A comparison of outcomes between laparoscopic and open appendectomy in Canada

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SUMMARY

The benefit of a laparoscopic approach to appendectomy continues to be debated. We compared laparoscopic (LA) with open appendectomy (OA) for appendicitis in Canada using the Canadian Institute for Health Information database (2004–2008). The odds of female patients undergoing LA were 1.26 times higher than the odds of male patients, and the odds of patients with nonperforated pathology undergoing LA were 1.38 times higher than the odds of those with perforated pathology. Increasing comorbidities were associated with OA. While LA is becoming more frequent, the associated length of stay, postoperative complication rate and mortality are clearly lower than for OA. As a result, we support the continued increase in use of LA with regard to both safety and outcomes.

Appendicitis is one of the most common surgical conditions in North America, affecting 8% of the population within their lifetime.¹ First described by McBurney in 1894,² appendectomy remains the standard of care for appendicitis. Until the introduction of the laparoscopic approach by Semm in 1983,³ however, little had changed with regard to surgical technique for almost a century. Since its initial description as a feasible procedure, a multitude of publications have compared laparoscopic (LA) with open appendectomy (OA). Among these studies, the methodological quality ranges from moderate to poor, with many lacking randomization, few blinding investigators, and most analyzing data without applying intention to treat principles.⁴

In a recent meta-analysis by Sauerland and colleagues⁴ (56 studies comparing LA versus OA), significant decreases were noted in wound infection rate, length of hospital stay, postoperative pain and time to return to work in patients who received LA. Unfortunately, LA also displayed an increased risk of intra-abdominal abscesses.⁴ A recent large database study analyzing the Nationwide Inpatient Sample (NIS; 2006–2008) also identified lower overall morbidity, mortality and shorter hospital stays for LA than OA.⁵

Despite these studies supporting the safety and potential advantages of LA, debate remains in Canada as to the best surgical approach. This is evident by the observation that 28% of appendectomies within the NIS database are still being performed using open techniques.⁵ As a result, we used both the Discharge Abstract Database (DAD) from the Canadian Institute for Health Information (CIHI) and Hospital Morbidity Database (HMDb) to compare LA with OA for the treatment of acute appendicitis in Canada. In particular, we assessed the rates of LA versus OA over time (2004–2008) as well as the outcomes for both procedures across pediatric, adult and elderly populations.

Although this Canada-wide analysis of 105 882 patients (2004–2008) displayed similar characteristics to preceding publications comparing LA and OA (mean age 32 yr; male patients 55%; mean length of stay 2.9 d;

Charlson Comorbidity Index [CCI] score of 0 was 96%, CCI 1 was 2.9%, and CCI > 1 was 1%; rate of nonperforated appendicitis was 69%; laparoscopic approach in 48% of cases), the odds of female patients undergoing LA were 1.26 times higher than the odds of male patients. Furthermore, the odds of a patient with a CCI of 0 undergoing LA were 1.35 times higher than patients with a CCI of 1 or more, and the odds of undergoing LA were 1.38 times higher for patients with nonperforated than perforated appendicitis. Patients between 20 and 49 years of age were also more likely to receive LA than both younger and older cohorts. Numerous theories as to why these trends have evolved in Canada are intriguing and include the increased diagnostic capabilities of laparoscopy, improved surgeon comfort with the laparoscopic approach and poorer comfort levels with traditional open techniques among recent trainees.

Aside from patient-specific factors that affect the choice of surgery, we identified geographical differences in the rate of LA. In particular, there is a trend toward the increasing use of LA in western (British Columbia, Alberta, Saskatchewan, Manitoba) and central (Ontario) Canada compared with Atlantic Canada (Prince Edward Island, Nova Scotia, New Brunswick and Newfoundland). Lower rates of LA in Atlantic Canada may relate to surgeon preference or to overall lower health care expenditures in these regions.

In addition to the observed trends in our analysis favouring LA for certain patient populations, our results clearly support the overall safety of LA compared with OA in the Canadian context. Although the overall complication rate was lower in the LA than the OA group (3.2% v. 5.3%), specific complications, such as intra-abdominal abscess and postoperative obstruction, were also reduced in the LA population. To our knowledge, this is the first large database confirmation of these findings. While decreased overall morbidity, mortality and length of stay are supported by prior research, the observed decrease in intra-abdominal abscess in patients who received LA contrasts the results of prior large studies.⁴ This important novel finding likely represent changes in the LA technique over time. More specifically, the decreased use of copious irrigation and increased skill of surgeons using this technique are important contributors. Furthermore, in addition to the overall length of stay being shorter among patients undergoing LA than those undergoing OA (2.3 v. 3.5 d), this surgical time frame has now anecdotally been

converted into a day procedure among many patients with nonperforated appendicitis.

During the period 2004–2008, there was clearly a linear trend toward increasing use of LA (36% in 2004 v. 59% in 2008). While this pattern closely mirrors those observed in other industrialized nations, the 2008 rate of LA remains comparably lower in Canada than in the United States (59% v. 72%).⁵ The trend toward LA likely reflects an increasing acceptance of the lower morbidity and mortality associated with the laparoscopic technique. We expect this trend to continue, with recent literature confirming the superior cost effectiveness of LA.

In summary, our analysis demonstrates an increasing trend toward LA for the treatment of acute appendicitis in Canada. While there remain certain patient characteristics that may influence the decision to choose LA over OA (patient age, female sex and perforation), evidence supports the safety profile for LA. Overall, LA is associated with decreased morbidity, mortality and length of stay. This is particularly relevant to fewer observed intra-abdominal abscesses and postoperative bowel obstructions. Based on these findings, LA appears to be a superb option for the management of acute appendicitis across all patient populations and should be encouraged.

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