

## INGUINAL HERNIA REPAIR: A SURVEY OF CANADIAN PRACTICE PATTERNS

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**OBJECTIVE:** To describe the preferences of general surgeons across Canada with respect to hernia repair technique.

**DESIGN:** A survey by mailed questionnaire.

**PARTICIPANTS:** All 1452 fellows of the Royal College of Physicians and Surgeons of Canada currently holding a certificate in general surgery.

**INTERVENTION:** Two mailings of the survey: the first in December 1996, the second to nonrespondents in February 1997.

**MAIN OUTCOME MEASURES:** Surgeons' preference of hernia repair technique for specified indications. This was analysed according to practice setting and geographic location.

**MAIN RESULTS:** Based on 706 completed questionnaires, the preferred techniques for repair of primary inguinal hernias were as follows: 23% Bassini, 20% mesh plug, 16% Lichtenstein, 15% laparoscopic, 11% Shouldice and 11% McVay. Preference for laparoscopic repair increased to 34% for recurrent hernias and 35% for bilateral hernias. The Atlantic provinces had the lowest preference rates for laparoscopic repair and the highest rates for the mesh plug technique.

**CONCLUSIONS:** Most surgeons select the type of repair on the basis of the clinical scenario. Large variations in practice exist between provinces.

**OBJECTIF :** Décrire l'approche chirurgicale préférée des chirurgiens canadiens pour la cure des hernies de l'aine.

**CONCEPTION :** Sondage.

**PARTICIPANTS :** Tous les associés du collège royal des médecins et chirurgiens du Canada détenant un certificat de spécialité en chirurgie générale ( $N = 1452$ ).

**INTERVENTION :** Un premier envoi en décembre 1996 suivi d'un second envoi aux non-répondants au mois de février 1997.

**PRINCIPALES MESURE DES RÉSULTATS :** L'approche chirurgicale préférée des chirurgiens selon les indications et selon le site géographique et le type de pratique.

**RÉSULTATS :** Sept-cent six questionnaires complétés ont servi pour l'analyse. L'approche préférée pour les hernies primaires sont : 23 % Bassini, 20 % "mesh plug", 16 % Lichtenstein, 15 % laparoscopique, 11 % Shouldice et, 11 % McVay. La popularité de l'approche laparoscopique est de 34 % pour les hernies récidivantes et 35 % pour les hernies bilatérales. Les provinces de l'atlantique ont le plus faible taux de préférence pour l'approche laparoscopique et le taux le plus élevé pour la méthode "mesh plug".

**CONCLUSIONS :** La plupart des chirurgiens sélectionnent une approche chirurgicale selon le scénario clinique. De grandes variations régionales sont observées.

After years of relatively stable practice, the general surgical community is re-exploring the surgical treatment of inguinal her-

nia. General dissatisfaction with long-term results and the morbidity associated with traditional repairs have stimulated interest in several new

procedures. The Lichtenstein, mesh plug and laparoscopic repairs are only some of the newly developed techniques being promoted for their good

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long-term results and improved recovery from the surgical intervention.<sup>1,2</sup>

The purpose of this study was to describe the extent to which new techniques of inguinal hernia repair have been assimilated into Canadian general surgical practice by means of a questionnaire survey. In particular, the aim of the survey was to focus on laparoscopic repair and to describe variations in clinical indications and surgical technique according to geographic location and practice setting.

Despite extensive promotion and initial enthusiasm, laparoscopic hernia repair has not enjoyed the same level of popularity as laparoscopic cholecystectomy. The available randomized clinical trials comparing open and laparoscopic techniques generally report a faster return to regular activities with the laparoscopic approach. Length of hospital stay and complication rates appear to be similar.<sup>3-16</sup> The main arguments against laparoscopic inguinal hernia repair are higher hospital costs, which are due to surgical supplies and the need for general anesthesia.

There could be several reasons why Canadian general surgeons have not embraced the laparoscopic technique as their standard approach to inguinal hernia repair. By now most general surgeons are competent at performing laparoscopic cholecystectomy. In the progression of laparoscopic skill, hernia repair is the next logical step, but some surgeons may find it difficult to obtain additional training. Whereas laparoscopic cholecystectomy reproduces the open approach exactly, laparoscopic hernia repair entails a different procedure with new instrumentation. Uncertainty about the procedure, its efficacy and the complication rates may justifiably deter surgeons from changing to the laparoscopic technique. Hospital budget restrictions and lack of instruments may be other factors that prevent wide

acceptance of this procedure, particularly in the Canadian medical community. Finally, open mesh repairs are an attractive alternative because the skills are easier to acquire and results to date appear to be good.<sup>2</sup>

## METHOD

A questionnaire was developed and distributed to a pilot group of 50 surgeons for validation. Responses led to modifications and creation of the final questionnaire in French and English. This survey was approved by the Conjoint Scientific Review Committee and the Conjoint Medical Research Ethics Board of the University of Calgary. The project was supported in principle by the Canadian Association of General Surgeons.

All current members of the Royal College of Physicians and Surgeons of Canada with certification in general surgery were included in the survey population ( $N = 1452$ ). This group includes 285 surgeons also holding certificates in vascular, cardiovascular, thoracic and pediatric surgery. Each surgeon was assigned a number on a master coding sheet. To ensure anonymity, the master coding sheet was kept separate from the data collected. The first mailing took place in December 1996 and respondents were tracked through their assigned numbers. Nonrespondents were sent a second mailing in February 1997. As an incentive, respondents were promised a summary of the results within 4 months of returning the completed survey.

Double data entry was performed to ensure accuracy. Since the complete population of general surgeons was sampled, the data were expressed as percentages and frequencies. Subgroup analyses were performed to assess differences in surgical preferences according to region and practice set-

ting. Chi-squared analysis was carried out to evaluate the significance of differences between categorical data and analysis of variance was used for continuous variables.

## RESULTS

In total, 826 questionnaires were returned after the 2 mailings. One hundred and twenty questionnaires were excluded from the analysis: 14 members had moved with no forwarding address, 84 were not practising general surgery and 22 questionnaires were received after the cut-off period. The analysis is therefore based on 706 completed questionnaires received from Canadian general surgeons who are currently involved in the surgical treatment of inguinal hernias.

Overall, the preferred methods of repair for primary unilateral inguinal hernias were as follows: open repair, 45% (Bassini, McVay and Shouldice techniques), open repair with mesh, 36% (Lichtenstein and mesh plug techniques) and laparoscopic repair, 15%. The percentage of surgeons preferring laparoscopic repair increased to 34% for the management of recurrent hernias and 35% for bilateral hernias. A majority of surgeons (52%) favoured the McVay repair for femoral hernias. Surgeons using the mesh plug repair used it for all indications including femoral hernias (Table I).

Of the 706 respondents currently treating inguinal hernias, 307 (44%) performed laparoscopic inguinal hernia repair. Of the 307, 150 (49%) used this approach in less than one-third of their cases. Overall, only 174 respondents have performed more than 50 laparoscopic inguinal hernia repairs. The majority of respondents (85%) used the transabdominal approach for laparoscopic hernia repairs. Respondents stated that they reduced the hernial sac completely on average

77% of the time, and the median mesh size used was 8 × 11 cm.

Laparoscopic hernia repairs were performed by 32% of university-based surgeons compared with 48% of

community-based surgeons ( $\chi^2 = 13.049, p = 0.001$ ). There was also a significant overall effect of practice setting on the proportion of laparoscopic hernia repairs performed as a day-care

procedure: community setting, 71%; tertiary-care setting, 60% and university setting, 59% ( $F_{2,341} = 3.110, p = 0.046$ ).

Use of the mesh plug repair was reported by 30% of respondents. The variation in use of this technique by practice setting was not statistically significant (community 31%, tertiary-care 26%, university 27%;  $\chi^2 = 2.177, p = 0.337$ ). Geographically, great variations were noted in the number of respondents who performed mesh plug and laparoscopic hernia repairs. Fig. 1 suggests an inverse relationship in the use of these 2 procedures: laparoscopic repair is most popular in Saskatchewan and least popular in the Atlantic provinces whereas mesh plug repair is most popular in Nova Scotia, New Brunswick and Newfoundland.

The reason most commonly cited by surgeons not performing laparoscopic hernia repair was a lack of convincing evidence for the superiority of this repair (73%). Fifty-five percent of respondents were awaiting the results of clinical trials that demonstrated superiority of this repair. Lack of equipment and lack of training were noted infrequently (9% and 2%) (Table II).

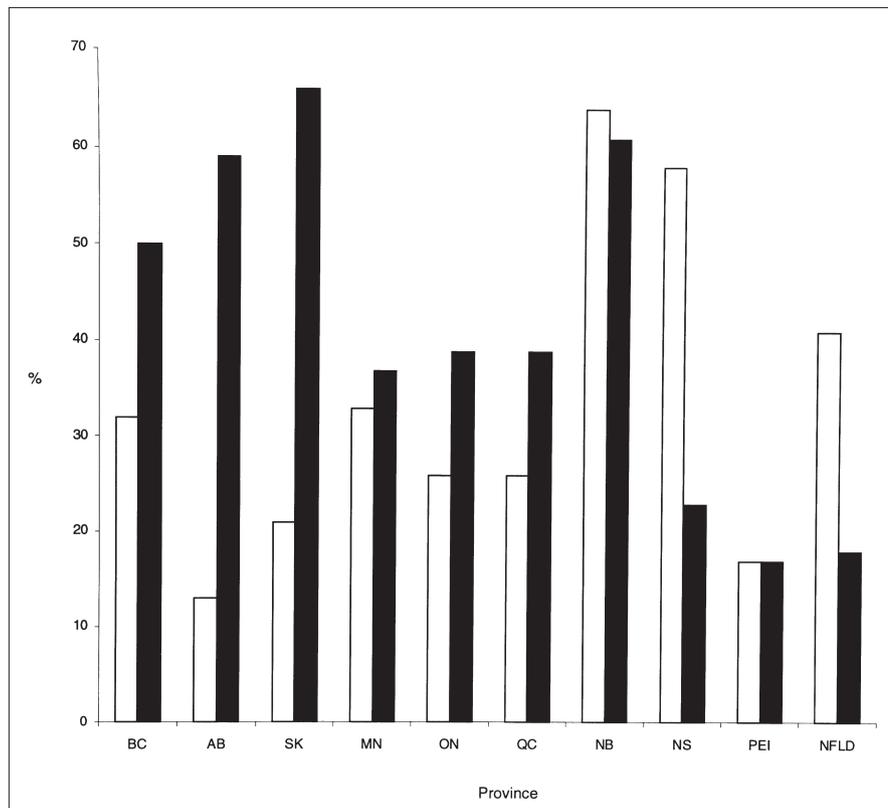
The most frequently cited absolute contraindication to laparoscopic inguinal hernia repair (33% of respondents) was the risk associated with general anesthesia. This was considered a relative contraindication by 49% of respondents. Previous lower abdominal surgery was cited as a relative contraindication by 66% of respondents who performed laparoscopic hernia repair (Table III).

An accurate assessment of the complication rate is difficult to obtain in a survey. To circumvent this difficulty, respondents were asked to estimate the type and number of complications attributable to laparoscopic inguinal hernia repair in their personal series. The following complications of la-

**Table I**

**Respondents' Preference (Percentage) of Surgical Technique by Hernia Type**

Surgical technique	Type of hernia			
	Primary			
	Unilateral	Bilateral	Recurrent	Femoral
Bassini	23	11	4	2
McVay	11	8	10	52
Shouldice	11	8	8	3
Anterior mesh (e.g., Lichtenstein)	16	13	22	4
Preperitoneal mesh (e.g., Stoppa)	1	4	4	2
Mesh plug	20	17	18	18
Laparoscopic (preperitoneal or transperitoneal)	15	35	34	12
Other	2	3	1	7



**FIG. 1. Geographic variations in the proportion of surgeons performing laparoscopic (black bars) and mesh plug (white bars) repair of groin hernias.**

paroscopic inguinal hernia repair were reported (in order of decreasing frequency): hydrocele/seroma, urinary retention, bleeding, nerve entrapment, wound infection, injury to an intra-abdominal organ, severing of vas deferens and mesh infection. The most commonly cited reasons for recurrence were staple security and inadequate size of the mesh.

## DISCUSSION

The relatively high response rate to this survey suggests that results are representative of the general surgical community. To ensure as complete a representation as possible, current members of the Royal College of Physicians and Surgeons of Canada holding a second certificate in a subspecialty other than general surgery were not excluded. This probably overestimates the population of surgeons currently treating inguinal hernias surgically and underestimates the representativeness of the response.

Open surgical approaches that do not include mesh (Bassini, McVay, Shouldice techniques) are still favoured by many general surgeons

(45%). According to our findings, 20% of respondents prefer the mesh plug repair for surgical treatment of primary inguinal hernias. The results also suggest that those using the mesh plug use it uniformly for all types of hernias. This is in contrast to the laparoscopic approach, which is used selectively and most commonly for bilateral and recurrent hernias, where it is preferred by 35% and 34% of surgeons, respectively.

The wide variation in practice according to geographic location was a surprising result. Overall, 44% of general surgeons performed laparoscopic inguinal hernia repairs and 30% performed mesh plug repairs. Saskatchewan had the highest proportion of surgeons performing laparoscopic hernia repair (66%) (Fig. 1). This may be related to strong enthusiasm for this technique and effective training of surgeons early in the development of laparoscopic surgery. It is conceivable that budget restrictions in less affluent provinces have a stronger impact on the choice of surgical procedure. The mesh plug repair can be performed with standard instrumentation and is therefore less expensive,

perhaps explaining its popularity in the Atlantic provinces.

The relative frequency of complications after laparoscopic inguinal hernia repair was not totally unexpected; hydrocele, seroma, urinary retention and bleeding were the commonest complications. Nerve entrapment remains a problem despite the absence of dissection in the immediate vicinity of the ilioinguinal nerve. The laparoscopic approach also places the femoral nerve, lateral femoral cutaneous nerve and genital branch of the genitofemoral nerve, at risk.<sup>17</sup> Whereas mesh infection is an infrequently reported complication, several cases were reported by the survey respondents. This complication is a serious one that can occur up to 10 months after the initial surgery and deserves more attention.<sup>18</sup>

Surgeons who chose not to perform laparoscopic inguinal hernia repair did so mainly because they were not convinced of its superiority. Training, concern about mesh infection, availability of equipment and operating time were not frequently mentioned. It would appear that clinical evaluation and critical appraisal of the outcome were the

**Table II**

**Respondents' Reasons for not Using the Laparoscopic Approach to Inguinal Hernia Repair\***

Reason	%
Not a better repair	73
Waiting for clinical trials demonstrating superiority	55
Higher cost	52
Not trained	36
Need for general anesthesia	23
Concern about mesh infection	17
Not enough operating room time	14
Equipment not available	9
Training not available	2

\*Expressed as a percentage of those who do not perform inguinal hernia repair.

**Table III**

**Relative and Absolute Contraindications to Laparoscopic Hernia Repair\***

Contraindication	Relative	Absolute
General anesthetic risk	49	33
Previous lower abdominal surgery	66	10
Previous deep venous thrombosis	42	10
Femoral hernia	24	10
Large direct hernia	33	9
Young female	27	9
Very large hernia	32	7
Young male	26	7
Large indirect hernia	27	6
Primary hernia repair	22	3
Bilateral hernia	12	1

\*Expressed as a percentage of respondents selecting each statement.

most significant determinants in the choice of surgical technique as opposed to limited resources and inability to obtain training in laparoscopic techniques.

A search of the literature identified several randomized clinical trials that compared laparoscopic inguinal hernia repair with some form of open procedure with or without mesh.<sup>3-16</sup> Most agree that the laparoscopic approach leads to less postoperative pain for the patient and a faster return to usual activities. Although less pronounced, these advantages remain when laparoscopic repair is compared with a form of tension-free repair such as the Lichtenstein or Stoppa techniques.<sup>11-16</sup> Early experience may explain the prolonged surgical times of laparoscopic repair. Costs are uniformly higher for laparoscopic hernia repair.

In a recent multicentre trial conducted in the Netherlands,<sup>19</sup> the extraperitoneal laparoscopic repair was compared with a variety of open inguinal hernia repairs as selected by the surgeon at the time of operation (Bassini 29%, Shouldice 22%, Bassini-McVay 19%, McVay 9%, tension-free mesh repair 3%). Results favoured the laparoscopic group in terms of complication rate, return to activity and Activities of Daily Living score.<sup>19</sup> The recurrence rate at a median follow-up of 607 days was 6% (31 of 507) for the open surgery group and 3% (17 of 487) for the laparoscopic group; this difference was statistically significant. It is interesting that half of the recurrences in the laparoscopic group were attributed to 1 of the 23 surgeons who performed this procedure.<sup>19</sup>

In contrast, there are no randomized clinical trials comparing mesh plug repair with any other method of inguinal hernia repair. In several published case series, long-term recurrence rates of 0.2% to 1.5% have been reported.<sup>20-24</sup> A nonrandomized trial

comparing laparoscopic repair with mesh plug repair demonstrated a faster return to usual activities but a higher cost, more postoperative readmissions and longer operative time in the laparoscopic repair group.<sup>23</sup>

Several randomized clinical trials have compared 2 to 4 open surgical repairs of inguinal hernias.<sup>25-36</sup> In most studies, the Shouldice repair had the lowest recurrence rate when compared with other methods of hernia repair (1% to 6%). Few randomized trials have studied tension-free mesh repairs.<sup>13,16,23,34,36</sup> Because of the short follow-up, no conclusion can be reached regarding the recurrence rate with these techniques. There is general agreement that these techniques are less painful and lead to faster return to usual activities than other open approaches. However, in this respect, the laparoscopic technique appears to be superior.<sup>13,15,16</sup>

Interpretation of the literature on techniques of inguinal hernia repair is made difficult by the large number of described repairs and occasional modifications in technique. Recurrence, the end point of greatest interest, occurs at a relatively low rate, as long as 10 years after the initial surgical procedure, and differences in outcome between techniques may be small. Adequate comparative evaluation requires a large number of patients and long-term follow-up that can best occur through multicentre trials. In this setting, standardization of surgical technique between surgeons becomes a problem.

Since inguinal hernias are not created equal and patient factors must be considered, a single technique is not likely to be superior in all respects and to be suitable for all patients.<sup>37</sup> The results of this survey suggest that most Canadian general surgeons are indeed selective in their choice of a surgical approach to inguinal hernia repair.

Surgical trainees should be proficient in a variety of surgical techniques and be able to select among them given a clinical scenario.

## CONCLUSIONS

Laparoscopy has achieved a low level of assimilation into surgical practice, its highest preference rating being for recurrent and bilateral hernias. Traditional open methods are still preferred by the majority of surgeons, closely followed by open mesh techniques. The mesh plug method is used by 30% of respondents and tends to be applied uniformly for all indications. Randomized prospective trials are required to further evaluate this technique.

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