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Penetrating Abdominal Wounds: Epidemiological, Diagnostic and Therapeutic Aspects at Idrissa Pouye General Hospital in Dakar

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Abstract
Introduction: Penetrating abdominal wounds (PAW) represent a major surgical emergency, particularly in urban African settings. This study aims to describe their epidemiological, clinical, therapeutic, and evolutionary profile at Idrissa Pouye General Hospital (HOGIP) in Dakar.
Methods: A descriptive retrospective study was conducted over a 12-month period (January to December 2023). All patients admitted for PAW were included. Epidemiological, clinical, paraclinical, therapeutic, and outcome data were analyzed.
Results: Thirty-three patients were included. The mean age was 28.19 years, with a male predominance (93.94%). Assaults (33.33%) and riots (27.27%) were the main circumstances. White weapons (60.61%) and firearms (30.30%) were the most frequent causal agents. The mean time to consultation was 3.95 hours. The small intestine (30.30%) and colon (24.24%) were the most injured organs. All patients underwent exploratory laparotomy, with a negative laparotomy rate of 12.12%. Postoperative morbidity was 6.06% and mortality was 9.09%. The mean hospital stay was 7 days.
Conclusion: PAW primarily affect young men and are often related to urban violence. Early and appropriate management, combined with rigorous monitoring, can improve the prognosis.

Keywords: Penetrating abdominal wounds, exploratory laparotomy, abdominal trauma

Introduction
Penetrating abdominal wounds (PAW) are defined as traumas to the abdominal wall with peritoneal breach. They are termed perforating when accompanied by an underlying visceral injury [1]. Their frequency is increasing worldwide, particularly in regions affected by insecurity and crime [2]. In Africa, PAW represent a growing public health problem, with significant morbidity and mortality rates [3, 4].
The management of PAW has evolved over recent decades, moving from systematic exploratory laparotomy to a more selective approach, known as "selective non-operative management," under close clinical, biological, and radiological monitoring [5, 6]. However, in many African centers, laparotomy remains the rule due to the frequent unavailability of emergency imaging and the risk of missed injuries [7].
In Senegal, few recent studies have been dedicated to PAW. This study aims to describe the epidemiological, diagnostic, therapeutic, and evolutionary aspects of PAW managed at Idrissa Pouye General Hospital (HOGIP) in Dakar.

Methods
Study setting and period
This was a descriptive retrospective study conducted in the Department of General Surgery at HOGIP from January 1 to December 31, 2023.

Population
All patients admitted for PAW during the study period were included. Incomplete records and abdominal contusions without breach were excluded.

Data collection and analysis
Data were collected from medical records and via telephone interviews using a pre-established survey form. The studied parameters included:
- Epidemiological data: age, sex, circumstances, causal agent, time to consultation;
- Clinical data: hemodynamic status, physical signs, evisceration;
- Paraclinical data: biology, imaging;
- Therapeutic data: type of surgery, procedures performed;
- Outcome: complications, length of hospital stay, mortality.

Data were entered and analyzed using EPI-Info and Excel 2013 software.

Results
Epidemiological data
Among the 33 included patients, the mean age was 28.19 years (range: 17–72 years). The 20–30 age group was the most represented (54.55%). The sex ratio was 15.5 in favor of males (93.94%). Assaults (33.33%) and riots (27.27%) were the main circumstances. White weapons (60.61%) and firearms (30.30%) were the most frequent causal agents. The mean time to consultation was 3.95 hours.

Clinical data
Hemodynamic status was stable in 51.51% of patients. Abdominal pain was constant (100%). Evisceration was present in 45.45% of patients, mainly omentum (33.33%) (Figures 1 and 2). The right iliac fossa (21.21%) was the most frequent wound site.

Paraclinical data
Acute anemia was present in 12.12% of patients. Abdominal ultrasound was performed in only one patient (3.03%). CT scan, performed in 30.30% of patients, showed hemoperitoneum in 24.24% of cases.

Therapeutic data
All patients underwent exploratory laparotomy.
Small bowel injuries were the most frequently encountered visceral lesions, found in 10 patients (30.30%). The distribution of small bowel lesions was as follows:
- Multiple perforations (≥2 sites): 45% of cases (Figure 3)
- Mesenteric injuries with bowel ischemia: 30% of cases
- Isolated single perforations: 25% of cases

The jejunum was involved in 60% of cases, the ileum in 30%, and both segments in 10% of patients. Associated mesenteric injuries were present in 70% of small bowel trauma cases, with varying degrees of vascular compromise.
A surgical procedure was performed in 87.88% of patients. The management of small bowel injuries included:
- Resection-anastomosis: 9 patients (90% of small bowel injuries) (Figure 4)
- Primary suture: 1 patient (10% of small bowel injuries)

The most frequent procedures were small bowel resection-anastomosis (27.27%) and gastric suture (12.12%). The negative laparotomy rate was 12.12%.

Outcome
Postoperative outcomes were simple in 84.84% of cases. Morbidity was 6.06% (peristomal skin burn). No anastomotic leaks were observed in patients with small bowel repairs. Postoperative mortality was 9.09%, mainly due to hemorrhagic shock. The mean hospital stay was 7 days.

Discussion
Penetrating abdominal wounds remain a significant cause of morbidity and mortality in trauma surgery, particularly in urban African settings. Our study of 33 patients at Idrissa Pouye General Hospital provides valuable insights into the current epidemiological, clinical, and therapeutic patterns of this condition in Dakar, Senegal.

Epidemiological aspects
The demographic profile observed in our series aligns consistently with numerous studies from Africa and other regions. The marked male predominance (93.94%) with a sex ratio of 15.5 reflects patterns reported by Sissoko in Mali (sex ratio 6.3), Nwashilli in Nigeria (7.5), and Choua in Tchad (13.3) [3, 8, 9]. This overwhelming male predominance can be attributed to several factors: greater involvement in high-risk activities, higher rates of substance abuse, increased participation in public demonstrations, and higher exposure to urban violence [10, 11].
The mean age of 28.19 years, with the 20-30 year age group representing 54.55% of cases, corresponds with findings by Dieng in Senegal (27 years), Kante in Mali (27.7 years), and Bombah in Cameroon (27 years) [4, 10, 12]. This concentration among young adults represents a significant economic burden, as this demographic constitutes the most productive segment of the population. The socioeconomic implications are substantial, considering the potential for long-term disability, loss of employment, and healthcare costs [13].
The temporal distribution of incidents, with a peak between 7-11 PM (30.30%), correlates with periods of increased social activity, alcohol consumption and reduced security presence. This pattern has been similarly observed in urban trauma centers worldwide and highlights the importance of targeted prevention strategies during these high-risk hours [14].

Circumstances and etiological agents
The circumstances surrounding PAW in our study reflect the complex socio-political context of Dakar. Criminal assaults accounted for 33.33% of cases, consistent with reports by Miabaou (38.2%) and Bombah (59.4%), though lower than Sissoko's report of 62.12% [4, 9, 14]. This variation may reflect differences in urban security dynamics across regions.
Notably, riots represented 27.27% of cases in our series, a finding absent in reports from Congo, Cameroon, and Mali [4, 9, 14]. This significant proportion coincides with political tensions and social unrest experienced in Senegal during the study period, highlighting how political instability directly impacts trauma epidemiology.
The distribution of causal agents demonstrates the persistent predominance of white weapons (60.61%) over firearms (30.30%), consistent with findings by Barbois (78%), Choua (77.5%), and Gomez (76.9%) [2, 3, 15]. This pattern reflects both the accessibility and lower cost of white weapons, as well

as legal restrictions on firearm ownership in many African countries. However, the substantial proportion of firearm-related injuries (30.30%) remains concerning, indicating persistent illicit arms circulation.

Clinical presentation and diagnostic approach

The clinical presentation in our series was characterized by abdominal pain in all patients (100%), with evisceration present in 45.45% of cases, predominantly involving the omentum (33.33%). These findings align with multiple authors who identified evisceration, abdominal tenderness, and guarding as constant physical signs [9, 16]. The presence of objective signs such as intestinal or colonic evisceration, abdominal rigidity, or digestive fluid leakage through the wound should mandate urgent exploratory laparotomy.

The right iliac fossa was the most frequent wound location (21.21%), which may be explained by both anatomical factors (reduced muscle protection) and the mechanics of frontal assaults among right-handed individuals.

Paraclinical assessment

The limited use of imaging modalities in our series reflects resource constraints common in many African surgical centers. Abdominal ultrasound was performed in only one patient (3.03%), substantially lower than rates reported by Younssa (11.70%) and Sissoko (36.36%) [9,17]. This underutilization is particularly significant given ultrasound's proven value in detecting hemoperitoneum and quantifying its volume, especially when performed by trained clinicians [9, 17].

Abdominal X-rays without preparation were obtained in only 21.21% of cases, compared to 75.6% in Bombah's Cameroonian series and 57.60% in Sissoko's Malian study [4, 9]. This low utilization rate may be attributed to the evident peritoneal breach observed preoperatively in most cases, leading surgeons to proceed directly to surgical exploration.

CT scanning, performed in 30.30% of patients, demonstrated hemoperitoneum in 24.24% of cases. While CT offers superior performance in diagnosing solid organ injuries compared to ultrasound [18], its limited availability after hours, high cost, and requirement for hemodynamically stable patients restrict its routine use in our emergency context. As Arslan [19] suggested, in settings with diagnostic challenges and limited emergency imaging resources, a rapid and meticulous clinical examination often enables prompt decision-making, potentially reducing morbidity and mortality from traumatic injuries.

Therapeutic management and surgical findings

The systematic approach to exploratory laparotomy in our series (100%) reflects the prevailing practice in many African centers, despite global trends toward selective non-operative management. The negative laparotomy rate of 12.12% compares favorably with Bombah (16.2%) and is substantially lower than Barbois' report (35.6%) [2, 4]. This variation may reflect differences in patient selection, surgical experience, and institutional protocols.

The distribution of organ injuries in our study follows established patterns, with small intestine involvement (30.30%) being most frequent, consistent with reports by Bombah (50%), Choua (42%), and Younssa (31.37%) [3, 4, 17]. This predominance can be attributed to the extensive length and mobility of the small bowel, making it vulnerable to penetrating trauma. The lesions observed ranged from simple punctiform or linear injuries to complex wounds with associated mesenteric damage.

Our therapeutic approach to small bowel injuries reflects current surgical principles in trauma management. The predominance of resection-anastomosis (90% of cases) over primary suture (10%) is consistent with the complex nature of the lesions encountered, particularly multiple perforations and injuries with associated mesenteric damage.

This pattern differs somewhat from other African series. Sissoko in Mali reported primary suture in 63% of small bowel injuries versus resection-anastomosis in 37% [9], while Bombah in Cameroon reported 89% primary suture and 11% resection [4]. This variation may reflect differences in injury patterns, with our series showing a higher proportion of complex lesions requiring resection.

Colonic injuries, present in 24.24% of cases, pose particular challenges in management, especially when wounds are small and located on fixed segments [9]. The therapeutic approach must consider the time elapsed since injury, degree of fecal contamination, and patient's overall condition [20].

Gastric injuries (12.12%) were managed primarily by simple suture. The principal risk in gastric wounds lies in missed injuries, particularly when they are through-and-through or located in less accessible areas like the posterior wall or lesser curvature [21].

Hepatic injuries (6.06%) were managed conservatively with packing, reflecting current trends toward non-operative management of solid organ injuries when possible [22, 23]. The major concern in hepatic trauma involves unrecognized biliary or intrahepatic vascular injuries [24].

Postoperative outcomes

The absence of anastomotic leaks in our patients undergoing small bowel resection-anastomosis supports the safety of this approach in our setting. This is particularly relevant given the often-challenging conditions of emergency trauma surgery in resource-limited environments. As emphasized by Plancq *et al.* [14], the decision between primary repair and resection-anastomosis should be based on the number, size, and location of injuries, as well as the patient's overall condition.

The morbidity rate of 6.06% in our series compares favorably with other studies. While superficial surgical site infection was the most common complication reported by Choua (4.65%), Omer (16.47%), and Nadikuditi (30.13%) [3, 13, 25], this complication was absent in our patients. Instead, we observed one case of peristomal skin burn (3.03%) requiring reoperation.

The postoperative mortality rate of 9.09% falls within the range reported in comparable studies: Omer (4.7%), Miabaou (2.95%), and Bombah (8.1%) [4, 14, 25]. All deaths in our series resulted from hemorrhagic shock, underscoring the critical importance of early hemodynamic stabilization and prompt surgical intervention for major vascular injuries. The number of injured organs significantly influences prognosis, with mortality exceeding 50% when more than five visceral lesions are present [26].

The mean hospital stay of 7 days aligns with reports from Omer (8.5 days), Choua (8.9 days), and Younssa (9.25 days) [3, 17, 25]. This duration is influenced by multiple factors including injury complexity, postoperative complications, and associated injuries.

Fig 1: Post-traumatic small bowel evisceration

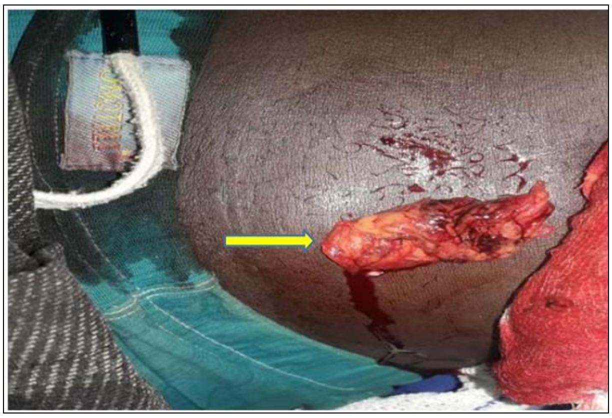

Fig 2: Left flank wound with epiplocele

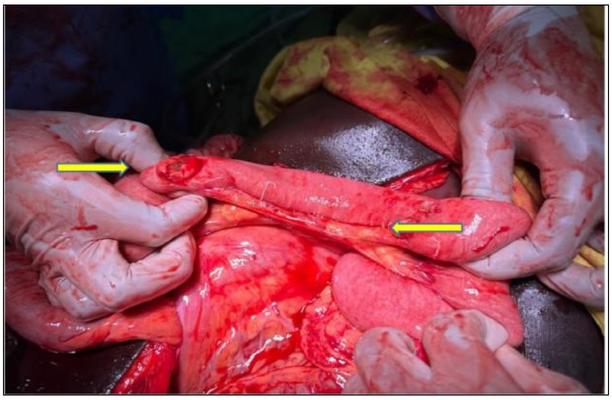

Fig 3: Small bowel injuries (yellow arrows) (Peroperative view)

Fig 4: Small bowel resection pieces removing intestinal wounds

Conclusion

The management of penetrating abdominal wounds at Idrissa Pouye General Hospital reflects both the challenges and adaptations necessary in a resource-constrained environment. While exploratory laparotomy remains the cornerstone of management, selective non-operative approaches warrant consideration in stable patients with adequate monitoring capabilities. The epidemiological profile underscores the need for targeted prevention strategies addressing urban violence, particularly among young males. Improving diagnostic resources and surgical training will be essential to optimizing outcomes for these challenging injuries.

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