

Current practice of abdominal fascial closure: a survey of Ontario general surgeons

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Objectives: To determine the current practice of abdominal fascial closure among provincial general surgeons. The primary objective was to determine the proportion of surgeons choosing absorbable versus nonabsorbable sutures. Secondary objectives included determining knowledge and attitudes of surgeons to evidence-based medicine and concordance of current practice with level I evidence. **Design:** A survey. **Setting:** The province of Ontario. **Participants:** One hundred general surgeons. **Methods:** A stratified random sample of community and academic surgeons was assembled and a questionnaire was mailed to them. Common clinical scenarios and questions pertaining to attitudes and knowledge of evidence-based medicine were included. **Main outcome measures:** Use of absorbable versus nonabsorbable suture material. Willingness to change current practice on evidence-based level I reports. **Results:** Most surgeons (86%) chose an absorbable suture for abdominal fascial closure. Nonabsorbable suture was chosen by 58% of surgeons in the highly contaminated surgical scenario. Eighty-one percent of surgeons indicated they would be willing to change their current practice of fascial closure if there was evidence that the incidence of wound complications was reduced. Polyglactin (Vicryl) was the most commonly chosen suture. **Conclusions:** The current practice of abdominal fascial closure among Ontario general surgeons is in disagreement with the findings from a recent meta-analysis, recommending a nonabsorbable suture for a 32% relative risk reduction in the incisional hernia rate. The majority of surgeons employ a continuous absorbable closure in common surgical scenarios. A definitive randomized controlled trial comparing continuous nonabsorbable closure versus continuous absorbable closure is warranted.

Objectifs : Déterminer la pratique courante qui a trait à la fermeture de l'aponévrose abdominale chez les chirurgiens généraux de la province. L'étude visait d'abord à déterminer la proportion des chirurgiens qui choisissent des sutures résorbables ou non résorbables. Elle visait ensuite, notamment, à déterminer les connaissances et les aptitudes des chirurgiens face à la médecine factuelle et la concordance entre la pratique actuelle et les données probantes de niveau I. **Conception :** Sondage. **Contexte :** La province de l'Ontario. **Participants :** Cent chirurgiens généraux. **Méthodes :** On a constitué un échantillon aléatoire stratifié de chirurgiens communautaires et universitaires à qui l'on a envoyé un questionnaire par la poste. Le questionnaire comprenait des scénarios cliniques courants et des questions portant sur les attitudes et la connaissance à l'égard de la médecine factuelle. **Principales mesures de résultats :** Utilisation de sutures résorbables ou non résorbables. Volonté de changer la pratique actuelle en fonction de rapports fondés sur des données probantes de niveau I. **Résultats :** La plupart des chirurgiens (86 %) ont choisi une suture résorbable pour refermer l'aponévrose abdominale. Dans le cas du scénario chirurgical à forte contamination, 58 % des chirurgiens ont choisi une suture non résorbable. Quatre-vingt-un pour cent des chirurgiens ont indiqué qu'ils seraient prêts à changer leur méthode actuelle de fermeture de l'aponévrose si des données probantes indiquaient que cela réduirait l'incidence des complications liées à la plaie. Le polyglactin (Vicryl) était la suture choisie le plus souvent. **Conclusions :** La façon de refermer l'aponévrose abdominale qui a cours chez les chirurgiens généraux de l'Ontario ne correspond pas aux constatations tirées d'une récente méta-analyse à la suite de laquelle on a recommandé d'utiliser une suture non résorbable pour réduire de 32 % le risque relatif lié au taux de hernie de l'incision. La majorité des chirurgiens utilisent une fermeture résorbable continue dans les scénarios chirurgicaux courants. Une étude contrôlée randomisée définitive où l'on comparera la fermeture au moyen de sutures non résorbables continues par rapport à l'utilisation de sutures résorbables continues est justifiée.

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The ideal suture for abdominal fascial closure is yet to be determined. Many factors such as patient, and local and technical factors influence wound healing. Suture material and technique of abdominal fascial closure are controllable factors in reducing postoperative wound complications. Wound infection, dehiscence, incisional hernia, suture sinus formation and chronic wound pain continue to be a source of patient morbidity. The incidence of incisional hernias ranges from 5% to 19%,¹⁻³ with a recurrence rate as high as 40% after repair.⁴

To date, randomized controlled trials comparing suture materials and technique have been inconclusive because of small sample sizes and insufficient power.⁵⁻⁸ A recent meta-analysis of randomized controlled trials concluded that to reduce incisional hernia rates a nonabsorbable suture is the ideal material and continuous suture the ideal technique.⁹

The current practice of abdominal fascial closure among Ontario general surgeons is unknown. The purpose of this study was to conduct a provincial survey of academic and community general surgeons in order to determine what suture material and technique they employ for abdominal fascial closure. Secondary objectives included determining surgeons' attitudes to and knowledge of evidence-based medicine, detecting any differences in practice patterns between community and academic surgeons and determining the effect of potential independent predictors (e.g., surgical training, age) on suture use.

Methods

A provincial survey of Ontario general surgeons was conducted between February and May 1999. The *Canadian Medical Directory* 1998 was utilized as the sampling frame to identify Ontario general surgeons.¹⁰ This list identified 535 general surgeons in Ontario, approximately 60%

were academic, university based surgeons and 40% were community surgeons. A computer generated random number sequence was used to generate a random sample stratified for community and academic general surgeons. As there is no literature on current practice patterns of surgeons for fascial closure, for convenience we mailed surveys to 100 of them. As no sample size calculation could be performed *a priori* for the primary objective, *a posteriori* power was calculated. For the secondary objective it was estimated that a sample of 88 surgeons would be necessary to detect a 30% clinically significant difference in practice patterns between community and academic surgeons.

A questionnaire was developed consisting of 23 questions. The questions were compiled by consensus (surgical content experts) and were developed according to the Dillman Survey Methods.¹¹ It comprised 3 parts:

- Clinical scenarios requiring responses on choice of absorbable or nonabsorbable suture, continuous or interrupted suture technique and specific type of suture used (i.e., polydioxanone). Four clinical scenarios, ranging from elective to emergent abdominal cases requiring a laparotomy, were described. Patient and local factors were varied throughout the scenarios (Table 1).
- Knowledge of and attitudes to evidence-based medicine.
- Demographic and practice information, including surgeon's age, site of residency training, number of laparotomies performed per year and approximate percentage of elective and emergent laparotomies.

The questionnaire was pretested on a sample of 10 surgeons, and it was determined that it would take approximately 15 minutes to complete. Postage-paid return envelopes were used, and surgeons who did not return the first questionnaire were sent a second copy.

Descriptive statistics and the χ^2 test for difference in proportions were used for the univariate analyses. The responses of academic versus community surgeons were also compared. A logistic regression model was also formulated such that the dependent variable was defined as the choice of suture material (absorbable or nonabsorbable). The independent predictor variables were defined as number of years in surgical practice, age category, number of laparotomies per year and site of residency training. A *p* value of less than 0.05 was considered statistically significant. Data management and statistical analyses were performed using Statistical Analysis System version 6.07 for SunOS (on Unix).

Results

Practice patterns of abdominal fascial closure

Of the 100 questionnaires mailed, 75 were returned. Of these 75, 12 were excluded because the recipients were either deceased ($n = 2$), retired ($n = 8$) or not general surgeons ($n = 2$). This left 63 responses for analysis, 48 from the first mailing, 15 from the second mailing. The demographic profile of the surgeons who participated is outlined in Table 2.

Academic and community surgeons were similar with respect to age, sex, years in practice and number of laparotomies performed annually. There were slightly more academic surgeons (56%) than community surgeons. The majority of surgeons sampled (50 of 63 responses, 79%) performed more than 50 laparotomies annually.

Most respondents (85%–87%) used an absorbable suture for fascial closure for scenarios 1 to 3 (Table 3). A nonabsorbable continuous closure was more commonly chosen for scenario 4 (high-risk, contaminated). A continuous suture technique was the preferred method of closure (74%–76%) for scenarios 1 to 3, whereas slightly more

than half (53%) of surgeons chose a continuous technique for scenario 4.

The responses of academic and community surgeons were not significantly different for the 4 scenarios, with the exception of scenario 2 (emergent, clean) where community surgeons were more likely to use a continuous suture technique ($p = 0.015$). Most surgeons (41, 65%) consistently used the same suture for all scenarios. Twenty-two (35%) of the 63 respondents used a different suture material throughout the scenarios. Twenty of them (91%) changed their choice of suture only for scenario 4 (high-risk, contaminated).

For specific suture types, polyglactin (Vicryl) was the most commonly chosen suture (39%–44%), followed by polydioxanone (PDS) (24%–26%) then polypropylene (Prolene) (14%–16%) for scenarios 1 to 3. Prolene was chosen most often (44%) for scenario 4 followed by Vicryl.

Self-reported rankings of wound complications are shown in Table 4. Wound pain (chronic) was the most common complication followed by wound infection.

Descriptive analysis of site of residency training on choice of suture technique and material was also explored. Surgeons consistently chose a

continuous absorbable suture irrespective of site of training with the exception of surgeons trained at the University of Western Ontario. These surgeons (7 of 11, 64%) were more likely to choose an interrupted suture technique.

Four potential independent predictor variables for choice of suture material were assessed, and only the number of laparotomies performed was statistically significant for scenario 3 (high-risk, clean) ($p = 0.027$).

Knowledge and attitudes of evidence relating to abdominal fascial closure

Eighty-one percent of surgeons who participated in this survey were aware of published literature on abdominal fascial closure. However, the literature had only influenced 38% of surgeons' current practice. When asked if surgeons would change their current practice if there was evidence that certain sutures had a lower incidence of wound failure, 85% responded that they would. The levels of evidence that would influence this change in practice were as follows: 59% of surgeons would change based on a large randomized controlled trial (RCT), 22% based on a meta-analysis of RCTs and the remainder based on cohort, case-control studies and case series.

Discussion

The current practice of abdominal fascial closure is predominantly a continuous technique and an absorbable suture material. There appears to be little difference between academic and community surgeons. Varying patient and wound factors appeared to have minimal influence as most surgeons (65%) consistently used the same suture material and technique irrespective of clinical scenario.

The most commonly reported suture in this random sample of surgeons was polyglactin (Vicryl). Polypropylene was the most common suture chosen by 44% of surgeons for

Table 1

Description of Clinical Scenarios	
Clinical scenario	Description
1 — elective, clean-contaminated	A 54-year-old man undergoes elective right hemicolectomy for colon cancer
2 — emergent, clean	A 24-year-old healthy man involved in a motor vehicle accident requires a laparotomy for a ruptured spleen
3 — high-risk, clean	A 36-year-old woman with Crohn's disease on steroid treatment has a small-bowel obstruction. An enterolysis is performed; there is no contamination of the abdominal cavity
4 — high-risk, contaminated	A 64-year-old woman presents 2 yr after liver transplantation with perforated diverticulitis. Laparotomy reveals gross fecal contamination

Table 2

Demographic Information for Responding Surgeons (N = 63)			
Demographic data	All surgeons sampled	Academic surgeons	Community surgeons
Age, yr*			
25–35	3	2	1
36–45	19	10	9
46–55	22	12	10
≥56	17	9	8
Sex			
Male	59	33	26
Female	4	2	2
Years in practice, no.*			
1–5	10	8	2
6–10	6	3	3
11–15	15	8	7
16–20	13	4	9
≥21	17	10	7
Laparotomies/yr, no.†			
≤10	0	0	0
11–50	12	6	6
51–100	17	8	9
≥101	33	20	13

*Missing 2 values.
†Missing 1 value

fascial closure in scenario 4, an immunocompromised patient with gross fecal contamination. This suggests that surgeons recognize that a non-absorbable suture is superior in reducing wound failure in the high-risk patient. Why surgeons choose not to use nonabsorbable sutures in the elective scenarios is unknown. It can be postulated that the poor handling characteristics of Prolene may be a factor.

Of the surgeons surveyed 59% indicated that they would be willing to change their practice of abdominal

fascial closure based on the results of a large randomized controlled trial and 22% would be willing based on results of a meta-analysis of RCTs. Therefore, levels I and II evidence would influence 81% of surgeons sampled. But why 19% of surgeons sampled would believe levels III, IV and V evidence is disturbing.

Self-reporting of complications, moderate sample size and non-response bias are potential limitations of this study. However, the 75% response rate for a survey of surgeons

is excellent; recent surveys of surgeons have reported much lower response rates (from 49% to 56%).^{12,13}

The reported rank of incisional hernias was low, only 5.1% of surgeons indicated that this was their most common complication and 27.1% reported it as the second most common complication. The accuracy of these rankings may be unreliable because of self-reporting or that patients are lost to follow-up or seen by other surgeons. A more standardized study evaluating wound complications after laparotomy is warranted.

The multivariate logistic regression model, a secondary analysis, is strictly exploratory owing to small sample size. A *posteriori* power calculation yielded a power of 69% to detect a difference between absorbable and nonabsorbable suture choice. The study primarily aimed to explore current opinions and practice patterns of Ontario general surgeons. There are certainly other factors, such as cost and hospital administrative factors, that may influence a surgeon's choice of suture material. For example, some hospitals only stock sutures manufactured by a certain company. More questions exploring why surgeons chose certain sutures could have been added to the survey. Whether type of incision (transverse versus midline) influences suture choice was not addressed by this survey.

Meta-analysis of RCTs found a 32% risk reduction in the rates of incisional hernias when a nonabsorbable continuous closure rather than an absorbable continuous closure was employed.⁹ In contrast, the most common practice of fascial closure among Ontario general surgeons is an absorbable continuous technique. As incisional hernias contribute significantly to patient morbidity with recurrence rates as high as 45% being reported,⁸ a large definitive RCT with adequate follow-up is warranted. This may be instrumental in changing current surgical practice and ultimately reducing patient morbidity and reoperation.

Table 3

Suture Technique and Material Used by General Surgeons for the Outlined Clinical Scenarios

Clinical scenario	All surgeons, no. (and %)	Academic, no.	Community, no.
1 — elective, clean-contaminated			
Technique			
Continuous	48 (75)	28	20
Interrupted	14 (25)	6	8
Material			
Absorbable	53 (87)	30	23
Nonabsorbable	8 (13)	4	4
2 — emergent, clean			
Technique			
Continuous	49 (76)	30	19
Interrupted	13 (24)	4	9
Material			
Absorbable	52 (85)	28	24
Nonabsorbable	9 (15)	5	4
3 — high-risk elective, clean			
Technique			
Continuous	46 (74)	28	18
Interrupted	16 (26)	6	10
Material			
Absorbable	52 (85)	28	24
Nonabsorbable	9 (15)	4	16
4 — high-risk, contaminated			
Technique			
Continuous	35 (53)	19	16
Interrupted	27 (48)	14	13
Material			
Absorbable	26 (42)	15	11
Nonabsorbable	36 (58)	19	17

*1 missing value.
†2 missing values.

Table 4

Most Common Wound Complications as Reported by the 63 General Surgeons

Wound complication	Most common complication, %	Second most common complication, %
Wound infection	39	47.5
Wound dehiscence	—	1.7
Incisional hernia	5.1	27.1
Suture sinus	1.8	7
Chronic wound pain	54.5	14

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Category 16, Items 11, 12 and 13

11. A patient sustains a facial injury. The computed tomographic (CT) scans are shown. They are diagnostic of a(n)

- (A) orbital “blow-out” fracture
- (B) malar complex fracture
- (C) Le Fort II fracture
- (D) naso-orbital-ethmoid (NOE) fracture
- (E) frontal sinus fracture

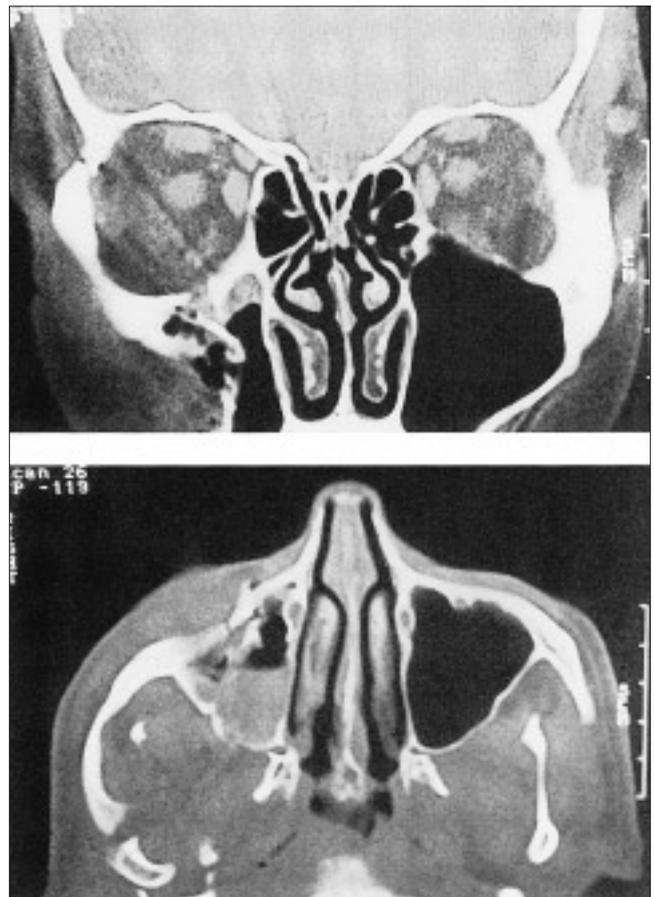
12. Clinical findings associated with this injury include all of the following EXCEPT

- (A) subconjunctival hemorrhage
- (B) infraorbital nerve numbness
- (C) flattening of the cheek prominence
- (D) enophthalmos
- (E) lengthening of the face

13. Which of the following findings is an indication for surgical treatment of this injury?

- (A) Periorbital ecchymosis
- (B) Crepitus in the buccal vestibule
- (C) Unilateral epistaxis
- (D) Impaired extraocular muscle function
- (E) Paresthesias of the cheek and hip

For the 2 incomplete statements and 1 question above, select the answer that is best of the 5 given for each item. For the critique of Items 11, 12 and 13, see page 382.



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