Prognostic Factors of Postoperative Morbidity and Mortality of Adult Strangulated Groin Hernia

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Abstract The aim of this work is provide the results of the surgical treatment of strangulated groin hernias and determine morbidity and mortality risk factors. It is a retrospective study related to the 288 records of patients aged 15 years and more, who underwent emergency surgery for strangulated groin hernia from January 2007 to December 2012. Postoperative evolution was assessed on the morbidity, mortality, and length of hospital stay. Mortality and morbidity risk factors were studied. The statistical analysis was conducted with the chi-square test and Fischer's exact test with a significance level of 5 %. Strangulated groin hernias account for 42.2 % of the overall groin hernia operations conducted during the study period (288/697). Necroses were present in 59 (20.5 %) patients. The mortality rate was 6.2 % ($n=18$). Admission time superior or equal to 48 h ($p=0.002$), American Society of Anesthesiologists (ASA) class superior or equal to III ($p=0.002$), presence of preoperative strangulated groin hernia complication (peritonitis, occlusion, hernia abscesses) ($p=0.001$), bowel necrosis ($p=0.000$), and bowel resection ($p=0.000$) were statistically related to a high risk of death. Forty-two ($n=42$) postoperative complications were recorded in 34 (11.8 %) patients. These complications were outnumbered by postoperative parietal suppuration ($n=26$) which led to three cases of evisceration. Bowel necrosis was related to a high risk of postoperative complications ($p=0.002$). Reoperation was necessary for 13 patients. The length of stay in hospital was 4 days (range between 1 and 28 days). The average follow-up period was 7 months. No recurrence was noticed during this period. Delay in consultation,

high ASA class, and moreover, bowel necrosis requiring bowel resection are the factors of unfavorable postoperative results. Groin hernias are an avoidable death cause provided that early treatment of strangulated hernias and the elective treatment of non-complicated hernias are conducted.

Keywords Strangulated groin hernias · Morbidity · Mortality · Bowel resection · Hernia repair

Introduction

Strangulated groin hernia (SGH) provokes a tight and permanent constriction of the abdominal viscera in a point of weakness of the groin area [1]. We distinguish strangulated inguinal hernias and strangulated femoral hernias. Femoral hernias are less frequent than inguinal hernias but have a higher strangulation risk [1, 2]. According to the Swedish Hernia Register, the mortality of elective treatment of inguinal hernia is comparable to that of the general population, whereas it is multiplied by 5 to 10 in the event of an emergency intervention and by 15 in the event of bowel resection [2]. The treatment and the prognosis of strangulated groin hernias are thus radically modified by the presence of a bowel necrosis [1, 3, 4]. In some African regions, hernia is still considered as a shameful disease which acts as a brake on the early consultation and on the elective treatment of this disease. When strangulation occurs, the accessibility to health facilities depends on many contingencies particularly sociocultural, geographical, and financial [1, 3, 4]. All these make us predict a belated consultation, high morbidity, and mortality rates.

The aim of this work is to provide the results of surgical treatment of strangulated groin hernias and determine morbidity and mortality risk factors.

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Patients and Methods

It is a retrospective study related to the records of 288 patients aged 15 years and more, who were operated of a strangulated groin hernia in the Department of General and Digestive Surgery of Bouaké University Teaching Hospital over a period of 6 years from January 2007 to December 2012. Bouaké University Teaching Hospital is a 283-bed urban public hospital. The hospital is a tertiary referral center and serves urban and rural population not only from Bouaké's agglomeration but also from the whole central and northern parts of the country. Six hundred and ninety-seven ($n=697$) groin hernias were operated during the same period of which 294 were strangulated hernias, i.e., a SGH frequency of 42.2 %. Of the 294 patients with SGH, 6 patients were excluded due to a lack of usable records.

The 288 patients included were 264 males and 24 females with a male-to-female ratio of 11:1. The mean age of the studied population was 36.7 years (range between 16 and 82 years); 100 and 8 ($n=108$; 37.5 %) patients were aged 60 years and more. The majority of patients ($n=159$; 55.2 %) were peasants coming from the rural areas located at a distance of 20 to 100 km from our hospital. A medical pathology (comorbidity) was noticed in 23 patients. Of these, 10 had hypertension (HTA), 6 had diabetes mellitus, 3 had HIV infection, 3 had cardiopathy, and 1 had pneumonitis. A history of having lifted heavy weights was ascertained in 31.9 % of the patients ($n=92$). The mean admission time was 2.1 ± 1.8 days (range from 1 to 18 days). One hundred and eight ($n=108$; 37.5 %) patients came to hospital at least 2 days after the onset of strangulation signs. Reasons for late presentation were financial constraints ($n=40$), long distance from health facilities ($n=25$), fear of surgery ($n=11$), feeling that hernia is not a dangerous disease ($n=18$), and being treated by traditional healers ($n=14$). Two hundred and seventy ($n=270$; 93.75 %) patients presented with primary hernia, and 18 ($n=18$; 6.25 %) patients presented with recurrence of previous open operation. Two hundred and thirteen ($n=213$; 73.5 %) patients had right-sided hernia, and 75 ($n=75$; 26.5 %) patients had left-sided hernia. Hernia was inguinal in 267 (92.7 %) cases and femoral in 21 (7.3 %) cases. Clinical tables were painful tumefaction of the groin ($n=288$) with signs of acute intestinal occlusion in 152 patients, acute peritonitis in 12 patients, hypovolemic shock in 6 patients, or hernia abscesses in 4 patients. According to the physical status scale of American Society of Anesthesiologists (ASA) class, 203 (70.5 %) patients had ASA class I, 72 (25 %) patients had ASA class II, 11 (3.8 %) patients had ASA class III, and 2 (0.7 %) patients had ASA class IV [5]. Patients had preoperative adequate resuscitation which went on during and after the operation. Operations were performed under general anesthesia in 272 (94.5 %) patients and under spinal anesthesia in 16 (5.5 %) patients.

The incision was either an oblique inguinal incision ($n=271$; 94.1 %) or both inguinal and midline incisions ($n=17$; 5.9 %). The hernial sac contained, in various combinations, the small intestine ($n=194$; 67.4 %), the omentum ($n=54$; 18.7 %), the cecum ($n=19$; 6.6 %), the sigmoid colon ($n=6$; 2.1 %), the urinary bladder ($n=2$; 0.7 %), and gynecological annexes ($n=2$; 0.7 %). The content of the hernial sac was viable in 229 (79.5 %) cases and necrotic in 59 (20.5 %) cases. There was necrosis of the small intestine alone ($n=43$), the colon alone ($n=5$), the omentum alone ($n=5$), and the small intestine along with the omentum in 4 cases and the colon in 2 cases. The necrosis was observed in 66.6 % of femoral hernias (14/21) and 16.8 % of inguinal hernia (45/267).

A bowel resection was performed in 54 (18.7 %) cases. The resection of the necrotized small intestine was conducted in 49 (17 %) cases followed by immediate restoration of the intestinal continuity in 41 cases and confection of an ileostomy in 8 cases. In 7 (2.4 %) cases, the colon was resected with the immediate restoration of the colon continuity in 5 cases and the confection of a colostomy in 2 cases. A partial omentectomy was conducted in 9 cases. In patients where resection of non-viable bowel or omentum was performed, broad-spectrum antibiotics were continued until the fifth post-operative day. The other patients received an antibiotic prophylaxis not exceeding 48 h. Hernia repair was conducted in 284 (98.6 %) cases with Verhaeghe's procedure ($n=133$), Bassini's procedure ($n=109$), McVay's procedure ($n=20$), Lichtenstein procedure ($n=11$), and Shouldice procedure ($n=10$). No hernia repair was conducted in patients with hernia abscesses ($n=4$). Inguinal necrosectomy with toilet and drainage was conducted in those four cases. Data related to hospitalization, morbidity, and mortality were collected. Morbidity was defined as all the non-fatal surgical and/or medical complications occurred during the patient's stay in hospital, in the 30-day period following the operation or within a time limit running till the day of the restoration of the digestive continuity for patients with stoma. Mortality was defined as any death occurred during the patient's hospital stay, in the 30-day period following the operation or within a time limit running till the day of the restoration of the digestive continuity for patients with stoma. The prognosis was assessed based on such factors as age, mean admission time, comorbidity, ASA class, and bowel necrosis. Statistical analysis was performed using Student's *t* test and the chi-square tests. A *p* value of less than 0.05 was considered statistically significant.

Results

Forty-two ($n=42$) postoperative complications were recorded in 34 (11.8 %) patients as 1 patient could have one or more postoperative complications. These complications were

outnumbered by postoperative parietal suppuration ($n=26$) which led to 3 cases of evisceration. Others were cases of scrotal hematoma ($n=8$), postoperative peritonitis due to anastomotic dehiscence ($n=2$) or secondary bowel necrosis ($n=1$), testicle necrosis ($n=2$), parietal hemorrhage ($n=2$), a stoma necrosis ($n=1$), and a pneumopathy ($n=1$). The presence of necrosis was related to a high risk of postoperative complications ($p=0.002$). Of the 11 patients treated by Lichtenstein repair, only 1 patient developed scrotal hematoma and we reported neither wound infection nor any other mesh-related complications. There was no significant difference in the rate of postoperative complications according to the hernia repair ($p=1.07$), patient's age (≥ 60 years) ($p=0.12$), and presence of comorbidities ($p=0.09$).

A reoperation was necessary in 13 patients. Patients with evisceration ($n=3$) had a parietal refection; those with postoperative peritonitis ($n=3$) underwent suppression of the anastomosis ($n=2$) or ileal resection ($n=1$) followed by an ileostomy, patients with testicle necrosis ($n=2$) underwent an orchiectomy, patients with parietal hemorrhage ($n=2$) underwent parietal hemostasis, and a refection of necrotized stoma was conducted in 1 patient. Parietal suppurations and scrotal hematomas were managed conservatively.

Eighteen patients (18/288) of whom 2 were reoperated died, giving a mortality rate of 6.2 %. All the patients died, but 1 underwent bowel resection. Postoperative peritonitis ($n=7$), postoperative hemodynamic shock ($n=6$), and sepsis ($n=5$) were the causes of death. Table 1 presents the characteristics of patients who died. Death occurred for patients who

came to hospital 48 h after the onset of strangulation, with an ASA class $\geq III$ or more and presented a preoperative complication such as acute peritonitis, intestinal occlusion, or hernial abscess. Bowel necrosis and bowel resection were moreover associated with a significantly high death rate. Table 2 presents the different risk factors of death.

The length of hospital stay was 4 days (range from 1 to 28 days). Hospitalization was significantly longer [8 days (range between 1 and 28 days)] in patients who presented bowel necrosis and underwent bowel resection ($p<0.001$). Out of 270 survivors, 263 (97.4 %) patients, 201 (74.4 %) patients, and 108 (40 %) patients were available for follow-up at 1, 3, and 12 months, respectively. That is a mean follow-up period of 7 months. No recurrence was noticed in patients who were seen again. Patients with digestive stoma experienced the recovery of the digestive continuity in an average of 76 days (range from 55 to 105 days). The 4 patients in whom we did not performed emergency hernia repair underwent Lichtenstein repair in an average of 120 days.

Discussion

Strangulated groin hernia remains to be one of the most frequent emergencies in visceral and digestive surgery [6]. The prognosis and the treatment of SGH are modified by the presence of bowel necrosis [1, 3, 7]. In our study, necrosis was present in 20.5 % of SGH. This rate is similar to the finding between 13 and 50 % in other series [3, 7–9]. In Western

Table 1 Characteristics of patients who died

Patient	Age	Sex	ASA	Bowel necrosis	Hernia	Treatment	DD	DC
1	70	M	III	Yes	Inguinal	Resect+stoma	J2	HS
2	77	M	II	Yes	Inguinal	Resect+Anast	J13	POP
3	34	M	II	Yes	Inguinal	Resect+Anast	J3	HS
4	52	F	IV	Yes	Inguinal	Resect+stoma	J6	Sepsis
5	59	M	III	Yes	Inguinal	Resect+Anast	J3	HS
6	63	F	III	Yes	Femoral	Resect+stoma	J13	Sepsis
7	42	M	II	Yes	Inguinal	Resect+Anast	J11	POP
8	55	M	III	Yes	Inguinal	Resect+Anast	J9	POP
9	31	M	IV	Yes	Inguinal	Resect+stoma	J22	Sepsis
10	38	M	II	Yes	Inguinal	Resect+Anast	J1	HS
11	76	M	IV	Yes	Inguinal	Resect+Anast	J1	HS
12	49	M	III	Yes	Inguinal	Resect+Anast	J12	POP
13	48	M	III	Yes	Inguinal	Resect+Anast	J3	POP
14	50	M	II	No	Inguinal	No resection	J2	HS
15	89	F	III	Yes	Femoral	Resect+stoma	J18	Sepsis
16	76	M	II	Yes	Inguinal	Resect+Anast	J5	POP
17	51	M	III	Yes	Inguinal	Resect+stoma	J12	Sepsis
18	81	F	III	Yes	Femoral	Resect+Anast	J3	POP

M male, *F* female, *Anast* anastomosis, *Resect* resection, *HS* hemodynamic shock, *POP* postoperative peritonitis, *DC* death cause, *DD* death date

Table 2 Prognostic factors of strangulated groin hernias

Parameters	Number	Deaths (%)	<i>P</i>	
Sex				
M	264	14 (5.7)	0.17	NS
F	24	4 (16.7)		
Age (years)				
≥60	108	7 (6.5)	0.081	NS
<60	180	11 (6.1)		
Bowel necrosis				
Yes	54	17 (31.5)	0.000	S
No	234	1 (0.4)		
Admission time (h)				
≥48	108	15 (13.9)	0.002	S
<48	180	3 (1.7)		
Comorbidities				
Yes	23	2 (8.7)	0.079	NS
No	265	16 (6)		
Type of hernia				
Femoral	21	2 (9.5)	0.112	NS
Inguinal	267	16 (5.9)		
ASA class				
I and II	275	7 (2.5)	0.000	S
III and IV	13	11 (84.6)		
Bowel resection				
Yes	54	17 (31.5)	0.000	S
No	234	1 (0.4)		
Strangulated hernia preoperative complications				
Preoperative complication	174	17 (9.8)	0.001	S
No complication	114	1 (0.9)		

NS not significant, S significant

countries, the advance age of patients (superior or equal to 65 years), admission time (≥ 24 h), and strangulated femoral hernia were incriminated in the occurrence of necrosis [2, 7–10]. In our study, we found out that an admission time ≥ 48 h ($p=0.003$) and strangulated femoral hernia ($p=0.017$) were significantly linked to the risk of bowel necrosis. However, the age did not influence the risk of bowel necrosis ($p=1.09$) as well as mortality and morbidity ($p=0.17$). This could be explained by the young age of the studied population which is common in African series [1, 3, 4], unlike to studies from Western countries which reported high age incidence [2, 7–10].

The overall mortality rate of strangulated groin hernias has been reported in the literature to range from 0.4 and 11 % [1, 4, 7, 9, 11, 12]. Our mortality rate of 6.2 % is in conformity with those findings. All the patients died, but 1 underwent bowel resection. Postoperative peritonitis was the main cause of death as it occurred in 7 patients; the other causes were postoperative hemodynamic shock ($n=6$) and sepsis ($n=5$). The high rate of postoperative peritonitis due to anastomotic dehiscence can be explained by the fact that most of emergency herniorrhaphy and bowel resection in our study were performed by basic

surgical trainees who were first on call. This calls for a strict supervision of surgical trainees. Six other patients died shortly after surgery as they presented to the hospital in endotoxic shock following strangulation hernia. As far as the other causes of death are concerned, they can be explained by poor socio-economic status and non-affordability of patients who could not face postoperative medical fees. The delay in admission (superior or equal to 48 h) was one of the main factors associated with high mortality ($p=0.02$) in our study. This late consultation is generally correlated with high mortality [1, 2, 4, 6, 7, 9, 13]. We can relate this delay in admission not only to socioeconomic difficulties our patients are facing but also to ignorance and the fear of operations. Other factors influencing mortality include the ASA class superior or equal to III ($p=0.000$), preoperative complication ($p=0.001$), and bowel resection ($p=0.000$). Those factors were moreover incriminated in previously published series [1, 2, 8]. In spite of the highest proportion of necrosis in women and strangulated femoral hernia, neither the female sex nor strangulated femoral hernia was correlated with mortality. Comorbidity was not statistically related to death risk ($p=0.079$) in contrary to other findings [7, 9, 14].

In the present study, postoperative morbidity rate of 11.8 % is similar to the finding between 8.3 and 16.7 % in other series [1, 4]. This mortality rate could reach 64.5 % in the case of necrosis [3]. In our study as well as in various other studies [1, 3, 4, 6–9, 13, 15], necrosis and bowel resection induced a high risk of postoperative complications ($p=0.002$). Parietal suppuration was the most frequent with 76.5 % of the overall complications. This predominance of operation site infection is noticed in African series [1, 3, 4, 13]. The fear of infection has for long led to the refusal of mesh hernioplasty in emergency. In our studies, we performed 11 Lichtenstein repair and they were conducted in patients with no bowel necrosis. We reported neither wound infection nor any other mesh-related complications. Although not representative, these results appear to be encouraging with regards to the use of mesh repair in emergency in our practice in selected cases. The use of mesh hernioplasty could reduce the rate of recurrence after emergency hernia repair estimated to be 7.4 % by Dieng et al. [4] and 20.8 % by Hayrullah et al. [12]. As a matter of fact, several studies conducted in Europe and Asia reported that it was possible to carry out a prosthetic hernia repair in emergency with good postoperative results [8, 12, 16, 17]. Bowel resection would not be a contraindication to the mesh hernioplasty [12]. The age and comorbidities did not influence the morbidity in this study in contrary to Western series where the advance age of patients and the presence of medical pathology increased the risk of postoperative complications moreover when a general anesthesia was conducted [2, 9, 11, 14, 18]. Complications observed in our study were severe because they required a secondary intervention in 13 cases. The length of hospital stay was longer for cases in which bowel resection was carried out and in the presence of postoperative complications.

Conclusion

Our data suggest that emergency strangulated groin hernias are frequent with high rates of morbidity and mortality. Delay in consultation, high ASA class, and moreover, the presence of bowel necrosis, which requires bowel resection, are correlated with unfavorable postoperative results. Hernia repair procedures did not have any impact on the operative recoveries. We therefore recommend early presentation to health facilities and elective hernia repair in order to reduce postoperative mortality and morbidity which reach unacceptable rates in this study.

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Conflict of Interest The authors declare that they have no competing interests.

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