

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

Doamba Rodrigue Namekinsba, MD, PhD Student

Windsouri Mamadou, MD

Sade Jean Flores N'doubare, MD

Rabo Faizah, MD

Traore Bazin Thony Lionel, MD

Zebango Adama, MD

Sanon Aimee Florence, MD

Department of General Surgery,

Tengandogo University Hospital, Burkina Faso

Yaro Ignace Imbe, MD

Zigani Soukoula Stephane Corentin, MD

Kabore Raweleguinbasba Armel Flavien, MD

Department of Anesthesia and Intensive Care,

Tengandogo University Hospital, Burkina Faso

Sanou Adama, MD

Department of General Surgery,

Tengandogo University Hospital, Burkina Faso

[Doi:10.19044/esj.2026.v22n30p86](https://doi.org/10.19044/esj.2026.v22n30p86)

Submitted: 25 May 2026

Accepted: 15 October 2026

Published: 31 October 2026

Copyright 2026 Author(s)

Under Creative Commons CC-BY 4.0

OPEN ACCESS

Cite As:

Doamba, R. N., Windsouri, M., Sade, J. F. N., Rabo, F., Traore, B. T. L., Zebango, A., Sanon, A. F., Yaro, I. I., Zigani, S. S. C., Kabore, R. A. F., & Sanou, A. (2026). *Strangulated Hernia in Adults, a Persisting Surgical Emergency: Epidemiology and Management at Tengandogo University Hospital (Burkina Faso)*. European Scientific Journal, ESJ, 22 (30), 86. <https://doi.org/10.19044/esj.2026.v22n30p86>

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 single-centre, retrospective observational cohort 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; over the study period, strangulated hernia accounted for 4.96% of abdominal surgical emergencies at Tengandogo University Hospital. The mean age of patients was 44 years, with a male predominance (sex ratio = 2.18). Manual workers (farmers and labourers) accounted for 49.0% of patients. Clinically, all patients presented with a tender, irreducible hernial swelling. 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. Among the 70 patients operated on for a groin hernia, residual pain was reported in 15 (21.4%) and recurrence in seven (10.0%) at six months. Residual pain was more frequent after Bassini repair and recurrence after McVay repair; given the very small subgroups and the number of comparisons performed, these associations should be regarded as exploratory. **Conclusion:** Reducing consultation delays and improving access to elective surgery are major challenges to limit these complicated forms. When they occur, a selective policy of mesh repair, in the absence of bowel necrosis or gross peritoneal contamination, proved feasible and was not associated with an excess of infectious complications; the lower rates of residual pain and recurrence observed after mesh repair should be regarded as exploratory given the small number of events.

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 and barriers to healthcare access (Lebeau et al., 2016; Ndong et al., 2024).

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 tender and irreducible, sometimes associated with intestinal obstruction (HerniaSurge Group, 2018). Irreducibility is the cardinal sign. In this context,

the management must be urgent and 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 (Ekwesianya et al., 2024). 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 et al., 2015). By contrast, in resource-limited countries such as Burkina Faso, it remains frequent and represents a genuine public health problem.

Series of strangulated hernias from sub-Saharan Africa are numerous, but most are short, purely descriptive, and stop at hospital discharge. As a result, two things that matter in practice are still poorly documented in the region: how the tissue-based techniques still widely used here actually perform over the medium term, and whether mesh can be used safely in the emergency setting. This series was built over a full decade of practice to address both questions, and to identify the health-system causes of delayed care that could realistically be acted upon.

The primary objective of this study was to investigate the epidemiological, diagnostic and therapeutic aspects of strangulated hernias at Tengandogo University Hospital, Burkina Faso. The secondary objective was to compare residual pain and recurrence at six months between the repair techniques used.

Methods

This was a single-centre, retrospective observational cohort study covering a 10-year period, from January 1, 2016 to December 31, 2025, in the Department of General Surgery of Tengandogo University Hospital, Burkina Faso. Adult patients (aged 18 years and over) admitted and operated on for a strangulated abdominal wall hernia during the study period were included. Patients who were brought in deceased and those whose medical records were unusable were excluded. A medical record was considered usable when it documented, at a minimum, the date and time of admission and of surgery; an operative report specifying the site of the hernia, the contents of the sac, the presence or absence of bowel necrosis and the repair technique used; and the postoperative course until discharge. All 102 patients were included in the

descriptive analysis; the comparison of six-month outcomes between repair techniques was restricted to the 70 patients operated on for a groin hernia, for which the tissue-based and mesh techniques are directly comparable. All procedures were performed by, or under the direct supervision of, a senior general surgeon of the department. Data were extracted from the departmental admission, hospitalisation and operative registers, from the inpatient medical records, and from the outpatient records of the scheduled follow-up consultations; no patient was contacted for the purposes of this study. 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). Irreducibility was assessed by gentle palpation, and no taxis was attempted. The cough impulse was not recorded, since it is not interpretable in an irreducible hernia. Follow-up was scheduled at six months after surgery. Residual pain and recurrence at six months were recorded as documented by the operating team in the six-month consultation note; residual pain was noted as present or absent rather than graded on a validated scale, and recurrence was ascertained clinically, without routine imaging. Data entry and processing were performed using Microsoft Office 2019 and Epi Info 7.2.5 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 (CI) to assess associations between surgical technique and postoperative outcomes (residual pain and recurrence). Because several subgroups contained few events, these associations were regarded as exploratory and hypothesis-generating. Given the small number of events, no multivariate analysis was performed. The threshold of statistical significance was set at $p < 0.05$. The comparison of six-month outcomes by technique was restricted to groin hernia repairs ($n = 70$).

Regarding ethics, given the retrospective design and the use of fully anonymised, routinely collected data, formal review by an institutional ethics committee was not required; institutional authorisation 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

Over the study period, 168 patients were admitted for a strangulated hernia, accounting for 2.06% of surgical emergencies and 4.96% of abdominal surgical emergencies at Tengandogo University Hospital; 102 of them met the inclusion criteria and were included in the analysis. 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).

Table 1 shows the distribution of patients according to occupation. Farmers and labourers accounted for 25.5% and 23.5% of occupations in our series, respectively, amounting to 49.0% of manual occupations.

Table 1: Distribution of patients according to occupation

Occupation	Number	Percentage
Farmer	26	25.5
Labourer	24	23.5
Unemployed	19	18.6
Homemaker	14	13.7
Trader	9	8.8
Pupil/Student	8	7.8
Civil servant	2	2.0
Total	102	100

Patients were referred from another facility in 84 cases (82.3%). Institutional causes of delayed or referred care were identified in 18 patients (17.6%): surgeon unavailability in 13 patients (72.2%), lack of an available operating room in three patients (16.7%), and a long waiting list in two patients (11.1%). A previously known hernia was reported in 51 cases (50.0%).

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 (43.1%). Groin hernias were found in 70 patients (68.6%), while midline hernias (umbilical and linea alba) were found in the remaining 32 cases (31.4%). Among the 70 groin hernias, 48 were right-sided (68.6%), 21 left-sided (30.0%) and one bilateral (1.4%). Table 2 shows the distribution of patients according to the anatomical site and side of the hernia.

Table 2: Distribution of patients according to the anatomical site and side of the hernia

Diagnosis	Number	Right	Left
Groin hernias	70	48	21
Inguino-scrotal	44	32	12
Inguinal, other	21	13	8
Femoral	4	3	1
Bilateral inguino-scrotal	1	n/a	n/a
Midline hernias	32	n/a	n/a
Umbilical	20	n/a	n/a
Linea alba	12	n/a	n/a
Total	102	48	21

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%); representative intraoperative findings are shown in Figure 1. Table 3 shows the distribution of patients according to the contents of the hernial sac.

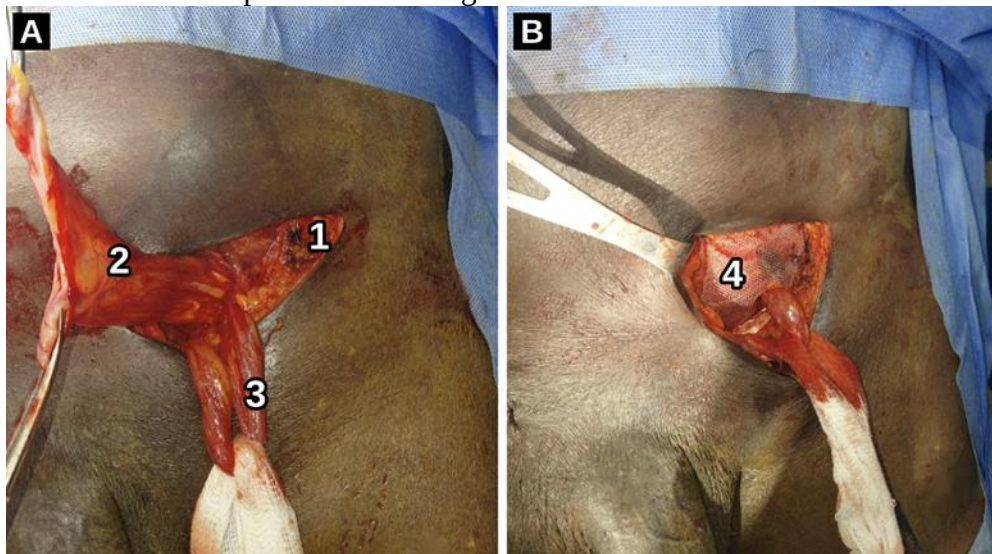


Figure 1: Intraoperative photographs of a strangulated left inguinal hernia
(A) Reduction and dissection of the hernial sac; (B) placement of the prosthetic mesh on the posterior inguinal wall. 1- skin incision at the inguinal fold; 2- opened hernial sac; 3- spermatic cord isolated on a sling; 4- prosthetic mesh.

Table 3: 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 McVay repair in four patients (3.9%).

The postoperative course was uneventful in 94 patients (92.2%) and complicated in eight patients (7.8%). The most frequent complication was surgical site infection, observed in four patients. Table 4 shows the distribution of patients according to complications and repair technique.

Table 4: 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%.

The comparison of six-month outcomes between repair techniques concerned the 70 patients operated on for a groin hernia: Bassini repair in 26, mesh repair in 24, Shouldice repair in 16 and McVay repair in four. The 32 midline hernias, repaired by simple suture in 20 cases and by mesh in 12, were not included in this comparison, which was restricted to groin-hernia repair. At six months, residual pain was reported in 15 of these 70 patients (21.4%) and recurrence in seven (10.0%).

On univariate analysis, residual pain was more frequent after Bassini repair ($p = 0.0387$), and recurrence more frequent after McVay repair ($p = 0.0496$, $RR = 6.60$ [95% CI: 1.81–24.03]); however, these results should be interpreted with caution given the very small number of patients in the McVay subgroup ($n = 4$), and both associations should be regarded as exploratory rather than confirmatory, given the number of comparisons performed without adjustment for multiplicity (Tables 5 and 6).

Table 5: 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
McVay 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 6 : 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
McVay 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 4.96% of abdominal surgical emergencies in our series, a frequency within the range reported from sub-Saharan Africa, where figures vary widely depending on hospital setting and access to care (Lebeau et al., 2016; Magagi et al., 2017; Ohene-Yeboah & Dally, 2014; 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). The predominance of manual occupations, together with the high proportion of episodes triggered by physical exertion (80.4%), is consistent with the classical view that repeated increases in intra-abdominal pressure contribute to strangulation. A study of this design cannot, however, establish occupation as a risk factor for strangulated hernia, since it includes no comparison group of patients without hernia; a case-control design would be required to address that question.

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. Public awareness of the need for early consultation for any painful, irreducible hernia, faster triage of these forms in the emergency department, and removal of the economic barriers to emergency surgical care (a no-prepayment policy for strangulated hernia, for example) would all help address this.

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 McVay 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.

Continuing education is also part of the answer. A national survey of surgical residents in Senegal found that the training they had received on a given technique was the factor most often cited as influencing its choice, ahead of ease of performance, operating time and cost (Ndong et al., 2025); a similar pattern was described by a structured postgraduate hernia-training programme recently reported from a comparable East African setting (Francis et al., 2025).

Minimally invasive surgery also has a growing place in the management of strangulated hernias, beyond these classical techniques.

Laparoscopic approaches 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 21.4% of the 70 groin-hernia repairs, was more frequent after 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 (HerniaSurge Group, 2018). Conversely, tension-free repairs, particularly mesh repairs, are associated with a reduction in this risk (HerniaSurge Group, 2018). Recurrence, observed in 10.0% of the 70 groin-hernia repairs, was more frequent after the McVay technique ($p = 0.0496$); however, given that only four patients underwent this technique, this finding should be interpreted with caution, as an exploratory and hypothesis-generating association rather than a generalizable conclusion. 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.

Regarding the distribution of repair techniques, our distribution (mesh 35.3%, Bassini 25.5%, simple suture 19.6%, Shouldice 15.6%, McVay 3.9%) can be compared with the largest regional synthesis available: a 20-year systematic review and meta-analysis of adult groin hernia surgery in sub-Saharan Africa, in which Bassini (40.1%) and Lichtenstein mesh repair (29.9%) predominated (Ndong et al., 2023). Our series shows a comparatively higher use of mesh, in line with the selective mesh policy described above.

Strengths and limitations

The main strength of this study lies in its 10-year recruitment period, which makes it one of the longest single-centre series of strangulated hernias reported from Burkina Faso, and in the fact that outcomes were documented at six months and analysed by repair technique. Most series published from sub-Saharan Africa report outcomes only up to hospital discharge, so that chronic pain and recurrence, the two outcomes that determine the long-term value of a repair, remain largely undocumented in the region; a recent cross-sectional study from Senegal illustrates the same gap (Tcheutchoua Soh et al., 2026). The study also quantifies the health-system causes of delayed care, an aspect rarely measured, and describes a selective policy of mesh use in the emergency setting together with its infectious outcomes.

Several limitations must nevertheless be acknowledged. The retrospective, single-centre design exposes the study to information bias and limits the generalisability of the findings; as a tertiary referral centre, our institution probably receives a higher proportion of complicated forms than secondary hospitals. The comparison of outcomes by technique was restricted to groin hernias and to the events documented at the scheduled six-month consultation. Some subgroups were very small, particularly the McVay group, so that the corresponding risk estimates carry wide confidence intervals and should be regarded as exploratory. No multivariable adjustment was possible given the number of events, and residual confounding by hernia type, patient age, or the presence of bowel necrosis cannot be excluded. Finally, residual pain was recorded as a binary variable rather than with a validated scale, hernias were not classified according to the European Hernia Society system, and recurrence was ascertained clinically without imaging.

Conclusions

Strangulated hernia remains a frequent surgical emergency in our setting, mainly affecting young and economically active adults, and its severity is closely linked to delayed presentation.

A selective policy of mesh repair, restricted to patients without bowel necrosis or gross peritoneal contamination, proved feasible and was not associated with an excess of infectious complications. Residual pain and recurrence at six months were less frequent after mesh repair than after tissue-based repairs, but the small number of events means that this series cannot demonstrate a difference, and the comparison should be regarded as exploratory. Reducing time to consultation and improving access to elective repair remain the main levers for limiting these complicated forms.

Authors' Contributions

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

Conflict of Interest: The authors reported no conflict of interest.

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

Funding Statement: The authors did not obtain any funding for this research.

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.

References:

1. Amougou, B., Eyongeta, D., Cisse, D., Ngandeu, M. J., Engbang, J. P., Djoufang, R., Beyeme, T. S., Sow, Y., Diallo, A. B., & Iii, F. A. (2021). Les hernies inguinales de l'adulte à l'Hôpital Central de Niète: aspects épidémiologiques et anatomocliniques. *Health Sciences and Disease*, 22(7). <https://doi.org/10.5281/hsd.v22i7.2703>
2. Attolou, S., Bilubi, J.-J. P., Laleye, M., Hounsou, N., Fadonougbo, P., Atchou, B., Chabi-Yorouba, M., Lissanon, T., Gbessi, D., & Dossou, F. (2026). Surgical abdominal wall pathologies in adults: epidemiological, diagnostic and therapeutic aspects at the Suru-Lere University Teaching Hospital (CHUZ-SL), Cotonou, from 1 January 2022 to 31 December 2024. *SAS Journal of Surgery*, 12(01), 81–87. <https://doi.org/10.36347/sasjs.2026.v12i01.014>
3. Birindelli, A., Sartelli, M., Di Saverio, S., Coccolini, F., Ansaloni, L., van Ramshorst, G. H., Campanelli, G., Khokha, V., Moore, E. E., Peitzman, A., Velmahos, G., Moore, F. A., Leppaniemi, A., Burlew, C. C., Biffl, W. L., Koike, K., Kluger, Y., Fraga, G. P., Ordonez, C. A., Sakakushev, B., Augustin, G., Latifi, R., Kelly, M. D., Wani, I., Baiocchi, G., Bala, M., Bendinelli, C., Bulger, E. M., Demetrashvili, Z., Di Carlo, I., Kashuk, J., Sugrue, M., Ivatury, R., Bonavina, L., Manfredi, R., Poiasina, E., Cui, Y., Inaba, K., Fikry, K., Ben-Ishay, O., Faccincani, R., Voiglio, E. J., Coimbra, R., Rossetti, D., Naidoo, N., Weber, D., Abu-Zidan, F. M., & Catena, F. (2017). 2017 update of the WSES guidelines for emergency repair of complicated abdominal wall

- hernias. *World Journal of Emergency Surgery*, 12(1), 37. <https://doi.org/10.1186/s13017-017-0149-y>
4. Bittner, R., Arregui, M. E., Bisgaard, T., Dudai, M., Ferzli, G. S., Fitzgibbons, R. J., Fortelny, R. H., Klinge, U., Kockerling, F., Kuhry, E., Kukleta, J., Lomanto, D., Misra, M. C., Montgomery, A., Morales-Conde, S., Reinpold, W., Rosenberg, J., Sauerland, S., Schug-Pass, C., Singh, K., Timoney, M., Weyhe, D., & Chowbey, P. (2011). Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia [International Endohernia Society (IEHS)]. *Surgical Endoscopy*, 25(9), 2773–2843. <https://doi.org/10.1007/s00464-011-1799-6>
 5. Ekwesianya, A. C., Ayantunde, A., & Nour, H. M. (2024). Assessing the safety of mesh repair in strangulated groin hernias: a systematic review and meta-analysis. *Cureus*, 16(9), e70496. <https://doi.org/10.7759/cureus.70496>
 6. Francis, B., Mubezi, I., Kakande, I., Oppong, C., Akoh, J., & Tatumwa, B. D. (2025). Postgraduate surgical hernia training with a standardized hernia surgery training tool: training while serving humanity. *Annals of Medicine and Surgery*, 87(12), 8304–8308. <https://doi.org/10.1097/MS9.0000000000004183>
 7. HerniaSurge Group. (2018). International guidelines for groin hernia management. *Hernia: The Journal of Hernias and Abdominal Wall Surgery*, 22(1), 1–165. <https://doi.org/10.1007/s10029-017-1668-x>
 8. Joe, C., Gowda, V., & Koganti, S. (2019). Laparoscopic assisted repair of strangulated obturator hernia—way to go. *International Journal of Surgery Case Reports*, 61, 246–249. <https://doi.org/10.1016/j.ijscr.2019.07.029>
 9. Johnson, P. L., Mullens, C. L., Jean, R. A., Lindsey, H. J., Dimick, J. B., & Hemmila, M. R. (2025). Emergency hernia repair outcomes for patients with and without established hernia care with a surgeon. *JAMA Network Open*, 8(9), e2531290. <https://doi.org/10.1001/jamanetworkopen.2025.31290>
 10. Kallinowski, F., Fortelny, R. H., Köckerling, F., Mayer, F., Morales-Conde, S., & Sandblom, G. (2022). Editorial: Mesh complications in hernia surgery. *Frontiers in Surgery*, 9, 841672. <https://doi.org/10.3389/fsurg.2022.841672>
 11. Khamajeet, A., Diab, A., Marchant, S., & Bougard, H. (2025). An adapted hybrid of open and laparoscopic techniques for ventral hernia repair in a resource-constrained setting. *Cureus*, 17(3), e81095. <https://doi.org/10.7759/cureus.81095>
 12. Köckerling, F., Heine, T., Adolf, D., Zarras, K., Weyhe, D., Lammers, B., Mayer, F., Reinpold, W., & Jacob, D. (2021). Trends in emergent

- groin hernia repair—an analysis from the Herniated Registry. *Frontiers in Surgery*, 8, 655755. <https://doi.org/10.3389/fsurg.2021.655755>
13. Lai, S. D., Smith, N. J., Park, B., Vandal, A., & MacCormick, A. D. (2025). Laparoscopic versus open approach for emergency repair of groin hernias: a systematic review and meta-analysis. *World Journal of Surgery*, 49(10), 2733–2741. <https://doi.org/10.1002/wjs.70076>
14. Lebeau, R., Traoré, M., Anzoua, K. I., Kalou, I. L. B., N'Dri, A. B., Agui, B., Kakou, A. G., & Diané, B. (2016). Prognostic factors of postoperative morbidity and mortality of adult strangulated groin hernia. *The Indian Journal of Surgery*, 78(3), 192–196. <https://doi.org/10.1007/s12262-015-1343-3>
15. Magagi, I. A., Adamou, H., Habou, O., Magagi, A., Halidou, M., & Ganiou, K. (2017). Digestive surgical emergencies in Sub-Saharan Africa: a prospective study of a series of 622 patients at the National Hospital of Zinder, Niger. *Bulletin de la Société de Pathologie Exotique*, 110(3), 191–197. <https://doi.org/10.1007/s13149-016-0499-9>
16. Meara, J. G., Leather, A. J. M., Hagander, L., Alkire, B. C., Alonso, N., Ameh, E. A., Bickler, S. W., Conteh, L., Dare, A. J., Davies, J., Mérisier, E. D., El-Halabi, S., Farmer, P. E., Gawande, A., Gillies, R., Greenberg, S. L. M., Grimes, C. E., Gruen, R. L., Ismail, E. A., Kamara, T. B., Lavy, C., Lundeg, G., Mkandawire, N. C., Raykar, N. P., Riesel, J. N., Rodas, E., Rose, J., Roy, N., Shrim, M. G., Sullivan, R., Verguet, S., Watters, D., Weiser, T. G., Wilson, I. H., Yamey, G., & Yip, W. (2015). Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Lancet*, 386(9993), 569–624. [https://doi.org/10.1016/S0140-6736\(15\)60160-X](https://doi.org/10.1016/S0140-6736(15)60160-X)
17. Melkemichel, M., Holmberg, H., Dahlstrand, U., & de la Croix, H. (2025). Short- and long-term outcomes after emergency groin hernia surgery: a nationwide population-based study from the Swedish Hernia Register. *Journal of Clinical Medicine*, 14(7), 2397. <https://doi.org/10.3390/jcm14072397>
18. Ndong, A., Diallo, A. C., Falola, A., Ndiaye, M. A., Faye, M., Faye, P. M., Niasse, A., Fall, S. M. A., Cissé, M., Diop, P. S., & Konaté, I. (2025). Choice of surgical technique in groin hernia surgery among residents in Senegal: experience and influencing factors. *Journal of Abdominal Wall Surgery*, 4, 14076. <https://doi.org/10.3389/jaws.2025.14076>
19. Ndong, A., Tendeng, J. N., Diallo, A. C., Diao, M. L., Sow, O., Mawuli, S. D., Diallo, S., Sarr, N., Sarr, I. S. S., Ndiaye, A., Dia, D.

- A., Manyacka Ma Nyemb, P., & Konaté, I. (2023). Adult groin hernia surgery in sub-Saharan Africa: a 20-year systematic review and meta-analysis. *Hernia*, 27(1), 157–172. <https://doi.org/10.1007/s10029-022-02669-9>
20. Ndong, A., Togtoga, L., Bah, M. S., Ndoeye, P. D., & Niang, K. (2024). Prevalence and mortality rate of abdominal surgical emergencies in Sub-Saharan Africa: a systematic review and meta-analysis. *BMC Surgery*, 24(1), 35. <https://doi.org/10.1186/s12893-024-02319-0>
21. Ohene-Yeboah, M., & Dally, C. K. (2014). Strangulated inguinal hernia in adult males in Kumasi. *Ghana Medical Journal*, 48(2), 101–105. <https://doi.org/10.4314/gmj.v48i2.8>
22. Pavithira, G., Dutta, S., Sundaramurthi, S., & Nelamangala Ramakrishnaiah, V. P. (2022). Outcomes of emergency abdominal wall hernia repair: experience over a decade. *Cureus*, 14(6), e26324. <https://doi.org/10.7759/cureus.26324>
23. Piltcher-da-Silva, R., Sasaki, V. L., Bettini, L. F. C., Soares, P. S. M., Valandro, I. G., & Cavazzola, L. T. (2023). Outcomes of emergency groin hernia repair in the elderly: a systematic review. *Journal of Abdominal Wall Surgery*, 2, 11246. <https://doi.org/10.3389/jaws.2023.11246>
24. Sawadogo, Y. E. (2024). Les hernies pariétales étranglées au Centre Hospitalier Universitaire Yalgado Ouédraogo. *Journal de Chirurgie et Spécialités du Mali*, 4(2), 35–44.
25. Tcheutchoua Soh, G., Gaye, S. A., Faye, P. M., Diallo, T. A. T., Diop, A. K., Tendeng, J. N., Thiam, O., Manyacka Ma Nyemb, P., Toure, A. O., Konate, I., & Cisse, M. (2026). Abdominal wall hernia management in a second level hospital of Senegal: a cross-sectional study. *Frontiers in Surgery*, 13, 1864822. <https://doi.org/10.3389/fsurg.2026.1864822>
26. von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *The Lancet*, 370(9596), 1453–1457. [https://doi.org/10.1016/S0140-6736\(07\)61602-X](https://doi.org/10.1016/S0140-6736(07)61602-X)