Implementing new surgical technology: a national perspective on case volume requirement for proficiency in transanal total mesorectal excision

Vanessa N. Palter, MD, PhD
Sandra L. de Montbrun, MD, PhD

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Correspondence to:
S. de Montbrun
St. Michael's Hospital
30 Bond St, Rm 16CC 064
Toronto ON M5B 1W8
demontbrunsa@smh.ca

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Background: Early data suggest that transanal total mesorectal excision (TaTME) is a safe alternative to the abdominal approach for rectal cancer. This study aims to understand the approach to the management of rectal cancer in Canada and to ascertain perspectives on introducing TaTME.

Methods: Surgeons were invited to complete a survey that asked about their management practices relating to rectal cancer and their opinions regarding TaTME.

Results: Ninety-four surgeons completed the survey (38% response rate). The number of rectal cancer cases handled annually by surgeons varied widely (1–80 cases, median 15 cases). Twenty-seven percent of respondents performed TaTME at the time of the survey, and 43% of those who did not said they planned on learning the technique. Surgeons who performed TaTME felt that a higher annual volume of rectal cancer cases was required to maintain proficiency than did non-TaTME surgeons (median 20 cases [interquartile range (IQR) 15–25 cases] v. 15 cases [IQR 10–20 cases]). Surgeons who performed TaTME also felt that a higher annual volume of TaTME cases was required to maintain proficiency (median 12 cases [IQR 10–19 cases] v. 9 cases [IQR 5–10 cases]).

Conclusion: These findings help define the current practice environment for rectal cancer surgeons in Canada and highlight the complex issues associated with learning TaTME.

Contexte : Selon des données préliminaires, l'exérèse totale du mésorectum par voie transanale (ou TaTME, pour transanal total mesorectal excision) est une solution de rechange sécuritaire à l'approche abdominale pour le cancer du rectum. Cette étude vise à faire le point sur le traitement du cancer rectal au Canada et à mesurer l'intérêt à l'endroit de la technique TaTME.

Méthodes : Des chirurgiens ont été invités à répondre à un sondage sur leur façon de prendre en charge le cancer rectal et sur leur opinion au sujet de la TaTME.

Résultats : Quatre-vingt-quatorze chirurgiens ont répondu au sondage (taux de réponse 38 %). Le nombre de cancer rectaux traités annuellement par chirurgien variait grandement (de 1 à 80 cas, nombre médian 15 cas). Vingt-sept pour cent des participants appliquaient la TaTME au moment du sondage et 43 % de ceux qui ne l'appliquaient pas disait avoir l'intention de s'y initier. Les chirurgiens qui appliquaient la TaTME se disaient d'avis qu'il fallait un volume annuel plus élevé de cas de cancer rectal pour garder la main comparativement aux chirurgiens qui n'appliquaient pas cette technique (nombre médian de 20 cas [éventail interquartile (ÉIQ) 15–25 cas] c. 15 cas [ÉIQ 10–20 cas]). Les chirurgiens qui appliquaient la TaTME ont aussi estimé qu'il fallait un volume annuel plus élevé de cas de TaTME pour garder la main (nombre médian de 12 cas [ÉIQ 10–19 cas] c. 9 cases (ÉIQ 5–10 cas]).

Conclusion : Ces observations permettent de mieux définir les pratiques actuelles des chirurgiens qui soignent le cancer rectal au Canada et mettent en lumière les enjeux complexes inhérents à l'apprentissage de la TaTME.

The surgical management of patients with rectal cancer has undergone significant changes in recent decades. In 1979, Heald popularized the concept of the total mesorectal excision (TME), which is now considered the standard of care in the surgical treatment of rectal cancer.[1–3] It can be technically challenging, however, to perform a TME dissection using an abdominal approach (either open or laparoscopic). Various factors, including male sex, a narrow pelvis, a high body mass index, low bulky tumours and advanced disease, contribute to this challenge by making both pelvic dissection and the introduction of the stapler into the pelvis significantly more difficult.[4,5] A transanal approach to the TME (TaTME), as opposed to the traditional approach through the abdomen, is hypothesized to be a means of circumventing these challenges.[6] Since the original description of TaTME in 2010, several reports have demonstrated the short-term safety and efficacy of this approach.[7–9]

Although surgeons are often very enthusiastic about learning TaTME, this technique is associated with a number of difficulties and complications, some of which have not been described in either open or laparoscopic TME surgery, including injuries to the urethra, bladder or iliacs.[8] In addition, although the literature on TaTME is too preliminary for learning curve data to be well described, expert consensus indicates that TaTME is a technically demanding procedure that requires advanced training and expertise.[10]

The advent of TaTME thus adds another layer of complexity to the surgical treatment of rectal cancer. The surgical landscape for rectal cancer in Canada remains largely undescribed. There is little information detailing who operates on patients with rectal cancer, what their patient volumes are, who is already performing TaTME, who plans to do so, and how surgeons acquire this new skill before operating on patients. To introduce this new procedure in an informed way, it is necessary to understand how rectal cancer is currently being managed in Canada. The purpose of this study was therefore to understand the current approach to the management of rectal cancer in Canada and to ascertain perspectives on introducing and implementing TaTME in the Canadian context.

Methods

Study design

This study involved a web-based self-administered cross-sectional survey of Canadian general surgeons. The protocol for this study was approved by the Health Sciences Research Ethics Board at the University of Toronto in Toronto, Canada.

Participants

Our population of interest was practising general surgeons and surgical subspecialists who operate on patients with rectal cancer. Respondents were identified through the membership rosters of the following organizations: the American Society of Colon and Rectal Surgeons (ASCRS), the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and the Canadian Society of Surgical Oncology (CSSO). Respondents were excluded if they were no longer in practice or they did not currently operate on patients with rectal cancer.

Survey development

The questionnaire was developed using current principles of survey design.[11] We performed a literature review and developed questions to comprehensively cover the knowledge gap relating to this topic. We initially generated items without restriction and then proceeded with item reduction to retain only the most relevant domains. The questionnaire was designed using this final list.

Ultimately the following domains were addressed in the questionnaire: (a) the demographics of practising surgeons, (b) their experience managing patients with rectal cancer, (c) their experience with transanal TME surgery and (d) their opinions regarding transanal TME. The survey contained 21 items and was designed to be completed in 10 minutes.

Survey administration

The survey was administered using SurveyMonkey. All targeted respondents received an individual email invitation to complete the survey with a unique web link that could be used only once. Electronic reminders were sent to nonrespondents 2 weeks and 4 weeks after the initial invitation. Surveys were considered complete when participants answered more than 80% of the questions.

Data analysis

Descriptive analysis was performed for all completed surveys; data from incomplete surveys were excluded from the analysis. Continuous data were summarized using medians and interquartile ranges (IQRs), and categorical data were summarized by frequencies and percentages. Statistical tests used for nonparametric data included the Wilcoxon rank-sum test and the χ^2 test for categorical variables.

Results

A total of 249 surgeons were identified from the relevant databases and were emailed the survey. Ninety-four

completed the survey (38% response rate). Of the 94 surgeons who completed the survey, 86 operate on patients with rectal cancer at the time of the survey and thus were included in the final analysis (Table 1). The majority of the participants (92%) were fellowship trained in colorectal surgery (42%), surgical oncology (29%) or minimally invasive surgery (21%). Most (83%) were affiliated with an academic institution, with only 15 respondents having a practice that was primarily community based. Fifty-four (67%) participants had been in practice for over 5 years.

The participants operated on a wide range of rectal cancer cases per year (1–80; median 15). The majority (64%) of the participants stated that less than 25% of their clinical volume consisted of rectal cancer cases (Fig. 1).

Table 1. Demographic characteristics of 86 survey respondents who currently operate on patients with rectal cancer

Characteristic	No. (%)
Fellowship training	
Colorectal surgery	36 (42)
Surgical oncology	25 (29)
Minimally invasive surgery	18 (21)
None	7 (8)
Practice location	
Academic	40 (47)
Community with academic affiliation	31 (36)
Community	15 (17)
Years in practice	
< 5	32 (37)
6–15	36 (42)
16–25	9 (10)
> 26	9 (10)

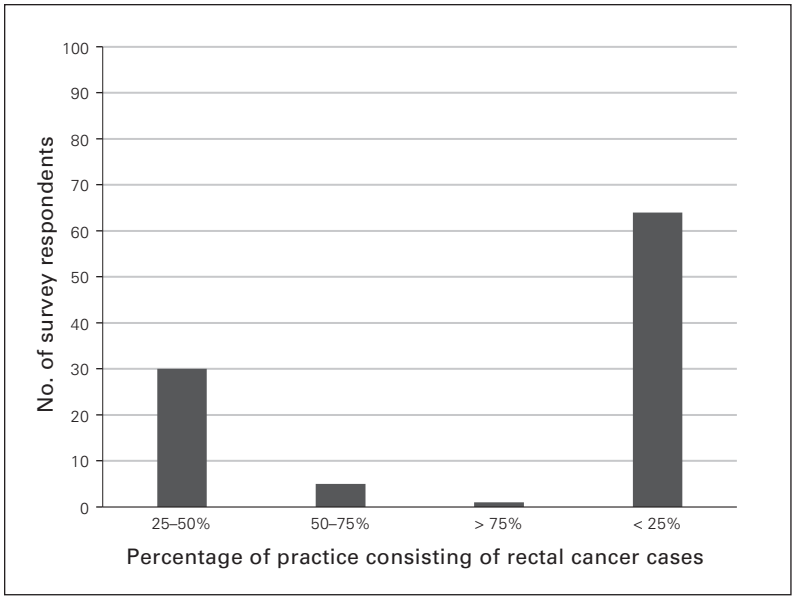

Fig. 1. Percentage of Canadian general surgeons' clinical practice made up of patients with rectal cancer.

Only 27% (23/86) of respondents performed TaTME at the time of the survey; all of these had an academic affiliation and they had a higher annual volume of rectal cancer surgeries than those who did not perform TaTME (median 23 cases [IQR 15–49 cases] for respondents who performed TaTME v. median 10 cases [IQR 7–20 cases] for those who did not). Forty-three percent (27/63) of surgeons who did not perform TaTME planned on learning it, endorsing mentorship and formal courses (76% and 82%, respectively) as critical components for skill acquisition. Of note, 6 out of 24 (25%) surgeons who performed fewer than 8 rectal cancer surgeries per year stated that they wanted to learn this technique.

Several differences were noted between TaTME and non-TaTME surgeons. First, 90% of surgeons who performed TaTME "strongly agreed" that advanced laparoscopic skills are required for this procedure, compared with only 64% of non-TaTME surgeons (p = 0.02) (Table 2). Second, TaTME surgeons felt that a higher volume of rectal cancer cases per year was required to maintain proficiency in TaTME (median 20 cases [IQR 15–25 cases] v. 15 cases [IQR 10–20 cases]; p = 0.28). Finally, TaTME surgeons also felt that a higher annual volume of TaTME cases was required to maintain proficiency (median 12 cases [IQR 10–19 cases] v. 9 cases [IQR 5–10 cases]; p = 0.12) (Table 2).

Those performing TaTME (both independently and mentored) had done so on average for 16 months (range 5–30 mo). Ninety percent of them were assisted by a surgical colleague. Respondents who performed this technique stated that on average they believed that they became comfortable performing TaTME independently after 9 cases (range 3–12 cases). At the time of the survey 7 respondents still did not feel comfortable performing TaTME independently. The experience of the study participants varied greatly. On average, respondents had done 20 cases independently, but the range was from 0 to 100. Surgeons were also using the technique to varying degrees in their rectal cancer patients. On average, respondents stated that they used this technique in 44% of their rectal cancer cases (range 1%–90% of their cases).

Discussion

This exploratory study, which surveyed rectal cancer surgeons across Canada, found that there was considerable variation by practice environment in terms of rectal cancer case volume and experience with TaTME. In addition, we found substantial differences between the perceptions of TaTME surgeons and those of non-TaTME surgeons regarding the difficulty of this technique.

Table 2. Opinions on transanal total mesorectal excision of survey respondents who currently operate on patients with rectal cancer

Opinion category	TaTME surgeons*	Non-TaTME surgeons†	*p* value
Respondents who endorsed the statement "I strongly agree that advanced laparoscopic skills are required for TaTME," %	90%	64%	< 0.05
Volume of rectal cancer cases that respondents believed is required annually for proficiency in TaTME, median no. of cases (IQR)	20 (15–25)	15 (10–20)	
Volume of TaTME cases that respondents believed is required annually for proficiency in TaTME, median no. of cases (IQR)	12 (10–19)	9 (5–10)	

IQR = interquartile range; TaTME = transanal total mesorectal excision.
*Surgeons who were performing TaTME at the time of the survey.
†Surgeons who were not performing TaTME at the time of the survey.

The annual number of rectal cancer cases reported by our study participants varied widely (1–80 cases), with a median of 15 cases. This variation is similar to what was found in a recent survey by Crawford and colleagues that looked at trends in the management of rectal cancer in Canada.[12] In this study, 51% (21/41) of the participating surgeons stated that they operated on more than 20 cases of rectal cancer per year, with 9% of them operating on fewer than 5 cases per year.[12] Although the data assessing volume outcomes for rectal cancer are inconsistent, with some studies showing a relationship and others not, low volumes of rectal cancer cases could prove to be a problem if surgeons are trying to add TaTME to their skill set.[13–17] Indeed, 25% of our cohort of surgeons who operated on 8 or fewer rectal cancer cases per year said they planned to learn TaTME. This might reflect access-to-care constraints in Canada, where patients living in rural and remote areas often have difficulty accessing cancer centres or specialist centres that are located at considerable distances from their communities. It is important to tailor educational strategies to the specific needs of this population of surgeons to ensure that they have sufficient volumes of cases to develop the necessary skill set.

The number of surgeons in our study already performing TaTME was significantly higher than the number reported by Crawford and colleagues (23 versus 4).[12] This might be related to the fact that Crawford and colleagues included only members of the Canadian Society of Colon and Rectal Surgeons in their study, whereas our work demonstrates that both surgical oncologists and minimally invasive surgeons have also adopted TaTME. On the other hand, this increase might reflect the rapid pace of adoption of TaTME. Indeed, in our cohort, 43% of surgeons who did not perform TaTME were interested in learning the technique, which reflects the increasing prominence of this technique both in the literature and in the surgical community. Moreover, a recent study showed that in a 12-month period, a high-volume training centre in the United States conducted 8 2-day training courses attended by 81 surgeons from 51 institutions and 6 countries.[18]

Preliminary work assessing the learning curve for TaTME in rectal cancer reflects the complexity of this technique. A recent study that defined proficiency in TaTME as high-quality TME (complete/near-complete mesorectal envelope, and negative distal and circumferential resection margin) showed a learning curve of at least 45–51 cases.[19] This finding is consistent with the results of a systematic review by Deijen and colleagues, which demonstrated that there is a difference in oncologic outcomes at high-volume (> 30 cases) and low-volume (< 30 cases) centres, with high-volume centres having a higher "complete" TME rate as well as a lower circumferential resection margin involvement and fewer major complications.[20] In another single-centre study, which assessed 138 patients operated on over a 5-year period, there was a substantial drop in major complications once a surgeon's experience exceeded 40 patients.[21] A Delphi study that solicited expert views regarding safe implementation of TaTME, however, concluded that a shorter learning curve is required, with a minimum of 20 cases.[22] Of note, no consensus could be reached on the number of procedures required to reach proficiency.[22] The responses of our study participants reflect the difficulty of this procedure, with individuals experienced in TaTME stating that they felt comfortable performing the procedure independently after an average of 9 cases and that a high volume of cases was needed per year to maintain proficiency.

Of note, participants in our study who used TaTME stated that they did so in 44% of their rectal cancer cases. This may be related to the previously described learning curve data. Perhaps TaTME surgeons recognize the difficulty of the procedure, as well as the length of the learning curve, and are deliberately performing this technique as often as possible to develop and then maintain proficiency. On the other hand, this number could represent the proportion of surgeries for rectal cancer that are facilitated by the TaTME technique. Future work to explore this could inform efforts to find the optimal way to train surgeons in this new technique.

The majority of our participants endorsed both formal courses and mentorship as essential factors in learning TaTME. The fact that mentorship is a critical component of the learning experience is highlighted by the experience of Atallah and colleagues, who reported that 53% of surgeons who attempted a TaTME after attending a 2-day course had surgical complications, the most significant being urethral injury (25% of survey respondents).[18] In addition, our data show a disconnect between surgeons who currently perform TaTME and those who

do not in terms of their appreciation of the difficulty of the procedure: TaTME surgeons said that higher numbers of rectal cancer cases and TaTME cases were required to reach and maintain proficiency than non-TaTME surgeons.

This apparent discrepancy is also reflected in Atallah and colleagues' survey, in which 0% of participants stated at the conclusion of the course that they felt uncomfortable performing the procedure but they still had an unacceptably high complication rate when they actually performed the procedure.[18] Moreover, a significant number of the course participants (32%) in that study had attempted TaTME before participating in the course, but after the course 95% thought the course should be required before performing TatME in clinical practice.[18] This illustrates a potential lack of appreciation even among very experienced surgeons of the difficulty of adopting this technique and attaining proficiency with it.

Clearly, Canadian surgeons are already performing and learning TaTME, with 27% of our participants performing the technique and 43% of our participants wanting to learn it. In a geographically large country such as Canada, where the surgical treatment of rectal cancer is not centralized and where the number of rectal cancer cases handled annually by surgeons varies substantially, it remains unclear how best to train interested surgeons in this technique in a safe manner while ensuring that all surgeons performing TaTME handle sufficient numbers of rectal cancer cases and TaTME cases to achieve and maintain proficiency. In addition to participation in dedicated courses and mentoring, other factors thought to be important in the safe implementation of TaTME include having a local institutional champion, performing the procedure with 2 surgeons (an abdominal surgeon and a perineal surgeon) and ensuring appropriate volumes both in the early phases of the learning curve as well as in the maintenance phase.[22,23] In the Canadian context, our data show that achieving the requisite case volume could potentially be an issue for many surgeons. As such, adopting TaTME as part of a well-defined team approach, where a surgeon is assisting regularly in a colleague's cases, could be helpful in generating the necessary experience to learn this highly technical procedure.

Limitations

The main limitations of this study are those inherent to most survey-based studies, the response rate and the presence of recall bias, which have the potential to limit the ability of this work to accurately reflect the current Canadian landscape. However, the response rate of 38% is consistent with the response rate of other web-based surveys in the literature.[24]

Conclusion

This study highlights the range of the number of rectal cancer cases handled annually by Canadian general surgeons and confirms that there is widespread interest in TaTME and enthusiasm for learning this technique among Canadian surgeons. These findings help to define the current practice environment for rectal cancer surgeons in Canada and add to the body of literature highlighting the complex issues associated with learning TaTME while continuing to maintain the highest standards of patient safety.

Affiliations: From the Department of Surgery, St. Michael's Hospital, Toronto, Ont. (Palter, de Montbrun); and the University of Toronto, Toronto, Ont. (de Montbrun).

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