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Strangulated Hernia, a Persisting Surgical Emergency: Epidemiology and Management at Tengandogo University Hospital (Burkina Faso)

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Abstract

Introduction: Strangulated hernia is a frequent and potentially serious surgical emergency that can be life-threatening. The objective of the study was to investigate the epidemiological, diagnostic, therapeutic and outcome aspects of patients managed for strangulated hernias.

Materials and methods: This was a retrospective observational study with a descriptive and analytical purpose, conducted over a 10-year

period from January 1, 2016 to December 31, 2025 at Tengandogo University Hospital.

Results: We collected 102 cases of strangulated hernia, accounting for 5% of surgically managed abdominal emergencies. The mean age of patients was 44 years, with a male predominance (sex ratio = 2.18). Manual laborers represented 44.1% of occupations. Clinically, all patients presented with a painful, irreducible swelling that was non-impulsive and non-expansive on coughing. Inguino-scrotal hernias were found in 43.1% of cases. Mesh repair was performed in 35.3% of patients. The small intestine was incarcerated in 46.1% of cases. The postoperative course was complicated in 7.8% of cases. Residual pain was reported in 14.7% of cases and recurrence was noted in 6.8% of cases. The Bassini technique was associated with residual pain ($p = 0.0387$), while the Mac Vay technique was associated with recurrence ($p = 0.0496$)); however, this result should be interpreted with caution given the very small number of patients in this subgroup ($n = 4$).

Conclusion: Reducing consultation delays and improving access to elective surgery are major challenges to limit these complicated forms. When they occur, mesh repair can be considered and is effective in the absence of any contraindication.

Keywords: Strangulated hernia, Surgical emergency, Hernia repair, Mesh, Sub-Saharan Africa

Introduction

Strangulated hernia is the sudden, irreducible incarceration of a viscus, most often a loop of bowel, within a hernial orifice, compromising its blood supply and rapidly exposing it to ischemic necrosis. It is a frequent and potentially serious surgical emergency (HerniaSurge Group, 2018). Without prompt management, it may progress to intestinal necrosis, perforation and sepsis, with life-threatening consequences.

Its frequency varies considerably across settings: estimated between 2.5 and 7.7% of surgical emergencies in high-income countries (Köckerling et al., 2021), it can reach 13.4 to 40% in sub-Saharan Africa, reflecting diagnostic delays barriers to healthcare access (Lebeau et al., 2016; Ndong et al., 2025).

The diagnosis of a strangulated hernia is primarily clinical. It relies on the sudden onset of severe pain over a hernial swelling that has become irreducible and non-impulsive, sometimes associated with intestinal obstruction (HerniaSurge Group, 2018). In this context, no investigation should delay management, which is exclusively surgical. Several wall repair

techniques have been described, including tissue-based repairs (Bassini, Shouldice, McVay) and tension-free mesh repairs.

Over recent decades, mesh repair and the laparoscopic approach have become reference techniques in strangulated hernia, due to lower rates of recurrence and chronic pain (Kallinowski et al., 2022). However, their use in the emergency setting, particularly in case of peritoneal contamination, remains debated (Gao et al., 2026). Despite technical advances, postoperative complications remain frequent, dominated by surgical site infections, chronic pain and recurrence (Johnson et al., 2025; Pavithira et al., 2022). Mortality, although generally low, ranges between 2 and 7% (Melkemichel et al., 2025; Ndong et al., 2024). In high-resource countries, strangulated hernia has become relatively rare thanks to ready access to elective surgery and to universal health coverage systems (Meara & Greenberg, 2015). By contrast, in resource-limited countries such as Burkina Faso, it remains frequent and represents a genuine public health problem.

The aim of this study was to investigate the epidemiological, diagnostic and therapeutic aspects of strangulated hernias at Tengandogo University Hospital, Burkina Faso.

Methods

This was a 10-year case series, from January 1, 2016 to December 31, 2025, in the Department of General Surgery of Tengandogo University Hospital, Burkina Faso. Patients admitted and who underwent repair for a strangulated hernia were included. Patients who arrived deceased, those with unusable medical records, and those lost to follow-up were excluded. Data were collected from the admission, hospitalization and operative registers of the general surgery department. Variables studied included sociodemographic characteristics (age, sex, occupation), clinical data (time to consultation, medical history, clinical and laboratory findings, diagnosis), management modalities (type of repair, complications) and outcomes (length of hospital stay, recurrence and residual pain). Data entry and processing were performed using Microsoft Office 2019 and Epi Info software. Statistical analysis included a descriptive analysis of the variables. Univariate analysis used the chi-square test and the relative risk (RR) with its 95% confidence interval to assess associations between surgical technique and postoperative outcomes (residual pain and recurrence). Given the small number of events, no multivariate analysis was performed. The threshold of statistical significance was set at $p < 0.05$. For the follow-up analysis, only patients who attended their 6-month postoperative visit were included; patients lost to follow-up after discharge were excluded from this analysis. Regarding ethics, authorization for data collection was obtained from the

administration of Tengandogo University Hospital, and the ethical principles of the Declaration of Helsinki were respected.

Anonymity and confidentiality were ensured through anonymized data collection and secure storage on a password-protected computer

Results

We collected 102 cases of strangulated hernia, accounting for 5% of abdominal surgical emergencies at Tengandogo University Hospital. The mean age of patients was 44 ± 18.15 years (range, 18–83 years). There were 70 male (68.6%) and 32 female patients (31.4%). The mean time to consultation was 2.56 ± 4 days (range, 2 hours–23 days).

Patients were referred from another facility in 84 cases (82.3%). Among the 18 patients (17.6%) referred for institutional reasons, the underlying causes were surgeon unavailability (75.6%), lack of an available operating room (15.8%), and a long waiting list (8.5%). A previously known hernia was reported in 51 cases (53.1%).

Strangulation followed physical exertion in 82 patients (80.4%) and occurred spontaneously in 20 patients (19.6%). Physical examination revealed an inguino-scrotal swelling in 44 patients (43.14%). Table 1 shows the distribution of patients according to diagnosis.

Table 1 : Distribution of patients according to diagnosis

Intraoperative diagnosis	Number	Percentage
Strangulated inguino-scrotal hernia	44	43.1
Strangulated inguinal hernia	21	20.6
Strangulated umbilical hernia	20	19.6
Strangulated linea alba hernia	12	11.7
Strangulated femoral hernia	4	3.9
Strangulated bilateral inguinal hernia	1	1.0
Total	**102**	**100**

Laboratory workup was limited to a complete blood count in the emergency setting. Hyperleukocytosis was found in 35 patients (34.3%) and moderate anemia (8–10 g/dL) in 26 patients (25.5%).

The mean time to surgery was 17.5 hours (range, 1 hour–6 days). All patients received preoperative resuscitation, including rehydration, analgesia and antibiotic therapy with ceftriaxone and metronidazole, the latter in 73 patients (71.6%). General anesthesia was used in 94 patients (92.2%) and spinal anesthesia in eight patients (7.8%).

At surgical exploration, the hernial sac contained small bowel in 47 patients (46.1%), and intestinal necrosis was present in 24 cases (23.5%). Table 2 shows the distribution of patients according to the contents of the hernial sac.

Table 2: Distribution of patients according to the contents of the hernial sac

Contents of the sac	Number	Percentage
Small intestine	47	46.1
Omentum	35	34.3
Omentum + small intestine	9	8.8
Omentum + colon	2	2.0
Colon	2	2.0
Small intestine + colon	2	2.0
Cecum + appendix	2	2.0
Bladder	2	2.0
Right adnexa	1	1.0
Total	**102**	**100**

The operative procedure consisted of simple parietal repair in 78 patients (76.5%). Intestinal resection with immediate anastomosis was combined with hernia repair in 21 patients (20.6%), and a stoma was fashioned after intestinal resection and hernia repair in three patients (2.9%).

Wall reconstruction was performed by mesh repair in 36 patients (35.3%), Bassini repair in 26 patients (25.5%), simple suture repair in 20 patients (19.6%), Shouldice repair in 16 patients (15.6%) and Mac Vay repair in four patients (3.9%).

The postoperative course was uneventful in 94 patients (92.2%) and complicated in 8 patients (7.8%). The most frequent complication was surgical site infection, observed in four patients. Table 3 shows the distribution of patients according to complications and repair technique.

Table 3: Distribution of patients according to complications

Complications	Mesh repair	Other techniques	Number
Surgical site infection	1	3	4
Septicemia	0	2	2
Pneumonia	1	0	1
Hemodynamic instability	0	1	1
Total	**2**	**6**	**8**

One patient died from postoperative sepsis, yielding a mortality rate of 0.98%.

Of the 102 operated patients, 70 (68.6%) completed the 6-month follow-up visit and were included in the outcome analysis. Among them, 26 had undergone Bassini repair, 24 mesh repair, 16 Shouldice repair, and 4 Mac Vay repair. The 32 patients who did not attend the 6-month visit were considered lost to follow-up and were excluded from this analysis. At 6 months of follow-up, residual pain was reported in 15 patients (14.7%) and recurrence in seven patients (6.8%).

On univariate analysis, the Bassini technique was statistically associated with residual pain ($p = 0.0387$). A statistically significant association was also observed between the Mac Vay technique and

recurrence (p = 0.0496, RR = 6.60 [95% CI: 1.81–24.03]); however, this result should be interpreted with caution given the very small number of patients in this subgroup (n = 4) (Tables 4 and 5).

Table 4: Distribution of patients operated on for strangulated hernia according to the existence of residual pain and surgical technique

Factor	N	Residual pain - Yes	Residual pain - No	RR [95% CI]	p-value
Bassini technique	26	9	17	2.54 [1.02–6.30]	0.0387
Mac Vay technique	4	1	3	1.18 [0.20–6.85]	0.6540
Shouldice technique	16	3	13	0.84 [0.27–2.63]	0.9605
Mesh repair	24	2	22	0.30 [0.07–1.20]	0.1049

Table 5: Distribution of patients operated on for strangulated hernia according to the existence of recurrence and surgical technique

Factor	N	Recurrence - Yes	Recurrence - No	RR [95% CI]	p-value
Mac Vay technique	4	2	2	6.60 [1.81–24.03]	0.0496
Bassini technique	26	3	23	1.27 [0.31–5.23]	0.9343
Shouldice technique	16	1	15	0.56 [0.07–4.34]	0.9244
Mesh repair	24	1	23	0.32 [0.04–2.50]	0.4500

Discussion

Strangulated hernia accounted for 5% of abdominal emergencies in our series, a frequency broadly comparable to recent data from sub-Saharan Africa, although substantial variations have been reported depending on hospital setting and access to care (Ndong et al., 2024). This heterogeneity essentially reflects differences in the organization of health systems, particularly in resource-limited countries where the absence of universal health coverage and financial constraints delay recourse to care, thereby favoring the progression of simple hernias to complicated forms (Meara et al., 2015).

The male predominance observed (68.6%) is in line with recent literature, which reports a male proportion of 60–75% (Attolou et al., 2026; Sawadogo, 2024). This has classically been attributed to greater exposure to repeated physical exertion, which causes chronic elevation of intra-abdominal pressure, and to a lower tendency among men to seek early care in some sociocultural contexts (Ohene-Yeboah & Dally, 2014).

The mean age of 44 years confirms that strangulated hernia preferentially affects a young and economically active population, with important socio-economic implications in settings where this age group constitutes the main workforce (Attolou et al., 2026).

Clinically, the predominance of groin hernias, particularly inguinal and inguino-scrotal, is consistent with international data. These locations, which correspond to the most frequent areas of anatomical weakness (Pavithira et al., 2022; Sawadogo, 2024), partly explain their overrepresentation. Furthermore, the high frequency of episodes occurring

after physical exertion (80.4%) supports the triggering role of intra-abdominal hyperpressure in the mechanism of strangulation (Attolou et al., 2026).

However, other local factors specific to each hernia may also play a role: the narrowness of the hernial ring, which directly determines the risk of vascular constriction; the nature and volume of the herniated content; and the possible presence of intrasaccular adhesions (HerniaSurge Group, 2018). The mean time to surgery of 17.5 hours remains a concern. Although comparable to some regional data (Magagi et al., 2017; Sawadogo, 2024), it remains higher than current recommendations advocating intervention within 4 to 6 hours after diagnosis, to limit the risk of intestinal necrosis (HerniaSurge Group, 2018). This delay appears mainly related to logistical and economic constraints, dominated by the unavailability of certain medical supplies and direct out-of-pocket payment by patients (Amougou et al., 2021). The small intestine was the most frequently incarcerated viscus (46.1%), consistent with classical findings due to its mobility and length (Pavithira et al., 2022). The substantial proportion of intestinal necrosis (23.5%) reflects the impact of diagnostic and therapeutic delay on the severity of lesions. This reality calls for concrete measures at several levels: raising public awareness of the need for early consultation for any painful, irreducible hernia; strengthening triage capacity in emergency departments to rapidly identify strangulated forms; and removing economic barriers to emergency surgical care (no-prepayment policy for strangulated hernia).

Regarding repair modalities, the growing role of mesh repair in the emergency setting warrants emphasis. Long controversial, the use of mesh in strangulated hernias is now supported by several recent studies, which demonstrate its safety in the absence of major contamination, with infection rates comparable to those of non-mesh techniques (Birindelli et al., 2017). In our series, mesh was used in 35.3% of cases, with a low rate of infectious complications, supporting these data. Our practice was to offer mesh repair to patients presenting with a strangulated hernia without signs of intestinal necrosis or gross peritoneal contamination. When necrosis required intestinal resection, or in the presence of purulent peritoneal fluid, tissue repair was preferred. This approach, in line with current recommendations, suggests that mesh repair can be considered even in resource-limited settings, provided patients are carefully selected (Birindelli et al., 2017; Ekwesianya et al., 2024).

Conversely, tissue-based techniques such as Bassini or Mac Vay remain widely used but appear increasingly limited in terms of long-term outcomes (Bittner et al., 2011). This finding argues for sustained continuing education and a regular supply of mesh material, even in resource-limited facilities.

Beyond classical techniques, minimally invasive surgery occupies a growing place in the management of strangulated hernias.

Laparoscopic techniques are now used successfully both in elective and emergency surgery (Joe et al., 2019). A recent meta-analysis of nearly 39,000 patients confirmed their safety in this context, with mortality and recurrence rates comparable to the open approach, alongside less postoperative pain and shorter hospital stay (Lai et al., 2025). Technically, laparoscopy offers the additional advantage of allowing exploration of the entire abdominal cavity and direct assessment of bowel viability (Joe et al., 2019). Its implementation, however, remains dependent on adequate equipment and a steep learning curve, estimated at 20–100 procedures (Khamajeet et al., 2025), which still limits its availability in our setting. In our series, no patient underwent a laparoscopic approach, reflecting current constraints in our environment. It nonetheless represents a perspective to consider as training and equipment progress in our hospitals.

The overall postoperative complication rate of 7.8% is comparable to that reported in the recent African literature, with rates ranging from 6 to 15% (Lebeau et al., 2016; Sawadogo, 2024). Surgical site infection remains the most frequent complication, particularly in the emergency setting (Lebeau et al., 2016). Residual pain observed in 14.7% of patients was significantly associated with the Bassini technique, consistent with current data showing that tissue-based repairs are more likely to cause chronic pain because of tissue traction and nerve irritation (Amougou et al., 2021). Conversely, tension-free repairs, particularly mesh repairs, are associated with a significant reduction in this risk (Isenberg et al., 2025). Recurrence, observed in 6.8% of patients, was significantly associated with the Mac Vay technique ($p = 0.0496$); however, given that only four patients underwent this technique, this finding should be interpreted with caution and cannot be generalized. This result is consistent with the known limitations of tissue-based techniques, whose recurrence rates remain higher because of the progressive weakening of repaired tissues (HerniaSurge Group, 2018).

The overall mortality of 0.98% in our series is relatively low and comparable to recent data, which report rates of 1–6% in similar settings (Piltcher-da-Silva et al., 2023; Sawadogo, 2024). It remains, however, closely related to delayed management, the occurrence of severe complications such as sepsis, and the presence of comorbidities.

Conclusions

Strangulated hernia remains a frequent surgical emergency in our context, mainly affecting young and active individuals. Its diagnosis is primarily clinical and requires rapid surgical management to avoid serious

complications. Despite the variety of techniques used, mesh repair appears to be an effective option, reducing postoperative pain and recurrence.

Its use, even in the emergency setting, deserves to be more widely integrated into practice, under well-controlled conditions. Improving the prognosis depends not only on optimization of surgical techniques but also on reducing time to consultation.

Author contributions

All authors contributed substantially to the conception of the study, the collection, analysis or interpretation of data; the drafting of the manuscript or its critical revision; and have approved the final version submitted for publication.

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Data Availability: All data are included in the content of the paper.

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Declaration for Human Participants: This study received authorization for data collection from the administration of Tengandogo University Hospital. The ethical principles of the Declaration of Helsinki were respected. Anonymity and confidentiality of information were guaranteed by anonymized collection and secure storage of data.

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