

Strangulated groin hernia prognosis in adults in sub-Saharan African context: Retrospective study at Zinder, Niger

Harissou Adamou^a, Ibrahim Magagi Amadou^a, Ousseini Adakal^b, Abdel Nasser M. Hamidou^a, Maman Laoul Hassane^c, Lasse James Didier^d, Rachid Sani^d

^aDepartment of Surgery, Zinder National Hospital, Faculty of Health Sciences, André Salifou University, Zinder, Niger, ^bDepartment of Surgery, Maradi regional Hospital, Faculty of Health Sciences, Dan Dicko Dan Kouloudou University, Maradi, Niger, ^cDepartment of Anesthesia and Critical Care, Zinder National Hospital, Faculty of Health Sciences, André Salifou University, Zinder, Niger, ^dDepartment of Surgery, Faculty of Health Sciences, Abdou Moumouni University of Niamey, Niger

Correspondence to Harissou ADAMOU, Faculty of Health Sciences, Zinder University of Zinder, PO Box 656, Niger. Tel: +22796968228; Fax: +227 20510920; e-mail: harissou1976@yahoo.fr

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Background

In our context, hernial strangulation has a high incidence. The aim of this work was to investigate prognostic factors in adults diagnosed with strangulated groin hernia.

Patients and Methods

This was a retrospective cross-sectional study conducted at Zinder National Hospital between 1 January 2016 and 31 December 2022 (7 years). Clinical and prognostic data were collected.

Results

Out of 568 patients who underwent surgery for groin hernia, 230 cases were strangulated (40.49%). Mean age was 47.8±16.6 years. The proportion of males was 86.65%, i.e. the sex ratio was 5.96. Inguinal hernia accounted for 85.2% ($n=196$). The median operative time was 7 h. The Bassini procedure was the most common with 83.5% ($n=192$). Small bowel was the content of the hernia sac in 80% ($n=184$). Intestinal necrosis occurred in 10.9% ($n=25$). This was associated with femoral location (OR=5.39, $P=0.00003$). Intestinal resection was performed in 13.9% ($n=32$) and stoma in 1.7% ($n=4$). Postoperative complications occurred in 25.2% ($n=58$). The overall mortality (grade V) was 6.5% ($n=15$). Mortality was statistically associated with age > 60 years (OR=5.16; $P=0.0016$), admission time (OR=3.20; $P=0.028$), time to surgery > 8 h (OR=4.20; $P=0.005$) and occurrence of necrosis (OR=9.39; $P=0.000$).

Conclusion

Strangulated groin hernia is a common surgical emergency. Its prognosis is associated with advanced age, femoral location, and diagnostic and therapeutic delay.

Keywords:

epidemiology, groin, prognosis, strangulated hernia, zinder

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Introduction

The management of groin hernias represents a worldwide surgical burden, with over 200 million people affected, including more than 20 million patients who undergo groin hernia repair annually [1–4]. From simple discomfort, groin hernias can progress to strangulation, which is associated with a poor prognosis and even death from peritonitis or toxic-infectious shock in 2.6 to 9% of cases [5–7]. This situation is frequently reported in developing countries, including sub-Saharan Africa, such as Niger Republic [1,5–11]. In our context, groin hernias are common and the risk of strangulation is over 37% [12,13]. This study was initiated to investigate the prognostic aspects of strangulated inguinal hernias in adults at Zinder National Hospital.

Patients and method

This was a cross-sectional study with retrospective data, conducted in the general surgery B department

of Zinder National Hospital over a 7-year period from January 2016 to December 2022. All patients were recruited from the General Surgery B Department and the Emergency Department of the Zinder National Hospital. All adults with strangulated groin hernia treated during this period were included. Non-strangulated groin hernias and other strangulated abdominal wall hernias were not included.

Variables were socio-demographic (age, sex, occupation, origin), clinical (type of admission, time to admission, symptoms), therapeutic and prognostic. The Clavien-Dindo classification was used to categorize postoperative complications [14].

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Departmental registers and patient records were used. Data were processed and analyzed using Excel and Epi Info7TM CDC. Quantitative variables were presented as numbers, mean±standard deviation or medians and ranges. Qualitative variables were presented as percentages, using *KHI*² or *Fisher* tests. A 95% confidence interval was used for all statistical tests.

Patient anonymity was maintained. Approval for this research was obtained from the Faculty of Health Sciences, André Salifou University of Zinder N°: 0037_11_032019_UAS/FSS/RS.

Results

Frequency

During the period of this study, 2240 gastrointestinal operations were performed, including 844 hernias. Of these hernias, 568 were inguinal hernias, including 230 cases of strangulated hernias, giving a frequency of strangulated cases of 40.49%.

Socio-demographic aspects

The mean age of the patients was 47.81±16.87 years (extremes: 18 and 85 years). Patients younger than 60 years accounted for 69.56% ($n=160$) and those older than 60 years for 30.44% ($n=70$). Males accounted for 85.65% ($n=197$) and females for 14.35% ($n=33$), giving a sex ratio of 5.96. Rural origin accounted for 70.87% ($n=163$).

Clinical features

In 18.26% ($n=42$) a history of obstructive and irritative symptoms of the lower urinary tract (OISLUT) and hypertension was found. Referred patients accounted for 57.39% of cases ($n=132$). The median admission time was 7 h (extremes: 1 h and 16 h). In more than 83% ($n=191$) this time was ≤8 h, Table 1.

Patients with right-sided strangulation accounted for 68.26% of cases ($n=157$). Right inguinal hernias were represented in 59.13% ($n=136$), Fig. 1.

Therapeutic and prognostic aspects

The time from admission to surgery was less than or equal to 8 h in 81.30% of cases ($n=187$). The median time to surgery was 7 h (extremes: 1 h and 12 h). General anesthesia was used in 81.74% of cases ($n=188$). Small intestine was the most common content of the hernia sac with 80% ($n=184$). Intestinal necrosis was observed in 10.87% ($n=25$). Intestinal necrosis was 5.39 times more frequent in crural hernias than in inguinal hernias (OR=5.39 [2.29–12.67], $P=0.00003$). The occurrence of bowel

necrosis was statistically associated with a surgical delay of more than 8 h (OR=3.47 [1.43–8.39], $P=0.0038$). Gastrostomy was performed in 1.74% ($n=4$). Bowel resection was performed in 13.91% ($n=32$). The Bassini technique was the most commonly used with 83.48% ($n=192$).

Postoperative complications occurred in 25.21% ($n=58$). Healed patients accounted for 93.48% ($n=215$). Superficial surgical site infections occurred

Table 1 Distribution of patients according to clinical aspects

Variables	Number (Percentage %)
<i>Past medical history</i>	
None	188 (81.74)
OISLUT*	38 (16.52)
HBP**	4 (1.74)
<i>Admission time</i>	
≤8 h	191 (83.04)
>8 h	39 (16.96)
<i>Mode of admission</i>	
Direct	98 (42.61)
Referred	132 (57.39)
<i>General condition</i>	
Altered	25 (10.87)
Preserved	205 (89.13)
<i>Fever</i>	
Absent	212 (92.17)
Present	18 (7.83)
<i>Occlusive syndrome</i>	
No	107 (46.52)
yes	123 (53.48)
<i>Type of hernia</i>	
Femoral	34 (14.78)
Inguinal	89 (38.70)
Inguino-scrotal	107 (46.52)
<i>Side of hernia</i>	
Right	157 (68.26)
Left	73 (31.74)

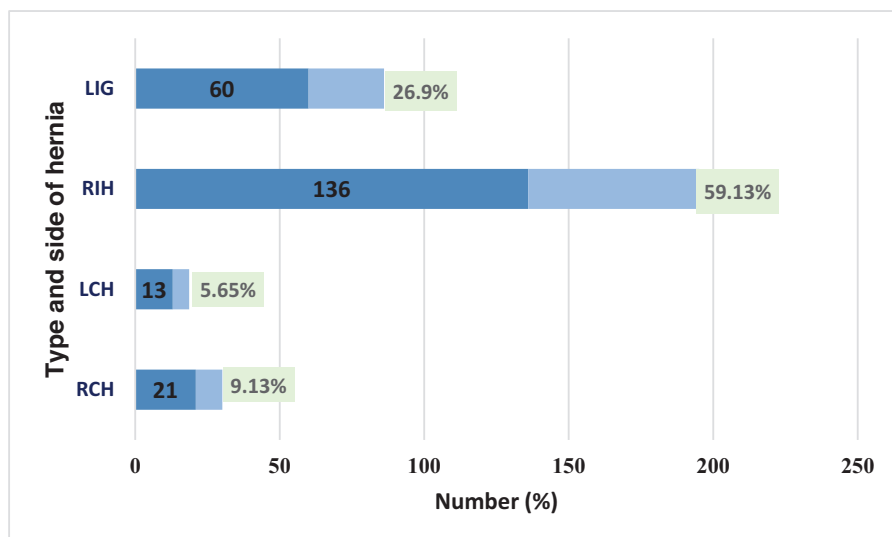
*OISLUT: obstructive and irritative signs of the lower urinary tract.

**HBP: high blood pressure.

Table 2 Distribution according to postoperative course

Postoperative course	n (%)
Simple	172 (74.79)
Complicated	58 (25.21)
Complication staging according to Clavien Dindo	
Grade I ($n=35$)	
Superficial surgical site infections	30 (13.04)
Postoperative ileus	5 (2.17)
Grade II ($n=5$)	
Anemia with transfusion	5 (2.17)
Grade III ($n=3$)	
Deep surgical site infections	3 (1.30)
Grade V ($n=15$)	
Death	15 (6.53)
Total	230 (100)

Figure 1



RCH: right crural hernia, LCH: left crural hernia, RIH: right inguinal hernia, LIG: left inguinal hernia.

Distribution of patients according to type and sides of hernia.

Table 3 Prognostic association between clinical aspects and the occurrence of postoperative complications.

Variables	Number	Complications		OR _{CI95%} [Lower-upper]	P value
		Yes	No		
Gender					
Female	33	6	27	1.61 [0.63–4.12]	0.314
Male	197	52	145		
Age					
> 60 years	70	19	51	1.15 [0.61- 2.18]	0.656
≤60 years	160	39	121		
Past medical history					
Yes	42	6	36	0.43 [0.17- 1.09]	0.071
No	188	52	188		
Mode of admission					
Direct	98	32	66	0.52 [0.28- 0.96]	0.0352
Referral	132	26	102		
Delay of admission					
>7 h	42	16	26	2.13 [1.05- 4.35]	0.033
≤7 h	188	42	146		
General condition					
Altered	25	14	11	4.65 [1.97–10.97]	0.0001
Preserved	205	44	161		
Fever					
No	212	53	159	1.15 [0.39–3.38]	0.794
Yes	18	5	13		
Occlusive syndrome					
Yes	123	38	85	1.94 [1.04–3.60]	0.033
No	107	20	87		
Type of hernia					
Femoral	34	16	18	3.25 [1.53–6.93]	0.0014
Inguinal & Inguino-scrotal	196	42	154		

Table 4 Prognostic association between clinical aspects and the occurrence of postoperative complications.

Variables	Number	Complications		OR _{C195%} [Lower-upper]	P value
		Yes	No		
Times to surgery					
>8 h	43	14	29	2.64 [1.31–5.32]	0.0053
≤8 h	187	28	159		
Anesthesia					
General	188	49	139	1.29 [0.57–2.89]	0.531
Loco-regional	42	9	33		
Hernia Sac content					
Small bowel	184	47	145	0.79 [0.36–1.72]	0.562
Colon and Epiploon	46	11	27		
Loop viability					
Necrosis	25	13	12	3.85 [1.64–9.02]	0.001
Viable	205	45	160		
Intestinal resection					
Yes	32	12	20	1.98 [0.90–4.35]	0.084
No	198	46	152		
Surgical procedure					
Bassini	192			1.60 [0.66–3.86]	0.291
Mac Vay	38				

in 13.04% of cases ($n=30$), Table 2. Length of stay (LOS) of 7 days or less predominated with 88.26% ($n=203$).

The mean LOS was 4.15 days, with extremes of one (1) day and sixteen (16) days.

Age greater than 60 years, admission time greater than 7 h, poor general condition, presence of occlusive syndrome and crural strangulation were clinical features statistically associated with the occurrence of postoperative complications; $P<0.05$. Table 3 shows the distribution of the different clinical factors associated with the occurrence of postoperative complications.

Therapeutically, surgical delay >8 h, presence of bowel necrosis and bowel resection were statistically associated with the occurrence of postoperative complications ($P<0.05$). Table 4 shows the different factors associated with the occurrence of complications.

There was a statistically significant association between age and mortality; in fact, the risk of death was 5.16 times higher in patients over 60 years of age (P value=0.0016). Also, a preoperative interval after diagnosis of more than 8 h was 4.20 times more associated with mortality (P value=0.005). The presence of bowel necrosis had a statistically significant association with mortality (OR=9.39; P value <0.0001), Table 5.

Discussion

In the Zinder region of Niger, strangulated groin hernias are common. They account for over 40% of the hernias operated on at Zinder Hospital. They often occur in rural males. This study enabled us to identify factors associated with the prognosis of strangulated hernias and to make recommendations for their management.

Surgical treatment of groin hernias accounts for 17% of gastrointestinal surgery in France and 24% in the United States [1–3]. In this study, groin hernia repair represents 25.35% of all surgical procedures in the department. The risk of strangulation is high in Africa, ranging from 42% to over 68% [10,15,16]. In contrast, the incidence of strangulation in developed countries is low, ranging from 1.7% to 7% [2,17]. This remarkable difference could be explained by the fact that in our context, patients do not come to us for simple hernias, but rather for complications, mainly strangulation [8,10,12]. The mean age in this study was 47.81 years. This is similar to Dieng *et al.* in Senegal who reported a mean age of 45 years [7], but higher than Eraslan *et al.* in Turkey who reported a mean age of 25 years [18] and lower than Smith *et al.* who reported a mean age of 57 years [6]. In this study, more than 85% were male. The literature is unanimous on the predominance of males in the pathology of groin hernias [1–12,16–21]. The anatomical peculiarities of the male groin explain this frequency, characterized by the fragility of this created zone crossed by the spermatic cord. The median admission time in this

Table 5 Prognostic association between clinical and therapeutic aspects and mode of discharge

Variables	Discharge mode		OR _{CI} 95% [Lower-upper]	P value
	Deceased	Recovered		
<i>Gender</i>				
Female	1	33	0.40 [0.05–3.21]	0.70
Male	14	183		
<i>Age</i>				
> 60 years	10	60	5.16 [1.69–15.74]	0.0016
≤60 years	5	155		
<i>Delay of admission</i>				
>7 h	6	37	3.20 [1.07–9.55]	0.0286
≤7 h	9	178		
<i>Type of hernia</i>				
Femoral	2	32	0.87 [0.18–4.08]	0.613
Inguinal & Inguino-scrotal	13	183		
<i>Times to surgery</i>				
>8 h	7	37	4.20 [1.43–12.32]	0.005
≤8 h	8	178		
<i>Loop viability</i>				
Necrosis	7	18	9.57 [3.11–29.02]	0.0000
Viable	8	197		
<i>Surgical procedure</i>				
Bassini	12	180	0.77 [0.20–2.89]	0.707
Mac Vay	3	35		

series was 7 h. In this study, inguinal and inguinal-scrotal hernias accounted for 85.2% ($n=196$). This is confirmed by many authors who have reported that inguinal hernias are more common, with rates ranging from 78% to over 98% of all groin hernias [2–8].

In this series, the mean time to surgery after preoperative diagnosis was 7 h. This time to surgery > 8 h was a factor in the occurrence of bowel necrosis (OR=3.47, $P=0.0038$). Several studies have described ischemia longer than 6 h as a source of necrosis. In resource-limited settings, diagnostic and therapeutic delays are often high, which explains the frequency of bowel necrosis [3,5,7,8,10,12]. This explains the bowel resection rate of around 11% in this study. In some African series, bowel resection rates vary from 13% to over 29% [7,10,15,22,23]. Bowel resection is most commonly performed in cases of necrosis, often due to delayed treatment; prompt treatment would therefore reduce the occurrence of necrosis and therefore the need for resection [10].

In this study, postoperative complications occurred in 25.21% of cases, including 6.53% of deaths. This mortality rate is similar to that reported by Lebeau *et al.*, Ogbuanya *et al.* and Ndong *et al.*, who reported a rate between 6.2% and 6.5% [8,10,22]. Mortality is lower in developed countries than in resource-limited settings. In the USA, Tastaldi *et al.* [24] and in Switzerland, Nilsson *et al.* [25] reported a mortality

rate of 3%. This difference with resource-limited countries may be related to early diagnosis and management of hernias.

In this study, age over 60 years, long admission time, poor general condition, presence of occlusive syndrome and crural strangulation were the different clinical aspects statistically associated ($P<0.05$) with the occurrence of postoperative complications. Our results confirm data from the literature where certain clinical features such as long admission time, occlusive syndrome, ASA class III and IV were associated with a poor prognosis [10,12,15,17,20–22,24]. According to Tastaldi *et al.*, urgent management of groin hernias is associated with higher morbidity and mortality rates; age and local contamination status were strongly associated with this prognosis [24]. In a German study, Köckerling *et al.* [17] also reported that age ≥ 66 years was a highly significant adverse factor for perioperative outcomes [17]. The same authors also noted the unfavorable influence of female gender on prognosis. In this study, gender was not associated with the prognosis of strangulated groin hernias. However, referred patients had a better prognosis than those admitted directly ($P=0.035$). Patients with direct admission to hospital were often referred to hospital after a number of unsuccessful attempts at self-care [21].

In this study, delay in diagnosis and the clinical condition of the patient were not the only factors

associated with prognosis. From a therapeutic point of view, a delay in surgery >8 h, the presence of bowel necrosis and bowel resection were statistically associated with the occurrence of postoperative morbidity and mortality ($P<0.001$). This necrosis was more associated with femoral hernia. The stricture is more severe in the femoral ring and late admission beyond 6 h is a factor in the occurrence of this necrosis. In a Nigerian study, Ogbuanya *et al.* [22] reported that cases of complicated inguinal hernia were more likely to be associated with femoral hernia.

Conclusion

Strangulated groin hernias are common pathologies in our context. Their prognosis is poor in our context, with high morbidity and mortality. Age over 60 years, delay in diagnosis and treatment, crural location and presence of necrosis are the various factors associated with the prognosis of groin hernia. We recommend raising public awareness of the need for early consultation and community-based hernia surgery activities.

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Conflicts of interest

There are no conflicts of interest.

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