%), familiar with literature and interested in use (45%), familiar with literature and using (15%), and other (5%).

Conclusions There appears to be some application of hernia prevention principles related to fascial closure; however, the use of prophylactic mesh still appears to be controversial.

Keywords Hernia · Prevention · Prophylactic · Mesh · Laparotomy

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Introduction

Incisional hernias are a common postoperative complication with an incidence of 1–20% [1–4] depending on patient and technical factors. Incisional hernias can be symptomatic, causing discomfort and impaired quality of life. They are also a considerable financial burden to patients, healthcare systems, and society, alike. According to recent estimates, the unanticipated and incremental healthcare costs related to incisional hernias vary from \$3,875 to \$98,424 per patient and the overall cost approaches 3 billion dollars [5].

As has been the case in many areas of medicine, there has been increased emphasis and attention directed toward hernia prevention over the last several years. The main focus has been on the prevention of incisional hernias from laparotomies and the prevention of parastomal hernias. Recent evidence suggests that small bite closures, in which precise fascial closure is performed, for laparotomies and the use of prophylactic mesh in high-risk patients undergoing laparotomies or end stomas reduces the rate of hernia formation [6–14]. Despite the mounting evidence in support of these techniques, their penetration into surgical practice remains unknown. The purpose of this study was to identify interest

in and practice patterns of hernia prevention strategies and potential barriers for implementation through survey of current active international and national surgeons' knowledge and clinical practice.

Materials and methods

A 14-question survey was sent via email and social media to surgeons from the Americas Hernia Society (AHS) (888), European Hernia Society (EHS) (1042), and International Hernia Collaboration (IHC) (3515) on 4/1/2017. The survey was designed and reviewed by 5 experienced hernia surgeons who have a particular interest in hernia prevention and based the questions to address important topics and controversies related to hernia prevention. The survey included 4 questions to assess demographic characteristics of respondents (area of surgical specialty, number of years in practice, type of hospital, and country of residence); 6 questions related to technique and number of laparotomies done, knowledge and practice of the 4:1 suture-to-wound (S:W) length ratio, and short stitch closure; and 4 questions on familiarity and practice patterns related to prophylactic mesh augmentation.

The survey was designed using SurveyMonkey® (<https://www.surveymonkey.com>). The electronic link to the survey was made available to all members of the AHS, EHS, and IHC and remained active from January 4, 2017 through April 11, 2017. Two reminders were sent by e-mail. All responses were anonymous. Descriptive statistics are presented.

Results

Four hundred ninety-seven surgeons responded to the survey for a response rate of 9%; 75% were general surgeons. Respondents had been in practice > 20 years (37%), 16–20 years (19%), 11–15 years (16%), 6–10 years (14%), and 0–5 years (14%). Respondents were hospital employed (38%), private practice (24%), academic (19%), group practice (9%), government employee (4%), employed by health maintenance organization (3%), and other (3%). The majority of respondents were from the US (47%) or Europe (40%). Questions and responses related to demographics and practice patterns are listed in Table 1.

Respondents reported > 100 laparotomies/closures (25%), 51–100 (26%), 16–50 (36%), < 16 (13%), with most closing using a slowly running absorbing suture (81%). The majority responded that they practiced but did not measure their S:W length ratio closure of > 4:1 (63%) and practiced but did not measure their number of stitches/short stitch technique (58%). Surgeons not using the short stitch closure reported these reasons: does not apply to my patient population (19%), not familiar enough with the method to correctly

execute it (25%), takes too long (13%), not reimbursed (4%), concerned about a closure-related complication (27%), and other (22%). Questions and responses regarding knowledge and practice patterns related to laparotomy closure are listed in Table 2.

Regarding familiarity with prophylactic mesh, respondents stated they were not familiar with literature (11%), familiar with literature but would not use (24%), familiar with literature and interested in using (45%), familiar with literature and using (15%), and other (5%). Reasons for not using prophylactic mesh included: does not apply to my patient population (13%), not familiar enough with the methods to correctly execute (12%), takes too long (6%), not reimbursed (14%), not convinced of benefit (23%), concerned about the possibility of mesh infection or mesh-related complications (46%), and other (14%). For respondents using prophylactic mesh, the majority used synthetic mesh (64%) in a sublay position (51%). Questions and responses related to knowledge and practice related to prophylactic mesh are listed in Table 3.

Discussion

This survey attempted to evaluate surgeons' attitudes about two major concepts in hernia prevention: suture closure techniques for laparotomy incisions, and the use of mesh for prophylaxis for laparotomy incisions. In 2015, the EHS published guidelines on abdominal wall closure, recommending continuous suturing with a S:W length ratio of at least 4:1 [8]. They also suggested a small bite technique for laparotomy closure and prophylactic mesh augmentation for high-risk patients undergoing elective midline laparotomy; however, at the time the guidelines were written, there was not enough evidence for strong recommendation for these two suggestions [8].

Several important findings can be gleaned from this survey. With regard to suture closure techniques of laparotomy incisions, most of the surgeons who responded are following current guidelines related to the technique of closure (81% reported closing with a slowly absorbable running suture, 79% using 4:1 S:W length ratio closures, and 72% using the short stitch technique). It is important to recognize that very few of responding surgeons actually measure their S:W length ratio or number of sutures placed to ensure the short stitch technique, with only 16% and 14%, respectively, doing this. The importance of actually measuring S:W length ratio and size of bites for sutures will remain controversial as this practice takes time and many surgeons feel it unnecessary. However, in a recent report of an audit of current practice of wound closure, a 4:1 S:W length ratio was only achieved in 77% of cases [15]. Surgeons should continue to encourage their colleagues to measure their S:W length ratio and

Table 1 Questions related to demographics and practices of respondents

Question	Response	Percentage
(1) What is your main area of specialty?	Acute care surgery	3.82
	Bariatrics	3.41
	Colorectal	7.63
	General	74.5
	Hepatobiliary	1.41
	Plastic surgery	0.8
	Transplant	0
	Trauma	1.2
	Vascular	0.8
	Urology	0.2
	Gynecology	0
	Other	6.22
(2) How many years have you been in practice?	0–5 years	14.37
	6–10 years	14.17
	11–15 years	15.59
	16–20 years	18.62
	> 20 years	37.25
(3) What best describes your practice?	Academic	19.32
	Employment by health maintenance organization	3.42
	Government employee	3.62
	Group practice	9.26
	Hospital employed physician	38.03
	Private practice	23.54
	Other	2.82
(4) In what country/region do you practice?	United States of America	47.19
	Europe	39.76
	South America	4.22
	Canada	1.41
	Asia	2.01
	Africa	0.6
	Other	4.82

stitch number or at least audit their practice to ensure good technique.

Several survey findings regarding the use of prophylactic mesh in laparotomy incisions merit discussion. Unlike suturing techniques for hernia prevention, which most (72–81%) respondents use to help prevent incisional hernias, fewer surgeons (15%) reported using prophylactic mesh to help decrease incisional hernia formation. This unsurprising finding is likely due to the less robust evidence supporting prophylactic mesh (which is currently a weak recommendation in recent EHS guidelines), medicolegal concerns related to the use of mesh and current climate (especially in the USA), and the perceived harm that may be related to this practice. Since this reluctance to use prophylactic mesh was not unexpected, we designed our survey to ask surgeons about potential reasons for this. Not surprisingly, the most commonly reported reason (46%) for not currently

using prophylactic mesh was concern about mesh-related complications; the second most common reason (23%) was not being convinced of its benefit. Two strategies are needed to help dispel these commonly held beliefs related to prophylactic mesh use. These include additional research with long-term outcomes (especially mesh-related complications) and improved education. Another important point confirmed in this study relates to the type of mesh used for prophylaxis. Most respondents reported using synthetic mesh (64%) in a sublay (51%) position as prophylaxis for laparotomy incisions. This is important because most studies showing a benefit of prophylactic mesh used synthetic mesh [8–10, 16], and the efficacy of using biologic and bioabsorbable mesh remains unknown [16]. There are also unanswered questions related to the location of mesh. A 2017 study [10] reported that the onlay mesh was equally as effective as the retrorectus placement, and this may lead more surgeons to

Table 2 Questions and responses regarding knowledge and practice patterns for laparotomy closure

Question	Response	Percentage
(1) How many primary laparotomy or abdominal wall closures do you perform yearly?	< 15	12.45
	16–50	36.35
	51–100	26.51
	> 100	24.7
(2) Which of the following describes your usual technique for laparotomy/abdominal wall closure?	Running permanent suture (ex: Prolene)	9.07
	Running fast absorbing suture (ex: Vicryl)	2.62
	Running slowly absorbing suture (ex: PDS)	80.85
	Interrupted permanent suture (ex: Prolene)	1.21
	Interrupted fast absorbing suture (ex: Vicryl)	2.42
	Interrupted slowly absorbing suture (ex: PDS)	2.22
(3) Which of the following best describes your knowledge of the 4:1 suture-to-wound length ratio for laparotomy closure?	Other	1.61
	Never heard of it	4.26
	Familiar with it, but do not practice	15.21
	Practice but do not measure my suture-to-wound length ratio	63.08
	Practice and measure my suture-to-wound length ratio	15.62
(4) Which of the following best describes your knowledge and practice using the short stitch (small bites) laparotomy closure?	Other	1.83
	Never heard of it	3.04
	Familiar with it, but do not practice	23.33
	Practice but do not measure my suture-to-wound length ratio and number of sutures placed	58.01
	Practice and measure my suture-to-wound length ratio and number of sutures placed	13.79
(5) If you are aware of short stitch (small bites) laparotomy closure methods but do not practice it, which of the following best describes your reason for this?	Other	1.83
	Does not apply to my patient population	18.83
	I am not familiar enough with the methods to correctly perform it	24.27
	It takes too long	12.97
	I am not reimbursed for performing it	3.77
	I am concerned about the possibility of a closure-related complication	26.78
	Other	22.18

transition to an onlay repair, which is thought to be a technically easier operation.

Our study has several limitations. First, the survey tool was self-administered, and did not undergo internal or external validation prior to distribution. However, it was developed and reviewed by five experienced hernia surgeons, and the questions it included are often discussed regarding hernia prevention. Second, as the survey was sent to members of the AHS/EHS and IHC, there is a selection bias of surgeons that likely have a special interest in hernia repair and in hernia prevention, and these results may not be generalizable to general surgeons/population. Third, the response rate was relatively low for some questions and less than 10% globally which may limit the generalizability of the results. The response rate is likely lower than traditional surveys as, in addition to sending out traditional emails, we used the International Hernia Collaboration (IHC) Facebook platform as well. While the IHC is a very active site, many of the

3515 surgeons likely did not see the survey if they didn't log in during the administration time. However, a recent study reported that response-rate-induced bias does not seem to be much of a threat to the validity of questionnaires [17]. We plan, however, to send this survey to some larger societies such as the American College of Surgeons or Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) that are not specifically hernia focused, to learn more about potential barriers to using hernia prevention techniques and to get a larger response.

Conclusions

Most surgeons who responded to our survey evaluating attitudes and practice patterns related to hernia prevention are using suturing techniques that will help reduce incisional hernia rates and are following current guidelines.

Table 3 Questions and responses related to knowledge and practice patterns regarding the use prophylactic mesh

Question	Response	Percentage
(1) I understand that the incisional hernia incidence at 5 years following laparotomy is	5%	4.02
	10%	15.29
	15%	22.74
	20%	40.04
	30%	14.49
	Other	3.42
(2) Which best describes your knowledge/interest in prophylactic mesh for hernia prevention in laparotomy closure for high risk patients?	Not familiar with literature	11.11
	Familiar with literature but would not use	24.04
	Familiar with literature and interested in using	45.05
	Familiar with literature and already doing	15.35
	Other	4.44
(3) If you are familiar with, but do not perform prophylactic mesh placement for hernia prevention, which of the following best describes your reason for this?	Does not apply to my patient population	12.56
	I am not familiar enough with the methods to correctly perform it	12.31
	It takes too long	6.41
	I am not reimbursed for performing it	14.36
	Not convinced of benefit	23.08
	I am concerned about the possibility of mesh infection or mesh-related complications	46.9
	Other	13.59
(4) If you are familiar with and perform prophylactic mesh placement for hernia prevention, in which position do you place the mesh?	Onlay	25.54
	Sublay	50.65
	Intraperitoneal	8.23
	Other	15.58
(5) If you are familiar with and perform prophylactic mesh placement for hernia prevention, which kind of mesh do you use?	Permanent synthetic	63.52
	Absorbable synthetic	16.74
	Biologic	4.72
	Other	15.02

Prophylactic mesh in laparotomy incisions to decrease the incisional hernia rate is used less due to concerns for mesh-related complications and the perceived lack of benefit. There are some differences in attitudes and practices between Europe and the USA related to hernia prevention. Further research and education about best practices in hernia prevention are needed and likely will help increase awareness of current techniques that will help lower rates of incisional hernia.

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Compliance with ethical standards

Conflict of interest Dr. Hope declares the following potential conflicts of interest not directly related to the submitted work: has consulted for CR Bard/Davol, served as a speaker for Bard, WL Gore and Intuitive Surgical, and has received research funding from Bard and Gore. Dr. Fischer declares the following potential conflicts of interest not directly

related to the submitted work: has consulted for Bard, WL Gore, and Allergan. Dr. López-Cano declares the following potential conflicts of interest not directly related to the submitted work: has received consultant fees from Bard, WL Gore, and B. Braun. Dr. Harris declares no conflict of interest.

Ethical approval This study was deemed exempt by our Institutional Review Board.

Human and animal rights This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent Informed consent was obtained by all survey participants.

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