

Inguinal hernia repair in a community setting: implications for the elderly

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Abstract

Objective Inguinal hernia repair is thought to be a relatively low morbidity operation. This study examined whether this tenet hold true in patients who are elderly with significant comorbidity.

Design Case series. Retrospective review of a prospectively collected database.

Setting Single surgeon practicing in Vermont over a period of 9 years.

Patients Consecutive sample of 2,145 inguinal herniorrhaphies in 1,889 patients.

Intervention Patients underwent an open inguinal hernia repair with mesh placement. A total of 81% of the repairs were performed under local anesthesia with intravenous sedation.

Main outcome measure Presence of comorbid conditions and complications were compared between patients younger and older than 65 years.

Results A total of 2,145 herniorrhaphies were performed on 1,889 patients (1,646 in younger patients and 499 in older patients). Hernia repairs in older patients were more likely associated with comorbid conditions than in their younger counterparts (74 vs 39%; OR = 4.55, $P < 0.0001$). Specifically, hypertension (26 vs 9%; OR = 3.5, $P < 0.0001$), coronary artery disease (34 vs 6%; OR = 8.4, $P < 0.0001$) and benign prostatic hypertrophy (26 vs 4%;

OR = 8.2, $P < 0.0001$) were more commonly present in older individuals. The commonest postoperative complications in both groups were recurrence (3%), hematoma (1%) and nerve entrapment (1%). There were no deaths. There was no significant difference in the rate of postoperative complications (6 vs 7%; OR = 0.95, $P = 0.88$) or recurrence rates (2 vs 3%; OR = 0.82, $P = 0.65$) between groups.

Conclusion Inguinal herniorrhaphy under local anesthesia is a safe operation with a high success rate in the elderly. Patients with significant comorbidities are not at higher risk of complications or recurrences.

Keywords Inguinal hernia · Complications · Recurrence · Elderly

Introduction

Inguinal hernia repair is one of the most commonly performed surgeries in the United States, with over 700,000 performed annually. This surgery can often be performed with good results, minimal morbidity and almost no mortality [1–3]. The hernia literature is burdened by reports from specialty centers that show good outcomes [4–7]; however, these results are often not mirrored in the community setting [1, 8]. Elderly patients with significant comorbidities are occasionally denied surgery due to perceived higher complication rates. When elderly patients present with complications such as incarceration or strangulation, their morbidity and mortality is much higher [9]. As such, it would be beneficial if inguinal hernia repairs could be performed in the elderly on an elective basis.

Herein we present contemporary outcomes of inguinal herniorrhaphies in a community setting, and compare them

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between patients younger and older than 65 years. This study provides data to attest to the safety and success of elective hernia surgery in elderly individuals.

Materials and methods

The study included the retrospective analysis of a database consisting of 2,145 inguinal herniorrhaphies performed on 1,889 consecutive patients. All surgeries were performed by a single surgeon (F.B.R.) at Fletcher Allen Health Care. Fletcher Allen Healthcare is the only tertiary care medical center in the state of Vermont and is served by a single surgical group, of which the primary author was a partner. Data was collected prospectively by the primary author throughout the 9-year study period from December 1995 to February 2005. Comorbidities were entered at the time of surgery. Patients were seen within 1 month following their surgery and thereafter in an opportunistic follow-up model. Complications were recorded at the time of the first postoperative visit, which occurred at less than 5 weeks after the operation, and at all other time points throughout the 9-year study period. Complications were made known to the primary author via office visits, office notes or direct communication. The mean time of follow up was 4.9 years (range 2 months to 9 years). The majority of the herniorrhaphies (81%) were performed under a local anesthetic with mild sedation. Spinal anesthesia was used in 10% of cases, general anesthesia in 6% and a combination anesthetic in 2%.

Patients underwent an open inguinal herniorrhaphy with mesh placement using the Lichtenstein method or modification of the Bassini repair [10–12]. In indirect hernias, the sac was reduced and mesh applied thereafter. Direct hernias underwent a combination of a Bassini repair with relaxing incision and mesh implantation as an onlay to the tissue repair. The mesh was anchored to the pubic tubercle, inguinal ligament and internal oblique muscle with the use of staples or sutures. Recurrences were treated according to the specific anatomic defect. A Perfix plug was used for recurrent hernias [7, 13]. Data was analyzed using Graph Pad In Stat 3, and compared using chi square statistics with a Yates correction. Initially, the association of complications was performed using a univariate analysis of each individual comorbidity and the development of complications. Co-variables were identified through the univariate analysis to determine the level of association with complications using the appropriate statistical tests. A multivariate binary logistic regression model was attempted to produce an adjusted odds ratio describing the association of comorbidities and complications in hernia repair. Odds ratios and 95% confidence intervals are reported. A $P < 0.05$ was considered statistically significant.

Results

Baseline characteristics of the patients

All inguinal hernia repairs performed between December 1995 and February 2005 were included in the analysis. A total of 2,145 inguinal hernias were performed on 1,889 patients. Of these, 499 (23%) were on patients older than 65 years. Elective procedures were performed for 1,817 (85%) hernias, 303 (14%) cases were performed semiurgently and 26 (1%) as an emergency. The patients had a wide array of comorbid conditions, 1,525 comorbidities in 2,145 hernias. There were 1,134 (53%) hernia repairs performed in patients without any comorbidity, and 1,004 (47%) in patients who had at least one comorbidity. The most common medical problems were hypertension 286 (13.3%), coronary artery disease 266 (12.4%) and benign prostatic hypertrophy 201 (9.4%). Smoking was an associated factor for 229 (10.7%) hernia repairs. Table 1 shows the baseline characteristics of the hernia repairs and their co-morbidities.

Complications

The great majority of the herniorrhaphies (91%) were performed without complication. There were a total of 191 complications, of which 49 (25.6%) were intraoperative, and 142 (74.4%) were recognized in the postoperative period. The most common intraoperative complication was ilioinguinal nerve incarceration or transection (1.0% of total hernias performed). Hernia recurrence was the most common postoperative complication, happening in 60 herniorrhaphies (2.8% of total hernias performed), followed by wound hematoma 29 (1.4% of total) and nerve entrapment 26 (1.2% of total). There were no deaths. Table 2 shows the complication rates.

Analysis of recurrences

Multivariate analysis was performed to examine factors predictive of hernia recurrence. The presence of a comorbid condition was not associated with a higher likelihood of recurrence (OR = 1.1, $P = 0.93$). Similarly, hypertension (OR = 1.3, $P = 0.57$), coronary artery disease (OR = 0.4, $P = 0.12$), obesity (OR = 1.1, $P = 0.89$), asthma/COPD (OR = 0.2, $P = 0.16$) and benign prostatic hypertrophy (OR = 1.3, $P = 0.70$) were not shown to be associated with a greater likelihood of recurrence. In contrast, herniorrhaphies in patients with a history of a cerebrovascular accident were more likely to recur compared to those in patients without such comorbidity (OR = 4.5, $P = 0.04$). Table 3 shows factors predictive of hernia recurrences.

Table 1 Baseline characteristics and associated comorbidities

Characteristic	Number	Percentage
Total	2,145	100
Male	1,995	93
Female	150	7
Left	972	45
Right	1,112	52
Unknown side	58	3
Unilateral	1,633	76
Bilateral	512	24
Younger than 65	1,646	77
Older than 65	499	23
Elective	1,817	85
Semi-urgent	303	14
Urgent	26	1
Comorbidity		
None	1,134	53
At least one comorbidity	1,004	47
HTN	286	13.3
CAD	266	12.4
Smoking	229	10.7
Prost CA/BPH	201	9.4
Obesity	99	4.6
COPD/asthma	97	4.5
Diabetes	65	3.0
PVOD	61	2.8
Malignancy	58	2.7
Cirrhosis/hepatitis	48	2.2
Endocrine	36	1.7
CVA	27	1.3
PUD	23	1.1
Renal failure	14	0.7
HIV	6	0.3
Bowel malabsorption	5	0.2
Pregnancy	2	0.1
Seizures	2	0.1

Comparison of baseline characteristics between patients younger and older than 65

Hernia repairs in older patients were more likely to be associated with comorbid conditions than in their younger counterparts (74 vs 39%; OR = 4.6, $P < 0.0001$). Specifically, hypertension (26 vs 9%; OR = 3.5, $P < 0.0001$), coronary artery disease (34 vs 6%; OR = 8.4, $P < 0.0001$), and benign prostatic hypertrophy (26 vs 4%; OR = 8.2, $P < 0.0001$) were all more commonly present in older individuals. Conversely, both smoking (6 vs 12%; OR = 0.5,

Table 2 Complications

Complication	Number	Percentage
All complications	191	8.9
Intraoperative complications	49	2.3
Ilioinguinal nerve transection or incarceration	22	1.0
Excessive bleeding	9	0.4
Epigastric artery ligation	7	0.3
Arrhythmia	3	0.1
Vas deference laceration	3	0.1
Testicular removal	2	0.1
Syncope	2	0.1
Bowel injury	1	0.05
Postoperative complications	142	6.6
Recurrence	60	2.8
Wound hematoma	29	1.4
Nerve entrapment	26	1.2
Scrotal hematoma	7	0.3
Wound infection	4	0.2
Urinary retention	4	0.2
Genital femoral neuralgia	3	0.1
Testicular atrophy	2	0.1
Orchitis	2	0.1
Bowel obstruction	1	0.05
Intestinal necrosis	1	0.05
Cellulitis	1	0.05
Lymphedema	1	0.05
Death	0	0

$P = 0.0006$) and obesity (3 vs 5% OR = 0.5, $P = 0.02$) were less likely present in the elder group.

Table 4 compares comorbid conditions between both groups.

Comparison of complications between patients younger and older than 65

Despite the higher rate of comorbid conditions in those older than 65, there was no significant difference in the rate of overall complications (9.8 vs 8.7%; OR = 1.1, $P = 0.49$), intraoperative complications (3.4 vs 1.9%; OR = 1.8, $P = 0.08$) or postoperative complications (6.4 vs 6.7%; OR = 0.95, $P = 0.88$) between groups. Specifically, recurrence rates (2.4 vs 2.9%; OR = 0.8, $P = 0.65$), wound hematomas (2.4 vs 1.3%; OR = 1.1, $P = 0.91$) and nerve entrapment (1.4 vs 1.3%; OR = 0.8, $P = 0.80$) were not significantly different. Table 5 compares complication rates between groups.

Table 3 Hernia recurrences by comorbid condition

Comorbidity	Recurrence rate	OR	<i>P</i> value
None	2.7	0.9	NS ^a
At least one comorbidity	2.9	1.1	NS
HTN	3.5	1.3	NS
CAD	4.1	0.4	NS
Smoking	2.6	0.9	NS
Prost CA/BPH	3.5	1.3	NS
Obesity	3.0	1.1	NS
COPD/asthma	0	0.2	NS
Diabetes	1.5	0.5	NS
PVOD	4.9	1.8	NS
Malignancy	1.7	0.6	NS
Cirrhosis/hepatitis	4.2	1.5	NS
Endocrine	5.6	2.1	NS
CVA	11.1	4.5 (1.5–6.7)	0.0404
PUD	4.4	1.6	NS
Renal failure	0		
HIV	0		
Bowel malabsorption	0		
Pregnancy	0		
Seizures	0		

^a Non significant

Discussion

The present manuscript reports the results of a large number of inguinal herniorrhaphies performed in Vermont over a period of 9 years. All herniorrhaphies were performed by the same surgeon (F.B.R.) using the Lichtenstein method. Important insight is gained from this data.

1. Inguinal hernia repair can be performed safely and successfully in the community setting with no mortality regardless of patient age.
2. The presence of comorbid conditions is not correlated with hernia recurrence.
3. Even though elderly patients have higher rates of comorbidity, they do not appear to have a higher rate of complications or recurrences.

This paper confirms that elective inguinal hernia repair can be performed safely in the community setting. There were no deaths, and the complication rate was low (9%). Furthermore, the great majority of complications did not result in significant morbidity. This low complication rate may be related to the adoption of a tension free method, as well as the prevalence of local anesthesia as the anesthetic of choice.

Table 4 Comorbid conditions between age groups

Characteristic	% Older than 65	% Younger than 65	OR (95% CI)	<i>P</i> value
Comorbidity				
None	26	61		
At least one	74	39	4.6 (3.6–5.7)	<0.0001
HTN	27	9	3.5 (2.7–4.5)	<0.0001
CAD	34	6	8.4 (6.4–11.1)	<0.0001
Smoking	6	12	0.5 (0.3–0.7)	0.0006
Prost CA/BPH	27	4	8.2 (6.0–11.2)	<0.0001
Obesity	3	5	0.5 (0.3–0.9)	0.02
COPD/asthma	8	4	2.3 (1.5–3.5)	<0.0001
Diabetes	6	2	3.1 (1.9–5.2)	<0.0001
PVOD	9	1	12.1 (6.6–22.2)	<0.0001
Malignancy	6	2	3.7 (2.1–6.3)	<0.0001
Cirrhosis/hepatitis	1	3	0.5	NS ^a
Endocrine	3	1	2.1 (1.1–4.2)	0.0415
CVA	3	1	3.1 (1.5–6.7)	0.0044
PUD	1	1	1.2	NS
Renal failure	1	0.05	2.5	NS
HIV	0	0.4	0.3	NS
Bowel malabsorption	0.2	0.2	0.8	NS
Seizures	0	0.1	0.7	NS

^a Non significant

Table 5 Complication rates between age groups

Complication	% Older than 65	% Younger than 65	OR (95% CI)	P value
All complications	9.8	8.7	1.1	NS ^a
Intraoperative complications	3.4	1.9	1.8	NS
Ilioinguinal nerve transection or incarceration	1.6	0.8	1.9	NS
Excessive bleeding	0.4	0.4	0.9	NS
Epigastric artery ligation	0.2	0.4	0.5	NS
Arrhythmia	0.2	0.1	1.7	NS
Vas deference laceration	0.6	0	23.2(1.2–18.2)	0.0111
Testicular removal	0.4	0	16.5	0.0811
Syncope	0	0.1	0.7	NS
Bowel injury	0	0.1	1.1	NS
Postoperative complications	6.4	6.7	0.9	NS
Recurrence	2.4	2.9	0.8	NS
Wound hematoma	2.4	1.3	1.1	NS
Nerve entrapment	1.4	1.3	0.8	NS
Scrotal hematoma	1.0	0.4	0.5	NS
Wound infection	0.2	0.2	1.1	NS
Urinary retention	0	0.2	0.4	NS
Genital femoral neuralgia	0.2	0.1	1.7	NS
Testicular atrophy	0	0.1	0.7	NS
Orchitis	0.2	0.1	3.3	NS
Bowel obstruction	0.2	0	9.9	NS
Intestinal necrosis	0.2	0	9.9	NS
Cellulitis	0	0.1	1.1	NS
Lymphedema	0.2	0.1	3.3	NS
Death	0	0		

^a Non significant

The most common complication was hernia recurrence. Our recurrence rates of 2.8% are slightly higher than those reported by specialty clinics, but consistent with what is reported when non-specialty clinics perform the repair [1, 2]. Recurrence was usually diagnosed more than 5 weeks after the initial surgery. Analysis of our dataset revealed that the presence of comorbid conditions was not associated with a higher rate of hernia recurrence. On the other hand, the subgroup of patients with a previous cerebrovascular accident was identified as having a higher rate of recurrence. These results should be interpreted with caution given the small sample size and the possibility of a type 1 error. This paper does not provide insight into the etiology of hernia recurrences in our cohort. Factors unrelated to the patients' medical status, such as technical details, appear as likely contributors. Data from the era of tissue repairs had found higher rates of hernia recurrences in patients with chronic obstructive pulmonary disease or benign prostatic hypertrophy [14]. Our analysis was unable to document such correlation. Larger contemporary studies will need to

be performed to answer this question in the era of tension free repairs and single digit recurrence rates.

The safety of open inguinal herniorrhaphy in the elderly has been confirmed by this report. In our database, elderly patients had significantly higher rates of comorbid conditions, but no increased rates of complications or recurrence. As long as inguinal herniorrhaphy can be performed under a local anesthetic and as an elective procedure, it should not be withheld from the overwhelming majority of elder individuals, even in the presence of significant comorbidity. Hernia incarceration and strangulation, although unlikely, pose an unnecessary threat to a person's life, especially in the elderly. Having said this, it should be noted that in our practice there were patients who were turned down for elective herniorrhaphy. In these individuals, it was the opinion of the surgeon author that the risk/benefit ratio of repairing the hernias exceeded that of non-operative management. An example of such a patient would be someone on home oxygen with a large hernia and loss of domain who is short of breath while sitting in the clinic being examined. The

number of patients turned down amounted to less than 1% of the total operative population.

The strengths of this study are that it was performed in the community and better reflects the status of hernia surgery in the United States. The database is large enough to allow for accurate analysis on complications that have a low rate of occurrence. Our patients were followed over a reasonably long period of time (4.9 years on average). The limited number of hernia specialists in Vermont and the prospective collection of data, allowed for a high capture rate of complications. Vermont is somewhat unique in that it has a stable patient population with excellent follow up rates. The surgeon who performed the repair at Fletcher Allen Health Care (F.B.R.) was in a group practice situation where all the other surgeons were partners. As such, any recurrences or complications were made known to the author via office notes or direct communication.

This study is limited by being retrospective and by the fact that it represents a single surgeon's experience in a specific setting. Thus, the conclusions of the manuscript cannot be generalized to other environments. Another potential threat to the validity of the conclusions of this study is that there may have been patients who developed complications, or who chose to follow up with a different surgical group or at another medical center. Thus, the true incidence of complications could have been confounded by their being lost to follow up.

In conclusion, elective inguinal herniorrhaphy is a safe operation with a high success rate in the community setting. Elderly patients with significant comorbidities are not at higher risk for complications or recurrences.

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