

Current practice of inguinal hernia repair at University of Cape Town affiliated hospitals: implications for training

EF Scout,  MF Scriba,  M Crous,  JC Kloppers 

Division of General Surgery, Grootte Schuur Hospital and Faculty of Health Sciences, University of Cape Town, South Africa

Corresponding author, email: earlscout@gmail.com

Background: Various inguinal hernia repair techniques exist, without one ‘single best’ option. Hernia society guidelines recommend laparoscopic repair as one of its mainstays, provided surgeons are adequately trained. The current practice for hernia repair in South Africa as well as the surgical registrar exposure to laparoscopic repair training is unknown.

Objectives: To quantify the current practice of inguinal hernia surgery in hospitals affiliated to the University of Cape Town (UCT) and to assess trainee exposure to laparoscopic repair.

Methods: Adult patients who underwent inguinal hernia repair during the 12-month study period, at the four UCT affiliated hospitals were included. Collected data parameters included age, gender, primary or recurrent, uni- or bilateral hernia, primary surgeon consultant or non-consultant, operative time, and open or laparoscopic technique used.

Results: Three hundred and seventy-seven patients were included. Eighty-eight (23.2%) repairs were performed laparoscopically, of which five (5.7%) were converted to open. Non-consultants were present at 70/88 (79.5%) cases performed laparoscopically and were the primary surgeon at only 15 (17%). Laparoscopic repair was performed for 63.6% of bilateral versus 19.5% of unilateral hernias, 39.4% of recurrent hernias and 45% of hernias in females. Two of the four hospitals in this study performed 81.8% of all laparoscopic repairs.

Conclusion: Inguinal hernias in our setting are predominantly repaired by open surgery. The likelihood of laparoscopic repair varies significantly depending on which hospital the patient is referred to. Non-consultants have limited exposure to performing laparoscopic hernia repairs as the primary surgeon.

Keywords: laparoscopy, hernia repair, surgical training

Introduction

Inguinal hernias are a very common problem, with a lifetime occurrence quoted in the literature for high-income countries (HICs) of 27–43% in males and 3–6% in females.¹ The picture in low- and middle-income countries (LMICs) is different, although exactly how different has been difficult to quantify. Studies from Africa have shown that the prevalence can range greatly, with one study from Ghana showing a prevalence of 1 400 hernias per 100 000 people, or 2.7% of the adult male population, much higher than in HICs where the rate is more typically 150–200 hernias per 100 000 people.² As hernias are so common and surgery is the only definitive treatment, it would follow that surgical hernia repair has become one of the most commonly performed general surgical operations globally, with more than 20 million procedures performed annually.¹ Different repair options exist, and there isn’t a “single best method”, so the modern general surgeon needs to be well versed in several different techniques, to best individualise patient treatment.

Hernia societies provide some guidance, with the current international Hernia Surge guidelines recommending that a laparoscopic inguinal hernia repair be the procedure of choice for primary unilateral and bilateral hernias, for recurrences where the primary repair was an open one, as well as for all femoral hernias, and all females with

groin hernias. These recommendations are made with the proviso that the surgeon has the required expertise.³

Very limited data exists as to what the burden of inguinal hernia surgery is in South Africa, with even less known about our laparoscopic experience. The guidelines of the Hernia Interest Group of South Africa recommend three operations that the general surgeon in South Africa should be equally proficient in performing, those being the laparoscopic inguinal hernia repair as the procedure of choice, the Lichtenstein tension-free technique as the preferred method for open repairs, and the Shouldice technique for tissue repairs, where gangrenous bowel is present or a bowel resection is performed.⁴ To achieve this, South African surgeons need to be appropriately trained to attain acceptable outcomes.

The objective of this study is to quantify the current practice of inguinal hernia surgery in hospitals in Cape Town, South Africa, affiliated to the University of Cape Town (UCT), a surgical specialist training institution, and to assess trainee exposure to laparoscopic repair technique.

Methods

This study was conducted over a 12-month study period from 1 January to 31 December 2017. All adult patients (aged 18 years and above) who underwent an inguinal

hernia repair in any of the four UCT-affiliated public hospitals who perform inguinal hernia repairs during this study period were included. This included the Acute Care Surgery Unit at a level three teaching hospital (Centre 1), a level two regional hospital (Centre 2) and two level one district hospitals (Centres 3 and 4). The surgical departments in Centres 1, 2 and 4 all have established operative databases and data about the study participants was retrieved from these databases. Centre 3 does not have an established database and thus surgical theatre logs were used to retrieve the relevant data needed.

Collected data parameters included patient demographics (age and gender) and hernia characteristics, such as whether the hernia was a primary or recurrent hernia and whether it was unilateral or bilateral. Data collected on the hernia repair surgery included whether the primary surgeon was a specialist consultant or a non-consultant trainee surgeon (i.e. surgical specialist trainee or junior medical officer), the length of operative time, and whether the case was done with an open or laparoscopic technique. Cases performed by senior non-specialist medical officers (who are not trainees) were excluded.

Statistical analysis

All collected data were entered onto a Microsoft Excel spreadsheet and analysed with basic statistical methods available in Excel. Descriptive statistics were used to present the analysis, except where comparisons were made between males and females, the consultant and non-consultant primary surgeon groups and laparoscopic versus open repairs. Inferential statistics for categorical data included chi-squared test and Fisher's exact test (for expected values < 5) and student's t-test for normally distributed continuous data. A probability value (*p*-value) of < 0.05 was considered statistically significant.

Results

During the 12-month study period, a total of 377 adult patients who underwent a total of 410 inguinal hernia repairs in the four UCT-affiliated hospitals (one tertiary,

one regional and two district hospitals) were included in the study. Three hernia repairs performed by senior non-trainee medical officers were not included. This equates to an average of 31.4 hernia repairs per month. Of these, 357 were male (94.7%). The mean age for this study was 54.3 years (range 18–89 years). The hernia repair distribution across the four hospitals was as follows: Centre 1: 100 patients (26.5%), Centre 2: 95 patients (25.2%), Centre 3: 94 patients (24.5%), and Centre 4: 88 patients (23.3%) (Figure 1). A total of 316 (83.8%) patients' hernia repairs were done electively, while 61 (16.2%) were done as emergency cases. Thirty-three patients (8.8%) had bilateral hernias. In 344 patients (91.2%) the hernia was primary, while in 33 patients (8.8%) the hernia was a recurrence. Hernia repair was done by a specialist consultant as the primary surgeon in 126 (33.4%) cases while the remaining 251 cases (66.6%) had a non-consultant trainee as the primary surgeon. The mean operative hernia repair time in this series was 67.4 ± 27.2 minutes (IQR 45–80 minutes). Female patients needed an emergency hernia repair in 4 cases (1.1%) and males in 57 cases (15.1%) (*p*-value: 0.633).

Consultant vs non-consultant

A total of 251 (66.6%) patients had their hernia repair performed by a non-consultant as the primary surgeon. In only 43 (17.1%) of these cases where the primary surgeon was a non-consultant, was a consultant present in theatre as the assistant. Thus, of the total 377 patients, more than half (208 patients [55.1%]) had their hernias repaired without any specialist consultant supervision. Non-consultants operating as the primary surgeon only started 15 cases (5.9%) laparoscopically, with seven of these done at Centre 1, six done at Centre 2 and one case each done laparoscopically by a non-consultant at Centre 3 and 4 respectively.

There was no difference in gender between the patients done by a consultant versus those done by a non-consultant as a primary surgeon. Consultants as the primary surgeon were more likely than non-consultants to do the hernia repair laparoscopically (57.9% vs 6.0%) and to do bilateral (15.9% vs 5.2%) or recurrent hernias (13.5% vs 6.4%). Consultants were more likely to do elective hernia repairs

Table 1: Comparison of hernia repair performed by consultant and non-consultant as the primary surgeon

	Consultant (n = 126)	Non-consultant (n = 251)	<i>p</i> -value
Mean age (IQR)	57 (48–68) years	53 (41–65) years	0.0222
Gender			0.5216
Male patient	118 (93.7%)	239 (95.2%)	
Female patient	8 (6.3%)	12 (4.8%)	
Elective vs emergency			< 0.0001
Elective repair	120 (95.2%)	196 (78.1%)	
Emergency repair	6 (4.8%)	55 (21.9%)	
Surgical access			< 0.0001
Open repair	53 (42.1%)	236 (94.0%)	
Laparoscopic repair	73 (57.9%)	15 (6.0%)	
Hernia laterality			0.0004
Unilateral repair	106 (84.1%)	238 (94.8%)	
Bilateral repair	20 (15.9%)	13 (5.2%)	
Primary vs recurrent			0.0210
Primary repair	109 (86.5%)	238 (93.6%)	
Recurrent repair	17 (13.5%)	16 (6.4%)	
Operative time (IQR)	70 (45–90) minutes	66 (45–75) minutes	0.1115

IQR – interquartile range, statistically significant *p*-values highlighted in bold

than non-consultants (95.2% vs 78.1%) and less likely to do emergency repairs than non-consultant surgeons (4.8% vs 21.9%). There was no significant difference in the operative times when repairs were done by a consultant vs a non-consultant as the primary surgeon (70 vs 66 minutes) (Table I).

Laparoscopic vs open repair

Of the total 377 hernia repairs, 88 (23.3%) were selected for laparoscopic repair and 289 (76.7%) were repaired via open surgery. In the total of 88 cases started laparoscopically, five had to be converted to an open repair, equating to a conversion rate of 5.7%. In the group of laparoscopic cases (including cases started laparoscopically and converted to an open repair) the vast majority (85 cases [96.6%]) were elective cases, with only three cases (3.4%) done as emergency laparoscopic cases. When looking at the distribution of laparoscopic cases across the four hospitals included in the study, these cases were performed more commonly at Centres 1 and 2 compared to Centres 3 and 4. Of the total 88 laparoscopic cases 39 (44.3%) were done at Centre 1, 33 (37.5%) were done at Centre 2, 11 (12.5%) were done at Centre 3 and only five cases (5.7%) were done at Centre 4 (Figure 1).

When comparing cases started laparoscopically to those done as an open procedure, it is evident that laparoscopic cases were statistically significantly more likely to be done by a consultant as the primary surgeon, and more likely to be done in bilateral or recurrent hernias or female patients when compared to open repairs. During the 1-year study period, only 15 hernia repairs were done laparoscopically by non-consultants as the primary surgeons across all four hospitals. Non-consultants were present at 70 laparoscopic cases (79.5%), while in the remaining cases both the primary surgeon and assistant were consultants. In only one case done laparoscopically, were both the primary surgeon

and assistant non-consultants, meaning that of the 88 cases done laparoscopically, 87 (98.9%) had a consultant present in theatre. Laparoscopy was less likely to be used for emergency repairs compared to open repairs (3.4% vs 96.6%). There was no significant difference in the mean age of patients having laparoscopic vs open hernia repair and no difference in the mean operative time between laparoscopic and open repair (69 vs 66 minutes) (Table II).

Discussion

This study included a significant number of patients requiring inguinal hernia repair. The only data previously available regarding inguinal hernia repair volumes in South Africa, was Pape et al. from a regional level hospital audit over a four-year period showing 379 elective and 87 emergency hernia repairs,⁵ while Klopper et al. from a tertiary level hospital over a three-year period showed that inguinal hernia repair was the second most commonly performed procedure in their acute care and general surgery unit, accounting for 352 (11.2%) of all procedures performed.⁶

In this study, hernias were repaired by an open technique in 77% and laparoscopically in 23% of cases. International and South African hernia societies recommend laparoscopic repair be performed for bilateral and recurrent hernias, as well as females with hernias, as they are associated with less pain, numbness, and haematoma formation, and provide a quicker return to full function and work.^{3,4} In this study laparoscopic repair was performed for 64% of bilateral hernias, 39% of recurrent hernias, and 45% of hernias in females. This compares favourably with the quality standards set out by the Royal College of Surgeons (RCS) in England, who recommend that there should be a laparoscopic repair rate of > 40% for females, and patients with bilateral and recurrent hernias.⁷ Unilateral hernias in males were repaired laparoscopically in 22.1% of cases in this study.

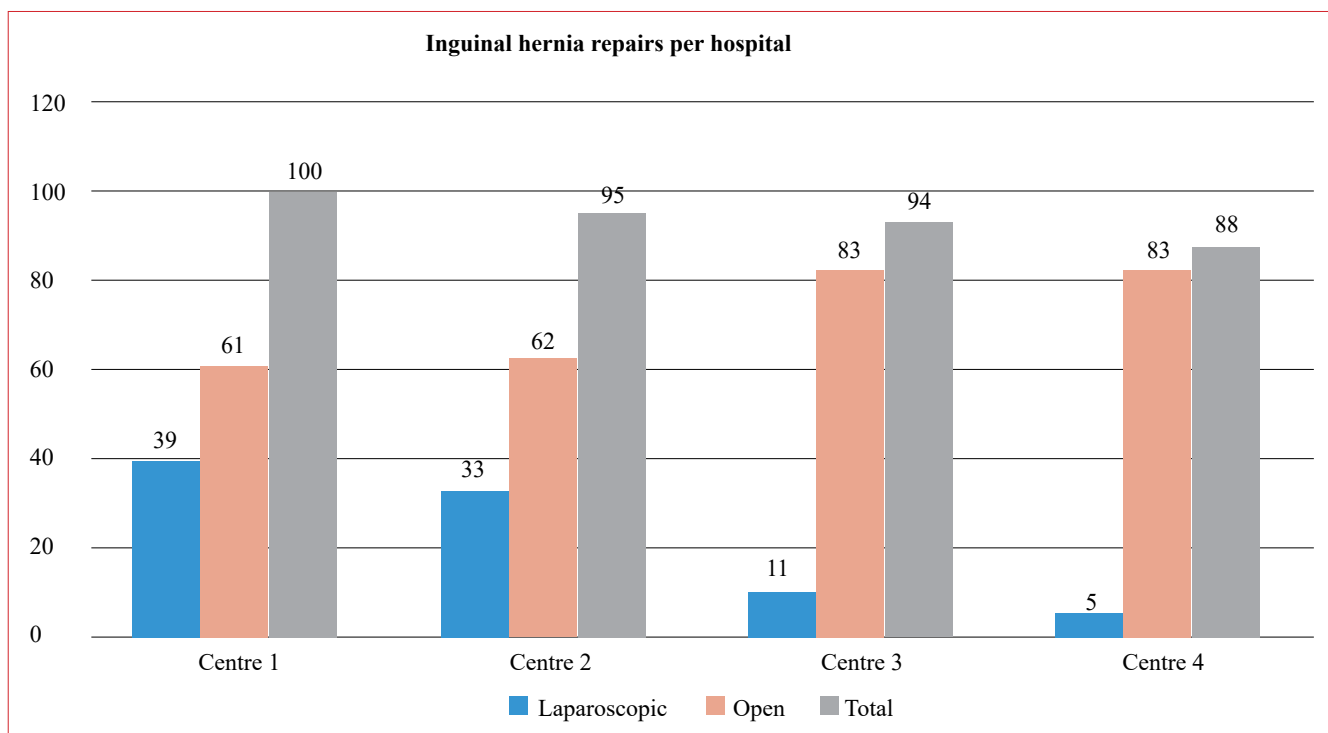


Figure 1: Hernia repairs per hospital

Table II: Comparison of cases started laparoscopically versus open inguinal hernia repairs. Total of 5 cases started laparoscopically were converted to open

	Laparoscopic (n = 88)	Open (n = 289)	p-value
Mean age (IQR)	56 (45–67) years	54 (42–66) years	0.1970
Primary surgeon			< 0.0001
Non-consultant	15 (17.0%)	236 (81.7%)	
Consultant	73 (83.0%)	53 (18.3%)	
Primary vs recurrent			0.0207
Primary hernia	75 (85.2%)	269 (93.1%)	
Recurrent hernia	13 (14.8%)	20 (6.9%)	
Hernia laterality			< 0.0001
Unilateral hernia	67 (76.1%)	277 (95.8%)	
Bilateral hernia	21 (23.9%)	12 (4.2%)	
Elective vs emergency			0.0002
Elective repair	85 (96.6%)	231 (79.9%)	
Emergency repair	3 (3.4%)	58 (20.0%)	
Gender			0.0278
Male patient	79 (89.8%)	278 (96.2%)	
Female patient	9 (10.2%)	11 (3.8%)	
Operative time (IQR)	69 (30–140) minutes	66 (20–180) minutes	0.2129

IQR – interquartile range

It is important when recommending laparoscopic hernia repair, that the surgeon is adequately trained, so as to be proficient and attain comparable outcomes to open surgery, which is still held as the standard of care. This study showed that of the 88 laparoscopic repairs performed, non-consultant surgeons were present at 70 cases (79.5%) but were the primary surgeon in only 15 cases (17%). Published series all show that to be proficient in laparoscopic inguinal hernia repair techniques, surgeons require between 100–200 cases to achieve independent competence.^{8–10} Our current laparoscopic volumes fall below what would be required to overcome this learning curve for independent practice. This, however, seems to be a universal problem, with a review by Köckerling et al. showing that surgical trainees perform on average 50–100 hernia repairs during their training, of which only 25 are laparoscopic.¹¹ Furthermore, Kurashima et al. showed that training required to achieve competence needs to be structured with a goal-directed curriculum and validated assessment tools,¹² while Simons et al. and Poelman et al. showed it needs to be supervised by a mentor, and started fairly early in the surgical training program.^{13,14} Currently, no such laparoscopic hernia training exists in South Africa.

This study also notes that the primary surgeon was a non-consultant at two-thirds of cases, of which 94% were open repairs. Non-consultant surgeons also performed emergency inguinal hernia repairs 90% of the time. Consultants only assisted non-consultants for a total of 43 cases, of which 14 were laparoscopic. This means that 88% of open hernia repairs done by non-consultant trainees were performed without consultant supervision. While one of the factors that make the Lichtenstein tension-free technique so popular is the reported ease with which the procedure can be learned, we also know that around 60 cases are reportedly needed to attain proficiency.³ As there is no standardised assessment tool or minimum number of supervised procedures required before a South African surgeon is signed off as being competent, and as so many procedures are performed without consultant supervision, including difficult emergency cases,

a question exists about practitioners' competence and proficiency in performing these operations.

Laparoscopic hernia repair, especially for primary unilateral hernias in males, remains a contentious issue and there has been a relatively slow uptake in its general use. Trevisonno et al. conducted a study amongst surgeons and trainees in North America and found that 46% of respondents never performed laparoscopic inguinal hernia repairs, and of those, only 26% were interested in learning.¹⁵ To overcome this problem, Köckerling et al. have suggested that dedicated hernia centres be established, where specialist hernia surgeons work who have already passed their learning curve.¹⁶ This would provide high volume centres with better patient outcomes and could also function as hernia training centres. Given the resource constraints, this is a model which could be considered in the South African setting.

While the volume of disease that we face appears to be high, there are questions around the structure and assessment of our training, especially with regards to exposure to laparoscopic hernia repairs. There exists great variability between hospitals and the trainees' experience is influenced by the rotations they are assigned to. Proficiency could be improved through laparoscopic simulation training, with many training institutions now having surgical skills labs where this could be undertaken. Structured training could be formulated with a minimum simulated set requirement. This can also potentially be improved by adopting already available assessment tools. Existing consultants also need to be upskilled through proctorship programmes, so that they can then teach trainees at the respective training hospitals.

A potential weakness of the study is that the data was retrospectively collected over a fixed 12-month period, and quality could vary between the different hospitals due to how variables were captured, as data from some hospitals were exported from prospectively-kept databases, while from others data were extracted from theatre logbooks. Although this allows for data collection and analysis from all hospitals affiliated to the University of Cape Town, the heterogenous nature of the data collection is prone to bias. Specific examples include who actually started the operation

versus who was recorded as the primary surgeon and how the operative time was recorded. Other variables of interest, such as the number of tissue versus mesh repairs performed in the open group, were also not available for review. The study also only provides an overview, and not an individual trainee's exposure to laparoscopic repair through the course of his or her training, nor how many hernia cases on average a surgical trainee is exposed to during the course of his or her training. Further research is required to assess trainee operative exposure throughout the course of a surgical specialist training programme.

Conclusion

Inguinal hernias in our setting are predominantly repaired by open surgery, by non-consultant trainee surgeons. The likelihood of laparoscopic repair varies significantly depending on which hospital the patient is referred to. Non-consultants have limited exposure to performing laparoscopic hernia repairs as the primary surgeon. Further research into surgical trainee exposure to laparoscopic inguinal hernia repair throughout a surgical training programme is needed. Although this is a problem in other centres across the globe, there is a need to improve the training of South African surgeons in laparoscopic inguinal hernia repair. Although this would be met with numerous challenges, the establishment of dedicated hernia centres with a high-volume caseload and the implementation of simulated laparoscopic training are potential solutions.

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Conflict of interest

The authors declare no conflict of interest.





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Ethical approval

This study was formally reviewed and approved by the University of Cape Town Human Research Ethics Committee (HREC REF: 390/2018).

ORCID

EF Scout  <https://orcid.org/0000-0003-1422-5481>
MF Scriba  <https://orcid.org/0000-0001-8903-0510>
M Crous  <https://orcid.org/0000-0002-0488-9412>
JC Kloppers  <https://orcid.org/0000-0003-2438-6879>

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