

Risk factors related with unfavorable outcomes in groin hernia repairs

M. Akinci · Z. Ergül · B. Kulah · K. B. Yılmaz ·
H. Kulacoğlu

Received: 25 February 2010 / Accepted: 15 May 2010 / Published online: 5 June 2010
© Springer-Verlag 2010

Abstract

Purpose Hernia repairs are a common surgical procedure, and are associated with a significant cost. Despite the acceptance of the advantages of early elective hernia repairs, the incidence of emergency admissions with complicated presentations remains high, and the natural history of an untreated hernia is not obvious. This study aimed to define risk factors related with unfavorable outcomes in groin hernia repairs.

Methods We analyzed the records of 685 elective or emergency repairs of groin hernias between December 2005 and June 2009. Patient age ranged from 17 to 85 years, with 240 (35%) of patients being older than 60 years of age. Indirect inguinal hernias were the most common hernia type in both sexes of patients. Coexisting cardiopulmonary problems were noted in 294 male and 33 female patients. American Society of Anaesthesiologists (ASA) grades 3 and 4 were encountered in 61 (9%) patients. Data were analyzed by chi-square test.

Results Significantly high incarceration and strangulation rates were found in females and femoral hernia type. The overall morbidity rate was 7%, major complications 3%. No mortality was observed in the series and postoperative

complications were significantly more common in patients with high ASA score and severe coexisting cardiopulmonary problems. Advanced age, delayed admission, femoral type hernia and female sex were also linked with unfavorable outcomes.

Conclusions The risk of complicated presentation and unfavorable outcome in patients with groin hernia is significant in the presence of factors such as advanced age, femoral hernia, female sex, delayed admission, severe coexisting cardiopulmonary problems and high ASA score. Although it is difficult to estimate the natural history of untreated hernia, hernia repairs of patients with the above-mentioned risk factors should be timely and elective.

Keywords Risk factor · Hernia repair · Groin hernia · Untreated hernia

Introduction

Inguinal hernia repairs are the most common elective procedures performed by surgeons and represent a significant health care cost. However, although it is well known that elective hernia repairs have more favorable outcomes, many patients present with incarceration and strangulation, which are associated with significant morbidity and mortality. There is no consensus on one solution for inguinal hernia repair. The age of the patient and coexisting problems considerably influence the surgical strategy and anesthetic technique chosen. Hernia surgery still attracts so much attention due to this confluence of surgeons, procedures and socioeconomic aspects [1–6].

There is no adequate information about the natural history of untreated inguinal hernias [7–9]. Thus, many surgeons suggest that all inguinal hernias should be

M. Akinci (✉) · Z. Ergül · B. Kulah · K. B. Yılmaz ·
H. Kulacoğlu

Department of General Surgery,
Ankara Diskapi Yildirim Beyazit Education and Research
Hospital, İrfan Bastug Cad Diskapi, 06110 Ankara, Turkey
e-mail: melihakinci@yahoo.com

Present Address:

M. Akinci
Department of General Surgery, Ankara Diskapi Education
and Research Hospital, 1424. Cadde 1435. Sokak 4/14 06520,
Cukurambar, Ankara, Turkey

Table 1 Distribution of type and location of groin hernias according to age and sex

No. of patients	Hernia types ^a				Total hernia repairs
	Direct	Indirect	Femoral	Direct + indirect	
Male (570)	211 (34%)	322 (52.4%)	15 (2.4%)	66 (10.7%)	614 (89.5%)
Female (69)	17 (24%)	33 (46.5%)	15 (21%)	6 (8.5%)	71 (10.5%)
>60 years old	93 (40%)	107 (45%)	12 (5%)	28 (12%)	240 (35%)
≤60 years old	135 (30%)	248 (56%)	18 (4%)	44 (10%)	455 (65%)

^a Bilateral groin hernias were noted in 44 male and 2 female patients

operated at diagnosis. They also perceive that complicated groin hernias presentations, such as bowel obstruction or incarceration with strangulation, require emergency operations.

The purpose of this study was to define the risk factors correlated with unfavorable outcomes in patients who underwent elective or emergency inguinal hernia repairs.

Patients and methods

The records of 685 patients who underwent elective or emergency surgery for preoperative diagnosis of inguinal hernia between December 2005 and June 2009 in our clinic were analyzed retrospectively. Data recorded for each patient included the type of presentation, age, sex, past medical history, duration of symptoms, presence of coexisting diseases such as cardiopulmonary disease, hypertension, diabetes, prostatic enlargement, type of hernia, American Society of Anesthesiologists (ASA) class, type of anesthesia, contents of hernial sac, surgical procedures, complications, length of hospitalization and mortality. Incarceration was defined as irreducibility of an external hernia and strangulation as irreducibility with objective signs of ischemia or gangrene.

The results were analyzed statistically using SPSS for Windows program (SPSS, Chicago, IL). Comparisons of variables were made using the chi-square test with Yates' correction. *P* values less than 0.05 were considered significant.

Results

During the above mentioned period, a total of 685 hernia repairs were carried out in 639 patients with groin hernias. Bilateral inguinal hernias were recorded in 46 (7%) of these, 601 (88%) were elective hernia repairs, and 84 (12%) were emergency hernia repairs with complicated presentations.

There were 570 men (89%) and 69 (11%) women. The median age of the patients was 51 years (range 17–85),

Table 2 Ratios of complicated presentations according to hernia type

Hernia type	Incarceration	Strangulation	Bowel obstruction
Direct	10 (14.5%)	1 (7%)	7 (17.5%)
Indirect	33 (48.5%)	6 (43%)	19 (47.5%)
Femoral	17 (25%)	6 (43%)	9 (22.5%)
Direct + indirect	8 (12%)	1 (7%)	5 (12.5%)
Total	68 (10.6%)	14 (2.2%)	40 (6.3%)

with 221 (35%) of the patients being over 60 years of age and grouped as “advanced age group”. The type and location of hernias and their distribution according to sex are detailed in Table 1. Indirect inguinal hernias were most frequently encountered in both sexes. Femoral hernias were significantly more common in women ($P < 0.001$).

In the 569 (89%) patients admitted to our clinic 48 h or more from the onset of symptoms, the most common presenting symptoms were a mass in the abdominal wall and localized pain. Duration of symptoms before admission varied from a few hours to 20 years. Incarceration was diagnosed in 68 (10.6%) patients and strangulation in 14 (2.2%) patients. The ratios of incarceration and strangulation were noted to be significantly greater in women, as was the occurrence of femoral hernia ($P = 0.001$ and $P \leq 0.001$, respectively). Forty patients (6.3%) were admitted with signs and symptoms of mechanical bowel obstruction. Bowel obstructions were also significantly more common in female patients ($P = 0.007$). A greater proportion (27.5%) of female groin hernias required emergency hernia repair compared with male groin hernias (11.2%; $P < 0.001$). The ratios of incarceration, strangulation and bowel obstruction according to hernia type are listed in Table 2.

Concomitant medical problems were noted in 302 (47.3%) patients (32 female and 270 male). Congestive heart failure and chronic obstructive pulmonary diseases were more frequent coexisting problems in men, whereas essential hypertension was more common in women. As expected, severe coexisting medical problems were significantly more common in patients with advanced age ($P < 0.001$).

The majority of the patients were ASA grades 1 and 2 (91%), patients with ASA grades 3 and 4 accounted for 9%

Table 3 Relationship between the American Society of Anaesthesiologists (ASA) score and age, sex, complicated presentation, length of hospital stay and major morbidity

	ASA-I	ASA-II	ASA-III	ASA-IV
Male/female	291/35	230/25	47/8	2/1
≤60/>60 years old	298/28	110/145	10/45	0/3
No. of cases with hospital stay ≥5 days	4/326 (1.2%)	10/255 (4%)	10/55 (18%)	0/3 (0%)
Complicated presentation rate	31/326 (9.5%)	40/255 (15.7%)	9/55 (16.4%)	2/3 (67%)
Major morbidity rate	2/326 (0.6%)	7/255 (2.7%)	11/55 (20%)	2/3 (67%)

Table 4 Statistical significance of risk factors according to unfavorable presentation and outcomes

Factors	Incarceration	Strangulation	Resection	Hospital stay (≥5 days)	Morbidity
Female sex	$P < 0.001$	$P < 0.001$	$P = 0.002$	NS ^a	NS
Femoral hernia type	$P < 0.001$	$P < 0.001$	$P < 0.001$	NS	NS
Emergency repair	$P = 0.018$	$P < 0.001$	$P < 0.001$	NS	$P = 0.03$
Advanced age (>60)	NS	NS	NS	$P < 0.001$	$P = 0.04$
Coexisting disease	$P = 0.007$	$P = 0.007$	$P = 0.004$	$P < 0.001$	$P = 0.008$
ASA-III and IV score	$P = 0.002$	$P = 0.002$	$P = 0.009$	$P < 0.001$	$P < 0.001$

^a Non significant

(58) of all patients, whereas of the advanced age group patients, 48 cases (22%) were ASA grade 3 and 4 ($P < 0.001$). Strangulation and bowel obstruction rates were significantly higher in patients with ASA grade 3 and 4 ($P < 0.001$ and $P < 0.05$, respectively). The length of hospital stay was also significantly longer in those patients ($P < 0.001$; Table 3).

Hernia repairs were performed under general anesthesia in 378 (59%) patients, spinal anesthesia in 211 (33%) patients, and local anesthesia in 50 (8%) patients. The method of hernia repair was determined largely by the surgeon's individual preference. Tension-free hernioplasty was the most common preferred procedure, and was applied in 648 (94.6%) cases. Concomitant hydrocelectomy was recorded in 11 (1.6%) patients. Intraoperative complications were reported as femoral vein laceration in two patients and iatrogenic ileum perforation in one patient. All were recognized and successfully treated.

Contents of the hernial sac were ileum only in 124 (18%), omentum only in 419 (61%), ileum with omentum in 81 (12%) patients, sigmoid colon in 16 (2%) patients, cecum in 5 (0.7%) cases, appendix in 2 (0.3%) cases and preperitoneal fat tissue in 36 (5%) cases. Ovary and fallopian tubes were found in two (0.3%) cases. Necrotic bowel resection was required in 2 (0.3%) patients, appendectomy in one patient, omentectomy in 7 (1%) patients and ovary and fallopian tubes were removed due to Tubo-Ovarian torsion in the hernial sac in 2 (0.2%) patients. Strangulation and resection rates were significantly high in patients with coexisting medical problems ($P < 0.02$ and

$P < 0.05$, respectively). The length of hospital stay was also significantly longer in those patients ($P < 0.001$).

Postoperative complications were observed in 49 (7%) of all hernia repairs. Major complications developed in 24 (3.4%) hernia repairs, 22 of whom (92%) had severe coexisting diseases. The most frequent serious complications were pulmonary insufficiency in 7 (1%) patients, and congestive heart failure in 5 (0.7%) patients. Cerebrovascular problems were observed in 3 (0.4%) patients and pneumonia in 3 (0.4%) patients.

Local wound complications were observed in 24 (4%) patients. Eighteen patients (3%) suffered from wound infections. Scrotal hematomas were noted in 6 (1%) patients. Wound infections were treated by drainage and antibiotics. Urinary retention was noted in 22 (3%) patients. One patient suffered recurrence in the early postoperative period.

The duration of hospital stay ranged from 1 to 16 days (mean 2 days). The length of hospital stay was significantly longer in patients with advanced age, femoral hernia, strangulation bowel obstruction, severe coexisting disease, high grade ASA class and late admission. Statistical significance of factors likely to be linked with presentation and outcomes are detailed in Table 4.

Discussion

The variability in frequency of groin hernias that affect the population and their socioeconomic impact is truly amazing [7]. Inguinal hernia repairs still constitute one of the

most common procedures in general surgery, with about 20 million procedures being performed worldwide each year at significant cost to health care organizations and society [3, 10]. Despite the frequency of this procedure, there is very little information on the natural history of the untreated hernia [8, 9].

It is widely accepted that progression of a hernia left unrepaired is inevitable and that repair of that hernia becomes more difficult. Thus many surgeons suggest that all inguinal hernias should be repaired at diagnosis. Surgical textbooks have also advocated that the presence of an inguinal hernia is sufficient indication for hernia repair [8, 9, 11].

On the contrary, some surgeons assert that delaying hernia repair incurs no increased complication risk compared with the immediate operation group. Although inguinal hernias will progress over time to complicated presentation, this does not seem to be related with an appreciable increase in morbidity and mortality, or even emergency surgery. Surgeons also advocate that watchful waiting strategy is a safe and acceptable alternative for male patients with asymptomatic or minimally symptomatic inguinal hernia [8, 9].

We had previously reported that advanced age, presence of severe coexisting disease and late admission were significant risk factors responsible for unfavorable outcomes of emergency hernia repairs. We also reported that emergency hernia repairs in elderly patients carries a high morbidity and mortality risk in the presence of coexisting cardiopulmonary problems [11, 12].

In advanced age group patients, the lack of the classic signs and symptoms of disease often leads to delays and errors in diagnosis, and also results in increased emergency surgical intervention. Almost regardless of the type of procedure, emergency surgery is associated with significantly increased morbidity and mortality. It is also associated with a higher rate of long-term hospital stay [13]. In the current study, the presence of coexisting cardiopulmonary problems in elderly patients was the principal cause of unfavorable outcomes. The length of hospital stay was also significantly longer in patients with high ASA score.

The presenting symptoms are likely to determine the decision of whether to perform elective or emergency hernia repair. In almost all hernia repair series, pain at the hernia site was described as the most common presenting symptom [2, 8, 14]. It has been showed that patients with an indirect inguinal hernia were considerably more likely to have pain compared with those with a direct hernia, and the cumulative probability of a patient presenting with pain increases with time. Some authors have found that pain had little effect on work or leisure activities. Baxter and coworkers showed that only 13% of employed patients had to leave their employment due to pain [8]. Our study

showed that most of the patients presenting with incarceration suffered from severe pain at the hernia site. We believe that the severity of the pain may be a harbinger of complicated presentations such as incarceration or strangulation. Emergency hernia repairs are inevitable in patients presenting with mechanical bowel obstruction findings. In our series, about one-half of the patients undergoing emergency hernia repair were hospitalized for signs and symptoms of mechanical bowel obstruction resulting from groin hernia.

Although it is extremely difficult to estimate the risk of complication of untreated hernia, Gallegos and coworkers reported that the cumulative probability of strangulation of an inguinal hernia was 2.8% at 3 months rising to 4.5% after 2 years. Complicated presentations of groin hernias are associated with a higher proportion of women and patients with femoral hernias [15–17]. Femoral hernias account for less than 10% of all groin hernias but 40% of these present as emergencies. Groin hernias occur much less frequently in women than in men, whereas femoral hernias are more common in women and carry a high risk of an emergency operation. It has been reported that women undergo a higher proportion of emergency hernia repair than men [18–20]. Our results were consistent with these literature data.

Duration of symptoms and late admission are considered to be important factors related to morbidity and mortality. However, early presentation does not remove the risk of necrotic bowel resection, thus we recommend leaving time for adequate resuscitation of patients before surgery [21–23]. Most of our patients were hospitalized after 48 h from the onset of symptoms. Principal causes of late admissions were socioeconomic factors and awareness of the hernia. The current study showed that morbidity, duration of hospital stay and resection rates were significantly correlated with late admission.

Conclusions

Elective and emergency hernia repairs still rank among the most common surgical procedures. Although we have no adequate information on the natural history of the untreated hernia, complications related with untreated hernia require emergency surgery, which carries a relatively higher mortality and morbidity risk. Factors such as female sex, advanced age, severe pain at hernia site and signs of mechanic bowel obstruction, presence of coexisting cardiopulmonary diseases, high ASA score, femoral-type hernia and late admission adversely affect the outcomes of hernia repairs. Surgical treatment of patients with groin hernia should be tailored in consideration of these factors. A watchful waiting strategy may be safe and acceptable in

the absence of these factors. Elderly patients with groin hernia and female patients with femoral hernia should be operated electively and in a timely fashion.

References

1. Franz MG (2006) Complications of abdominal wall and hernia operations. In: Mulholland MW, Doherty GM (eds) *Complications in surgery*. Lippincott Williams & Wilkins, Philadelphia, pp 523–545
2. Alvarez JA, Baldonado RF, Bear IG, Solís JA, Alvarez P, Jorge JI (2004) Incarcerated groin hernias in adults: presentation and outcome. *Hernia* 8:121–126
3. Yalçın S, Ergül E (2009) A single-surgeon, single institute experience of 115 Lichtenstein hernia repairs under local anesthesia. *Bratisl Lek Listy* 110:43–44
4. Rutkow IM (1998) Epidemiologic, economic, and sociologic aspects of hernia surgery in the United States in the 1990s. *Surg Clin North Am* 78:941–951
5. Rutkow IM (2003) Demographic and socioeconomic aspects of hernia repair in the United States in 2003. *Surg Clin North Am* 83:1045–1051
6. Yunis J (2009) Critical issues in groin hernia management. *Surg Technol Int* 18:119–124
7. Fitzgibbons RJ, Filipi CJ, Quinn TH (2005) Inguinal hernias. In: Brunickardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Pollock RE (eds) *Swartz' principles of surgery*, 8th edn. McGraw-Hill, New York, pp 1353–1394
8. Hair A, Paterson C, Wright D, Baxter JN, O'Dwyer PJ (2001) What effect does the duration of an inguinal hernia have on patient symptoms? *J Am Coll Surg* 193:125–129
9. Turaga K, Fitzgibbons RJ Jr, Puri V (2008) Inguinal hernias: should we repair? *Surg Clin North Am* 88:127–138
10. Smietański M, Lukaszewicz J, Bigda J, Lukianski M, Witkowski P, Sledzinski Z (2005) Factors influencing surgeons' choice of method for hernia repair technique. *Hernia* 9:42–45
11. Kulah B, Kulacoglu IH, Oruc MT, Duzgun AP, Moran M, Ozmen MM, Coskun F (2001) Presentation and outcome of incarcerated external hernias in adults. *Am J Surg* 181:101–104
12. Kulah B, Duzgun AP, Moran M, Kulacoglu IH, Ozmen MM, Coskun F (2001) Emergency hernia repairs in elderly patients. *Am J Surg* 182:455–459
13. Rosenthal RA, Andersen DK (1998) Physiologic considerations in the elderly surgical patient. In: Miller TA (ed) *Modern surgical care*, 2nd edn edn. Quality Medical, St. Louis, pp 1362–1384
14. Pollak R (1989) Strangulating external hernia. In: Nyhus LM, Condon RE (eds) *hernia*, 3rd edn. Lippincott, Philadelphia, pp 273–284
15. Malek S, Torella F, Edwards PR (2004) Emergency repair of groin herniae: outcome and implications for elective surgery waiting times. *Int J Clin Pract* 58:207–209
16. Gallegos NC, Dawson J, Jarvis M, Hobsley M (1991) Risk of strangulation in groin hernias. *Br J Surg* 78:1171–1173
17. Kark AE, Kurzer M (2008) Groin hernias in women. *Hernia* 12:267–270
18. Malangoni MA, Rosen MJ (2008) Hernias. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL (eds) *Sabiston textbook of surgery*, 18th edn edn. Saunders Elsevier, Philadelphia, pp 1155–1179
19. Dahlstrand U, Wollert S, Nordin P, Sandblom G, Gunnarsson U (2009) Emergency femoral hernia repair: a study based on a national register. *Ann Surg* 249:672–676
20. Woods B, Neumayer L (2008) Open repair of inguinal hernia: an evidence-based review. *Surg Clin North Am* 88:139–155
21. Andrews NJ (1981) Presentation and outcome of strangulated external hernia in a district general hospital. *Br J Surg* 68:329–332
22. McEntee GP, O'Carroll A, Mooney B, Egan TJ, Delaney PV (1989) Timing of strangulation in adult hernias. *Br J Surg* 76:725–726
23. Kurt N, Oncel M, Ozkan Z, Bingul S (2003) Risk and outcome of bowel resection in patients with incarcerated groin hernias: retrospective study. *World J Surg* 27:741–743