Int Surg 2015;**100**:455–460
DOI: 10.9738/INTSURG-D-14-00036.1

Visceral Organ Resection During Femoral Hernia Surgery Is a Predictor of Morbidity

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Reports on the outcomes of emergency and elective femoral hernia surgery are scarce. Most studies do not distinguish femoral hernia from other types of groin hernia; studies of femoral hernia alone are few in number. The main objective of the present study was to identify factors affecting morbidity of femoral hernia patients. We retrospectively analyzed data on 80 patients who underwent femoral hernia surgery between June 2009 and June 2013. Patients who did and did not experience morbidity were compared in terms of age, sex, hernia location, the presence of any comorbid disease, the type of anesthesia employed, the operative technique used, the type of surgical intervention, and performance of small bowel resection. Forty-three patients (53.8%) underwent emergency surgery because of incarceration. Of these, 18 (41.9%) experienced strangulation and underwent resection. Postoperative complications developed in 11 patients (13.8%). Upon multiple logistic regression analysis, visceral organ resection (of the small bowel and/or omentum) was the only independent predictor of significant morbidity ($P < 0.05$; odds ratio [OR]: 14.010, 95% confidence interval [CI]: 1.001–196.143). When diagnosed, femoral hernias should be electively repaired as soon as possible. The cumulative probability of strangulation rises over time. A requirement for bowel resection seems to significantly increase morbidity.

Key words: Femoral hernia – Elective surgery – Emergency surgery – Morbidity – Mortality

A femoral hernia features protrusion of the peritoneum (preperitoneal fat, with abdominal or pelvic contents) through the femoral ring into the femoral canal lying inferior to the inguinal ligament.[1] Femoral hernias are more likely to become strangulated than are other abdominal wall hernias, and emergent femoral hernia repair is associated with the poorest outcomes of abdominal wall hernia

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surgery. Patients suffer 30% morbidity and 10% mortality.[2] Prognosis is worse in the elderly, in whom such a hernia is most likely to present with strangulation. A variety of operations have been formulated for treatment of femoral hernia. The objectives of treatment are reduction of the hernia, excision of the sac, and closure of the femoral ring to prevent recurrence.[3] Reports on the outcomes of emergency and elective femoral hernia surgery are scarce. Most studies do not distinguish femoral hernia from other types of groin hernia; studies on femoral hernia alone are rare. The main objective of the present study was to review our experience with femoral hernia repair over a 3-year period, and to identify factors influencing morbidity.

Material and Methods

Between June 2009 and June 2013, 80 patients underwent femoral hernia surgery in either Buca Seyfi Demirsoy State Hospital or the Tepecik Teaching and Research Hospitals, Turkey, and data on these patients were retrospectively analyzed. Demographic information, clinical presentations, the presence of incarceration or strangulation, or strangulated organs, surgical techniques, development of postoperative complications, duration of hospitalization, the recurrence rate, and aspects of morbidity and mortality were all evaluated. The surgical techniques used embraced mesh plug hernioplasty, McVay repair, the Stoppa technique, and laparoscopy. The mesh plug technique featured use of nonabsorbable sutures to secure a polypropylene plug in place. McVay repair used interrupted nonabsorbable sutures placed between the aponeurotic margin of the transverse abdominal muscle and Cooper's ligament. Operations were performed under either regional or general anesthesia. A first-generation cephalosporin was used for antibiotic prophylaxis.

Statistical analysis

Data analysis was performed with the aid of statistical analysis (SPSS for Windows, version 11.5; SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov test was used to determine whether continuous and discrete variables were or were not normally distributed. Continuous and discrete variables are shown as mean ± SD, or as median (with minimum and maximum values). Nominal data are given as numbers of cases with percentages.

Mean differences between groups were compared using Student's *t*-test. The Mann-Whitney *U* test was employed to compare median values. Nominal data were analyzed using Pearson's χ^2 or Fisher's exact test, as appropriate.

Multiple logistic regression analyses were performed by statistician to identify predictor(s) of morbidity. All variables associated with *P* values $<$ 0.25 on univariate analysis were included in the multivariate model, together with variables of known clinical importance. We calculated odds ratios, 95% confidence intervals, and Wald statistics, for each independent variable. A *P* value less than 0.05 was considered to reflect statistical significance.

Results

Eighty patients underwent surgery, of whom 43 were females (53.8%) and 37 males (46.3%). Mean patient age was 57.1 ± 17.7 years (range: 22–96 years). Sixty-nine patients (86.3%) had primary and 11 (13.8%) recurrent femoral hernias. Fifty patients (62.5%) had right- and 30 (37.5%) left-side femoral hernias. Forty-three patients (53.8%) required emergency surgery to treat incarceration. Of these, 18 (41.9%) exhibited strangulation and underwent resection. Twenty-seven patients (33.8%) had comorbidities, of which the most common were hypertension, coronary artery disease, and chronic obstructive lung disease. Plug mesh repair was the most commonly used operative procedure (59 patients; 73.8%), whereas 16 patients (20%) underwent McVay herniorraphy. Two patients (2.5%) received primary repair, 2 (2.5%) were treated using the Stoppa technique, and 1 (1.3%) was treated laparoscopically (Table 1). The omentum was most frequently incarcerated (22 patients; 51.2%), followed (in order) by the small bowel, the sigmoid colon, and the right tuba salpingitis. Four patients had incarcerations of both the omentum and small bowel; 12 (27.9%) a strangulated omentum, 5 (11.6%) a strangulated small intestine, and 4 (9.3%) both strangulated intestines and omenta. All strangulated regions were resected. The remaining 25 patients exhibited incarceration and underwent simple reduction (no resection). Omental reduction was performed in 10 patients (23.3%), small bowel reduction in 9 (20.9%), sigmoid colon reduction in 2, and tuba salpingitis reduction in 1. Reduction was also performed on the 3 patients with incarceration of both the omentum and small bowel (Table 2). Ultrasound and plain radiography were most commonly used for preoperative evaluation (37

Table 1 Patient characteristics

Variable	Patients, n (%); N = 80
Age, y	57.1 ± 17.7
Range	22–96
Gender	
Male	37 (46.3)
Female	43 (53.8)
Comorbid disease	27 (33.8)
Hypertension	14 (17.5)
Coronary artery disease	9 (11.3)
Chronic obstructive lung disease	9 (11.3)
Chronic renal insufficiency	4 (5.0)
Diabetes mellitus	3 (3.8)
Asthma bronchiole	2 (2.5)
Hyperlipidemia	1 (1.3)
Others	6 (7.5)
Time interval between symptom onset and surgery, h	5 (2–48)
Hernia classification	
Primary	69 (86.3)
Recurrent	11 (13.8)
Location of the hernial sac	
Right side	50 (62.5)
Left side	30 (37.5)
Surgical intervention	
Emergency operation	43 (53.8)
Elective operation	37 (46.2)
Type of repair	
Plug mesh repair	59 (73.8)
McVay repair	16 (20)
Primary repair	2 (2.5)
The Stoppa technique	2 (2.5)
Laparoscopic repair	1 (1.3)
Hernia status	
Incarceration	43 (53.8)
Strangulation	18 (22.5)

Table 2 Tissue status and surgical intervention

Variable	Incarcerated patients, n (%); N = 43
Incarcerated tissue	
Omentum	22 (51.2)
Small bowel	14 (32.6)
Small bowel + omentum	4 (9.3)
Sigmoid colon	2 (4.7)
Right tuba salpinx	1 (2.3)
Strangulated tissue	18 (41.9)
Omentum	12 (27.9)
Small bowel	5 (11.6)
Small bowel + omentum	4 (9.3)
Surgery	
Reduction	25 (58.1)
Resection	18 (41.9)

patients; 46.3%). Seventy-one patients (88.8%) were treated under spinal anesthesia, and 9 (11.3%) under general anesthesia. The American Society of Anesthesiologists (ASA) scores were I in 35 patients (43.8%), II in 29 (36.3%), and III in 16 (20%). A first-generation cephalosporin was the prime choice for antibiotic prophylaxis (78 patients; 97.5%). Postoperative complications developed in 11 patients (13.8%). These were wound infections (5, 6.3%), pneumonia (4, 5%), hematoma (1, 1.3%), and cerebrovascular occlusion (1, 1.3%). The median hospitalization period was 3.04 days (1–52 days), and 2 patients died from pneumonia and cerebrovascular occlusion (1 each). Recurrence occurred in 1 patient who was treated using the McVay method (Table 3). Morbid and nonmorbid patients were compared in terms of age, sex, hernia location, presence of comorbid disease, type of anesthesia used, ASA score, operative technique employed, emergency or elective surgery status, surgical reduction, and visceral organ resection. Upon univariate analysis, morbid patients had significantly higher ASA scores (III versus I and II; $P = 0.002$) and had undergone significantly more frequent visceral organ resection (of the small bowel and/or the omentum; $P = 0.002$). No other between-group difference was statistically significant (Table 4). We sought to identify independent predictor(s) affecting morbidity, and performed multiple logistic regression analysis using the variables age, male sex, chronic renal insufficiency, use of general anesthesia, ASA score, the need for emergency surgery, time between symptom onset and surgery, performance of surgical reduction, and visceral organ resection. The only independent predictor of morbidity was visceral organ resection ($P < 0.05$, OR: 14.010, 95% CI: 1.001–196.143; Table 5).

Discussion

Although groin hernia repair is a very common adult surgical procedure, femoral hernia repairs constitute only 2–4% of all such procedures.[4,5] However, femoral hernias are clinically significant, because strangulation, or intestinal or omental necrosis requiring bowel resection, is often present, increasing morbidity and mortality.[6]

Femoral hernias are commonly observed in patients aged 40 to 70 years, principally in the fifth decade of life. Our patients ranged in age from 22 to 96 years (mean, 57.1 ± 17 years). Femoral hernias are 4- to 5-fold more common in females than males,[3,6] although some reports have claimed that the opposite is true.[4,7] In the present study, slightly more females than males (53.8% versus 46.3%)

Table 3 Patient demographics and characteristics

Variable	N = 80
Pre-operative radiological examination, n (%)	
Plain abdominal radiography + ultrasound, n (%)	37 (46.3)
Ultrasound, n (%)	10 (12.5)
Plain abdominal radiography, n (%)	5 (6.3)
White blood cell count, (1000/mm^3)	7.5 (4.3–5.6)
Anesthesia	
Spinal, n (%)	71 (88.8)
General, n (%)	9 (11.3)
ASA score	
I, n (%)	35 (43.8)
II, n (%)	29 (36.3)
III, n (%)	16 (20.0)
Antibiotic prophylaxis, n (%)	
First-generation cephalosporin, n (%)	78 (97.5)
Quinolone, n (%)	2 (2.6)
Postoperative complications, n (%)	11 (13.8)
Wound infection, n (%)	5 (6.3)
Pneumonia, n (%)	4 (5)
Hematoma, n (%)	1 (1.3)
Cerebrovascular occlusion, n (%)	1 (1.3)
Recurrence, n (%)	1 (1.3)
Hospitalization period, d	3.04 (1–52)
Deaths, n (%)	2 (2.5)

Table 4 Demographic and clinical characteristics of patients who did or did not experience morbidity

Variable	Morbidity (–), n (%)	Morbidity (+), n (%)	*P* value
Age, y	55.7 ± 17.0	66.2 ± 20.1	0.068
Sex			0.213
Female	39 (56.5)	4 (36.4)	
Male	30 (43.5)	7 (63.6)	
Location of the hernial sac			0.739
Right side	44 (63.8)	6 (54.5)	
Left side	25 (36.2)	5 (45.5)	
Comorbid disease	22 (31.9)	5 (45.5)	0.494
Hypertension	12 (17.4)	2 (18.2)	1.000
Coronary artery disease	8 (11.6)	1 (9.1)	1.000
Chronic obstructive lung disease	7 (10.1)	2 (18.2)	0.603
Chronic renal insufficiency	2 (2.9)	2 (18.2)	0.089
Diabetes mellitus	3 (4.3)	0 (0.0)	1.000
Asthma	2 (2.9)	0 (0.0)	1.000
Hyperlipidemia	1 (1.4)	0 (0.0)	–
Others	4 (5.8)	2 (18.2)	0.190
Anesthesia			0.103
Spinal	63 (91.3)	8 (72.7)	
General	6 (8.7)	3 (27.3)	
ASA Score			0.002
I	32 (46.4)	3 (27.3)	
II	28 (40.6)	1 (9.1)	
III	9 (13.0)	7 (63.6)	
Time interval between symptom onset and surgery (h)	5 (2–48)	11 (2–16)	0.199
Operative technique			
Plug mesh repair	51 (73.9)	8 (72.7)	1.000
McVay repair	14 (20.3)	2 (18.2)	0.621
Primary repair	2 (2.9)	0 (0.0)	1.000
The Stoppa technique	1 (1.4)	1 (9.1)	0.258
Laparoscopy	1 (1.4)	0 (0.0)	–
Surgical intervention			0.174
Emergency	35 (50.7)	8 (72.7)	
Elective	34 (49.3)	3 (27.3)	
Surgical reduction	14 (20.3)	4 (36.4)	0.120
Visceral organ resection[a]	11 (15.9)	7 (63.6)	0.002

[a]Small bowel and/or omentum.

required surgical intervention. Also, right-sided presentations were more common than left-sided, but we do not know why. Neither the width of the femoral ring, prior right-sided lower abdominal incision, or right-handedness, explained the observed right-side preference. It is possible that the sigmoid colon covers the femoral defect inside the abdominal cavity, preventing development of left-sided femoral hernia.[8] Similarly, in the present study, right-sided hernia was twice as common as left-sided hernia (62.5% versus 37.5%).

Emergency presentations were associated with higher incidences of visceral and small bowel involvement, increased small bowel resection rates, longer hospital stays, and higher mortality. Our data are in agreement with those of previous studies.[9–12] In the present study, 43 patients (53.8%) presented with visceral organ incarceration. Although the difference did not attain statistical significance, morbidity was more common after emergency operations than elective surgery ($P = 0.174$).

The low incidence of femoral hernias makes it difficult to conduct randomized trials of different repair procedures, and most existing literature features patient series varying in size. Systematic reviewers have found it impossible to draw firm conclusions on the safest and most effective repair method. Adherence to basic surgical principles and a thorough understanding of inguinal anatomy are essential if a procedure is to be successful in the long term. Complete inguinal exploration should precede repair, to ensure that no concurrent hernia is present. Such hernias may be responsible for up to 10% of recurrences.[4] No one technique is appropriate in all clinical situations. Several means of femoral hernia repair have been described. All have the same objective, which is to reduce the hernia, excise the sac, and close the ring to prevent

Table 5 Multiple logistic regression identifying predictor(s) of morbidity

Variable	OR	95% CI	*P* value
Age	0.996	0.928–1.069	0.912
Male sex	2.477	0.451–13.600	0.296
Chronic renal insufficiency	1.242	0.067–22.899	0.884
Other comorbid disease	2.784	0.172–44.991	0.471
General anesthesia	2.477	0.255–24.085	0.434
ASA score	1.510	0.250–9.128	0.653
Emergency surgery	0.212	0.012–3.650	0.286
Surgical reduction	2.044	0.211–19.815	0.537
Visceral organ resection	14.010	1.001–196.143	0.05

subsequent recurrence.[13–15] In general, the mesh-plug technique, the McVay operation, and a laparoscopic approach, are commonly used. In the present study, the mesh-plug technique was the most common approach employed (73.8% of patients). An advantage of this technique is that repair is tension-free.[16,17] The recurrence rate after femoral hernia repair ranges from 1 to 10% in the literature, and technical inadequacy is the most important predictor of recurrence. One of our patients experienced a recurrence after McVay repair.

Risk factors predicting morbidity after surgical repair of femoral hernias have been previously identified.[2,6,9,10,18–20] Some controversy remains, but apart from all of older age, strangulation, the presence of comorbid disease, the need for emergency surgery, the choice of midline laparotomy, and the type of anesthesia employed, the clearest predictor of morbidity was intestinal resection.[11,21–25] This is also our conclusion.

Advanced age, existing comorbid disease, a high ASA score (III–IV), and emergency surgery are risk factors strongly associated with elevated postoperative morbidity and mortality. In the present study, these risk factors did not attain statistical significance, but were indeed more prevalent in those who suffered morbidity. However, the prime contributor to morbidity was the need for visceral organ resection in patients with incarcerated femoral hernias that were strangulated because of late presentation to our hospital. This observation is in line with the conclusions of other clinical studies.[2,6,9,21–23,26] The influence of anesthesia (regional or general) on morbidity remains controversial. Some studies have suggested that general anesthesia increased morbidity,[11,22,23] but this has not been widely accepted. Local or regional anesthesia is preferred, to avoid respiratory complications associated with aspiration during induction. In our present study, most patients (88.8%) were treated under spinal anesthesia, and we found no significant association between anesthesia type and later morbidity. We suggest that spinal anesthesia is both safe and practical. However, patient health status and comfort must be considered when anesthesia is planned.

Risk factors contributing to incarceration and subsequent bowel resection are symptom duration of 3 days or over, lack of health insurance, obvious peritonitis, prescription of oral anticoagulants, and older age (>60 years). The cumulative probability of incarceration and strangulation increases over time.[27–29] In the present study, morbidity also increased when the time interval between symptom onset and surgery rose. The median duration from symptom onset to surgery was 11 hours (range: 2–16 hours) in patients who experienced morbidity, but this value did not significantly differ from that of patients who did not in fact suffer morbidity ($P > 0.05$).

Our study had several limitations. Our sample size was small and our analysis retrospective in nature. Several surgeons operated, and we were unable to include surgeon-dependent factors in our analysis. However, our work is valuable insofar as we focused on only femoral hernias. Most other relevant studies did not distinguish femoral hernias from all groin hernias.

Conclusion

A clinical femoral hernia should be electively repaired as soon as possible to avoid incarceration and strangulation. Watchful waiting is not appropriate. Bowel resection seems to significantly increase patient morbidity.

Acknowledgments

All authors thank Salih Ergocen for statistical analysis. All authors agree that there is no conflict of interest.

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