



PERITONITIS BY NON-TRAUMATIC INTESTINAL PERFORATION: EPIDEMIOLOGY, ETIOLOGY  
AND MANAGEMENT AT JOSEPH RAVOAHANGY ANDRIANAVALONA HOSPITAL CENTER

Rakotomena SD., Rahantsoa Finaritra CFP., Rajaonarivony T., Samison LH and  
Rakoto Ratsimba HN

Department of Visceral Surgery at Joseph Ravoahangy Andrianavalona Hospital

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ABSTRACT

**Introduction:** The management of non-traumatic intestinal perforations is limited in a low-income country such as Madagascar. Our objective is to evaluate the management of non-traumatic intestinal perforations.

**Patients and method:** This is a descriptive retrospective study during two years in the University Hospital Center of Antananarivo - Madagascar on patients operated for non-traumatic perforation of the intestine. The information obtained was entered into a database on the Excel® software and analyzed with the Epi-info7® software. The results are presented as a mean value ± standard deviation.

**Results:** A total of 137 cases had a non-traumatic bowel perforation. The mean age of all patients was 43.62 ± 16.70 years. Clinical examination revealed generalized abdominal contracture suggestive of acute generalized peritonitis in 106 patients (77.37%). Intestinal perforation was unique in 125 patients (91.24%). The perforation was localized on the anti-mesenteric rim in 124 cases (90.51%). Early postoperative complications were dominated by septic shock, which was observed in 16 patients (11.68%) (Table VII). 27 patients had died postoperatively (19.71%) of which 22 patients died within the first 72 hours (16.06%).

**Conclusion:** Spontaneous perforation of the small bowel is a pathology rarely observed in adults but which can be fatal in the absence of early and appropriate treatment.

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INTRODUCTION

Intestinal perforation is a frequent cause of peritonitis in surgical emergencies. The etiologies described in the literature are numerous: immune or inflammatory infections (viral, bacterial, parasitic and protozoan), drugs and biological agents, congenital, metabolic, vascular diseases and neoplasms {1}. Their frequency differs from country to country. Only hial perforation following abdominal trauma is of obvious etiological diagnosis. However, their management is similar, associating surgery with energetic pre-, per and postoperative resuscitation {2}. The synergy of medical and surgical management is the pillar of therapeutic success. However, spontaneous non-traumatic hial perforation often poses a diagnostic problem because the clinical, radiological, endoscopic and histological characteristics are similar for certain aetiologies, making it impossible to achieve optimal patient management and exposing the patient to considerable morbidity and mortality, particularly in a socio-economic context where complementary investigations are limited. The objective of this study is to describe the epidemiological particularity and the management of patients with non-traumatic intestinal perforation seen at the University Hospital Center of Antananarivo.

PATIENTS AND METHOD

This is a descriptive retrospective study running from January 2018 to June 2020 in the University Hospital Center of Antananarivo - Madagascar on patients operated for non-traumatic perforation of the intestine excluding appendicular perforations and cases where therapeutic data were missing. We had thus carried out our study on a series of 137 consecutive patients. The data were taken from medical records including observation charts, results of check-ups and operative reports. The information obtained was entered into a database on the Excel® software and analyzed with the Epi-info7® software. The results are presented as a mean value ± standard deviation.

RESULTS

Epidemiological profile

A total of 1,250 patients were admitted to our department during our study period. Among this population, 137 cases had a non-traumatic bowel perforation, a frequency of 10.97%, including 80 men (58.39%) and 57 women (41.61%) (sex ratio equal to 1.40). The mean age of all patients was 43.62 ± 16.70 years, with extreme ages ranging from 18 to 71 years. Ninety-

\*Corresponding author: Rakotomena SD

Department of Visceral Surgery at Joseph Ravoahangy Andrianavalona Hospital

six patients came from the city of Antananarivo (70.07%), and 41 patients were referred to our Center (29.93%) (Table I).

**Table I** Distribution of patients with spontaneous bowel perforation according to socio-demographic variables

Variables	Headcount	Rate
Sex		
Man	80	58,39%
Woman	57	41,61%
Age (years)		
[16 - 31[	45	32,85%
[31 - 46[	19	13,87%
[46 - 61[	44	32,12%
More than 61 yearsold	29	21,17%
Provenance		
Antananarivo	96	70,07%
Outside the city of Antananarivo	41	29,93%

In their medical and surgical history, we were able to identify five patients undergoing anti-tuberculosis drug treatment (3.65%), including 4 cases of pulmonary tuberculosis and one case of lymph node tuberculosis. Ten patients had noted systematic deworming (7.30%) (Table II).

**Table II** Distribution of patients according to their medical and surgical history

Medical and surgical history	Headcount	Rate
Ulcerogastrointestinal disease	13	9,49%
HTA	27	19,71%
Diabetes	11	8,03%
Kidney failure	2	1,46%
Cirrhosis	6	4,37%
Anti-tuberculosis treatment in progress	5	3,65%
Systematic de-worming	10	7,30%
Allergy	3	2,19%
Alcoholism	15	10,95%
Smoking	18	13,14%
Abdominal surgery	27	19,71%

On admission, all patients complained of abdominal pain of varying intensity. It was associated with abdominal meteorism in 30 patients (21.90%). Night sweats were present in 25 patients (18.25%). Vomiting was present in 109 patients (79.56%) with hydroelectrolytic disturbances in 78 patients (56.93%). In addition, 36 patients were admitted with shock at the outset (26.28%). Abdominal distension was present in 50 patients (36.49%) and 79 patients were febrile (57.66%). Clinical examination revealed generalized abdominal contracture suggestive of acute generalized peritonitis in 106 patients (77.37%) (Table III).

**Table III** Répartition des patients selon les manifestations cliniques observées à l'admission.

	Headcount	Rate
Abdominal pain	137	100%
Vomiting	109	79,56%
Fever	79	57,66%
Profuse night sweats	25	18,25%
Diarrhea	33	24,09%
Nausea	62	45,26%
Slimming	46	33,58%
Hematochemistry	0	0,00%
Perianal disease	4	2,92%
Material and gas shutdown	69	50,36%
State of shock	36	26,28%
Abdominal distension	50	36,49%
Abdominal Contracture	106	77,37%
Abdominal defence	31	22,63%

In addition, 120 patients had hyperleukocytosis (87.59%). All patients had had an x-ray of the abdomen without preparation. Abdominal ultrasound was performed in 128 patients (93.43%), and 44 patients received an abdominal CT scan

(32.12%). These imaging examinations had revealed images of pneumoperitoneum in 116 cases (84.67%) showing the presence of a hollow organ perforation. Intestinal ileus resulting in images of hydro-aerial levels was found in 69 cases (50.36%). 28 patients had noted a thickening of the intestinal wall (20.44%) of which two cases were in favour of an obstructive colonic tumour complicated by intestinal distension upstream. One case of intestinal diverticulosis was identified on abdominal CT scan (0.73%) (Table IV).

**Table IV** Distribution of patients according to the results of imaging examinations carried out in the pre-operative period

	Headcount	Rate
Pneumoperitoneum	116	84,67%
Hydro-aerial levels	69	50,36%
Aeroschool	57	41,60%
Intestinal distension	39	28,47%
Abdominal lymphadenopathy	36	26,28%
Thickening of the intestinal wall	28	20,44%
Hyperdensification of the mesentery	5	3,64%
Intestinal diverticulosis	1	0,73%

Of which 53 cases involved the entire abdominal cavity (38.69%) and in 31 cases the peritonitis was partitioned (22.63%), and it was fecaloid in 58 patients (42.34%).

Intestinal perforation was found intraoperatively in all our patients and was localized at the ileum in 100 patients (71.99%). Intestinal perforation was unique in 125 patients (91.24%). The perforation was localized on the anti-mesenteric rim in 124 cases (90.51%). The mean size was 17.56mm ± 22.22 with extremes ranging from 1mm to 90mm. Excision-suture of the perforation was performed in 81 cases (59.12%), and was generally reserved for single perforations less than or equal to 10mm. Bowel resection was chosen in 40 cases (29.20%), followed by anastomosis in 32 cases (23.36%), and a temporary stoma in 8 cases (5.84%). Finally, in 8 patients (5.84%), the local inflammatory phenomenon, the fragility of the intestinal wall, and especially the patient's general condition had limited the surgeon's therapeutic gestures, which included abundant washing of the peritoneal cavity with warm saline, followed by peritoneal drying and the insertion of a siphonage drain in the Douglas cul-de-sac (Table V).

**Table V** Distribution of patients by location, number and size of spontaneous bowel perforation, and surgical repair procedures performed

Perforation seat	Headcount	Rate
Jejunum	3	2,19%
Ileon	100	72,99%
Cecum	12	8,76%
Straight settler	3	2,19%
Sigmoid	19	13,87%
Number of perforation		
One	125	91,24%
More than one	12	8,76%
Perforation size (mm)		
[1 - 11[	87	63,50%
[11 - 21[	20	14,60%
[21 - 31[	1	0,73%
[31 - 41[	10	7,30%
[41 - 51[	5	3,65%
[51 - 61[	2	1,46%
[61 - 71[	10	7,30%
[71 - 81[	0	0,00%
[81 - 91[	2	1,46%
Surgical procedures performed		
Excision-suture	81	59,12%
Resection-anastomosis from the outset	32	23,36%
Resection and temporaryostomy	8	5,84%
Ostomy from the outset	8	5,84%
Washing-drainage	8	5,84%

All surgical specimens for peritoneal biopsy, excision and bowel resection were sent for pathological examination. The etiological diagnosis was made postoperatively in 106 cases (77.37%) and remains undetermined in 31 cases (22.63%) despite anamnestic, clinical and paraclinical investigations (Table VI).

**Table VI** Distribution of patients according to the cause of intestinal perforation

Etiologies of perforation	Headcount	Rate
Typical infection	49	35,77%
Intestinal tuberculosis	36	26,28%
Etiology not identified	31	22,63%
Perforation of an intestinal tumour	10	7,30%
Diastatic perforation	7	5,11%
Perforation of intestinal diverticulum	2	1,46%
Crohn's disease	2	1,46%

Infectious etiologies predominated with 49 cases of typhoid perforation (35.77%), the diagnosis of which was based on the finding of *Salmonella typhi* in the blood culture or on the clinical picture of typhoid fever associated with a positive Widal and Felix serology, and on the anatomopathological examination. They were followed by 36 cases of tuberculous intestinal perforation (26.63%) among which 5 patients were undergoing anti-tuberculosis treatment for pulmonary tuberculosis in 4 cases and 1 case of lymph node tuberculosis, and 9 patients presented on chest X-ray an active tuberculosis infection (6.57%). Clinical-radiological arguments had guided the diagnosis of intestinal tuberculosis. In 24 patients, pathological examinations of intestinal perforation and peritoneal biopsies confirmed tuberculosis infection (17.52%). In addition, we observed 10 cases of perforated intestinal tumor (7.30%), exclusively localized in the colon. Two cases were discovered preoperatively by abdominal CT scan and 9 cases were discovered intraoperatively.

Finally, we had found 2 cases of jejuno-ileal diverticular perforation (1.46%), all discovered intraoperatively.

91 patients had observed a simple operative follow-up (66.42%). Early postoperative complications were dominated by septic shock, which was observed in 16 patients (11.68%) (Table VII). 27 patients had died postoperatively (19.71%) of which 22 patients died within the first 72 hours (16.06%).

**Table VII** Distribution of patients according to early postoperative outcomes

Postoperative outcomes	Headcount	Rate
Simple operating suite	91	66,42%
Complications	46	33,58%
Parietal Suppuration	11	8,03%
Pulmonary embolism	2	1,46%
Septic shock	16	11,68%
Deep abscess	2	1,46%
Re-perforation of the intestine	2	1,46%
Suture loosening (sternal fistula)	1	0,72%

Finally, the average length of hospitalization was 6.65 days  $\pm$  13.59 days, ranging from less than 24 hours to 11 days.

## DISCUSSION

Spontaneous perforation of the small ball is a rare condition {1}. In recent years, its incidence has been increasing in our current practice. In two years, out of the 1250 patients admitted to the emergency room, we recorded 137 cases of non-traumatic perforation of the intestine.

According to the authors, spontaneous intestinal perforation concerns 13 to 80 year olds, with an average age of 40.5 years, and a majority of the male sex with a sex ratio ranging from 2.1 to 3 {3}. Our result is close to these data because we had retained a mean age of  $43.62 \pm 16.70$  years, and a sex ratio equal to 1.40.

In our current practice, in spite of the clinical evidence of acute peritonitis, the orientation of the etiologic diagnosis remains a major challenge, all the more so as its etiologies are numerous and their clinical presentations are vague and diverse with non-specific chronic symptoms.

The literature reports that the main etiologies of spontaneous intestinal perforation are infectious (cytomegalovirus, tuberculosis, bacterial, paracitic and protozoan), immune (Crohn's disease, celiac or gluten-sensitive enteropathy and vasculitis), congenital (Meckel's diverticulum and small intestinal diverticulum or duplication), vascular and neoplastic causes {4}. However, they differ according to the socio-economic level of the country.

Thus, our series was dominated by infectious causes of which mainly, typical perforation (35.77%) and tubercular intestinal perforation (26.63%). Our study identifies African results because socio-economically disadvantaged countries are endemic to typical and tuberculous infections due to poor living and hygiene conditions and lack of drinking water. Due to *Salmonella typhi* infestation, of which there are several species, the incidence of typhoid perforation in African countries is estimated at 0.5 to 3.13 {5}. In developed countries, vaccination, food hygiene and antibiotic therapy had reduced the frequency and improved the prognosis of typhoid perforation {6}.

As for spontaneous intestinal perforation by intestinal tuberculosis, the literature reports an incidence ranging from 1 to 15% {7}. And in our study population, the prevalence of tuberculous intestinal perforation was higher (26.63%), of which 13.88% were subtuberculous and 6.57% had active pulmonary tuberculosis on chest X-ray. Indeed, TB perforation of the small intestine can occur during or after tuberculosis treatment {8}. In her series, Shahida *et al.* found 11% of cases of tuberculosis perforation during tuberculosis treatment and that the majority of perforations in the large intestine were due to tuberculosis and perforation of the appendix {3}.

In contrast, in developed countries, non-infectious causes, such as Crohn's disease, predominate the causes of non-traumatic perforation of the intestine, with an incidence of 2-10%, whereas they are considered rare but with increasing incidence in African countries {8,9}.

In the diagnostic process, the history, clinical examination and radiological discovery of a pneumoperitoneum, the absence of which does not eliminate the diagnosis, allow the intestinal perforation to be suspected and its etiology to be determined {2}. However, etiological diagnosis remains difficult in preoperative care. In this sense, and verified by our series, abdominal pain is constant whatever the etiology, and the associated signs differ according to the etiology of the perforation {8}.

In endemic countries, among these associated signs are night sweats, which are more frequent in patients with intestinal tuberculosis, while diarrhea is more frequent in patients with typical perforation associated with a history of prolonged fever

{3}. Hammami *et al.* noted that in African countries where malaria is also an endemic infection with similar prodromes, the clinical history is usually that of peritoneal irritation that occurs during an infectious syndrome often mistakenly treated as a malaria attack {10}.

Thus, for the 35.77% of cases of typical perforation that we noted, the blood culture, the seropositivity of Widal and Felix, or the discovery of simple ulcerations, microabscesses and deep ulcerations involving all tunics on anatomopathological examination, made it possible to decide on the etiological diagnosis of peritonitis. However, for pecuniary reasons, these examinations are not accessible to our integral study population and could constitute an underestimation bias on our results. The literature suggests that spinal tap culture is the most reliable test for the early diagnosis of typhoid fever {2}.

As for the tuberculous origin of intestinal perforation, chest radiography may be a useful imaging modality for initial investigation, since it may suggest the presence of tuberculosis, in either the active or inactive form {8}. Thus, we found 6.57% concomitant active tuberculosis infection out of the 26.63% of tuberculous intestinal perforation. In addition, CT scan may help to orient the etiological diagnosis, since in cases of intestinal tuberculosis an asymmetric thickening of the intestinal wall greater than 10 mm may be found, associated with increased omental thickening and intra-abdominal necrotic lymphadenopathy greater than 10 mm {11}; this examination is rarely accessible to our population for its high cost. In addition, intraoperative bacteriological sampling of perforated hail was routinely performed to look for acid-resistant bacilli or caseification granulomas on histological samples or in front of the growth of *Mycobacterium tuberculosis* on tissue culture. However, the results were sometimes disappointing because they revealed only non-specific inflammatory findings, despite the anamnestic and clinical arguments, making further management difficult, particularly in cases of isolated intestinal tuberculosis. In cases of persistent doubt, the literature proposes empirical antituberculosis treatment and the final diagnosis is made on the basis of the clinical response to the antituberculosis drug {12}.

For the western series, the diagnostic difficulty lies between Crohn's disease and intestinal tuberculosis. Indeed, diarrhea is common in Crohn's disease perforation, and the appearance of other symptoms such as nausea, loss of appetite, fever, constipation, hematochezia, and perianal disease is similar {8}. The diagnosis of Crohn's disease may be suspected on the basis of images of mesenteric fat infiltration associated with symmetrical and concentric thickening of the intestinal wall and wall stratification and may be established on the basis of a combination of clinical, endoscopic, histological and radiological evaluations {13}.

In addition, there are rare causes of non-traumatic perforation of the intestine, such as perforation of the small intestinal diverticula, which are pseudo-diverticulars characterized by herniation of the mucosa and submucosa through the muscle layer of the intestinal wall, resulting from an increase in intraluminal pressure and weakening of the intestinal wall {14}. Non-Meckel diverticular disease of the small intestine has a prevalence of 0.3 to 1.3% in postmortem studies and 0.5 to 1.9% in contrast-enhanced imaging modalities {15}. In our series, diverticular perforation was observed in 1.46% of cases, all of which were of intraoperative discovery. Thus, our cases

illustrate the literature which suggests that diagnosis is usually made intraoperatively for an indication not exclusively guided by the suspicion of diverticular disease {16}. However, in the case of perforated hail diverticulum, ultrasonography can detect jejuno-ileal diverticulosis, but exploration is often limited by meteorism and adiposity. While abdominal CT may show a mass lesion containing an isolated extra-luminal air bubble, a dilated loop of the small intestine with an enlarged and thickened wall, involvement of the surrounding tissues (e.g., a fistula between the small intestine, colon and bladder) and the hyperdense appearance of the mesentery {14}. However, according to Habib *et al.*, the diagnosis classically involves opacification of the small intestine (preferably by enteroclysis) and <sup>99m</sup>Tcperchnetatescintigraphy {16}.

In short, our series reflects the diagnostic difficulty of non-traumatic perforations of the intestine in our context. Indeed, all our cases were of intraoperative discovery, and 22.63% of the cases remained of undetermined etiology. However, when faced with an acute abdomen, complementary paraclinical examinations were rarely requested preoperatively so as not to further delay management, since a late diagnosis can be fatal and hail perforation is associated with high mortality in up to 40% of patients {14}.

In addition, the initial surgical exploration had discovered the pathology at the stage of purulent peritonitis in 61.31% of cases and fecal peritonitis in 42.34% of cases, while specifying the number, location and size of intestinal perforations. In Pakistan, in the Shahida series, all etiologies combined, the small intestine was the preferred site of spontaneous intestinal perforation (37.6%) {3}. Perforation of the jejunum and ileum can be single or multiple, generally punctiform, less than 1 cm in size {4}. According to Ayite *et al.*, the seat on the anti-mesenteric edge of the perforation is constant {10}. Finally, we found that tuberculous ileal perforations are isolated or in combination with perforations of the cecum. The literature states that tuberculous intestinal perforations are generally multiple and occur in ulcerative tuberculosis cases {3}.

The repair of non-traumatic intestinal perforations depends on the condition of the intestine, the general condition of the patient, and the number of perforations {3}. The literature lists 3 techniques: simple excision-suture, resection-anastomosis from the outset, and temporary terminal resection-ileostomy, which is the least frequently used. However, none of these repair techniques is unanimously accepted {2}. In our series, bowel resection with perforation was performed in 29.20% of cases, subject to careful verification of good vitality and the absence of a pre-perforated area in the remaining haematoma, and excision-suture was performed in 59.12%. We also believe that this conservative technique, simple and quick, exposes less risk of a certain failure of an anastomosis in a septic environment. All the more so since, in cases of single perforation, it was shown that excision of the edges of the perforation and the adjacent indurated area was sufficient to guarantee quality suture {10}.

Finally, whatever the etiology of peritonitis by spontaneous perforation of the intestine, the management is medico-surgical, aiming to treat the cause and its consequences, including immuno-electrolytic disorders, associated visceral failures and infection. Energetic resuscitation before, during and after surgery is the cornerstone of successful treatment {2}.

Post-operative complications were reported with varying frequency. Ayite *et al* suggested that complications are significantly more frequent with resection-anastomosis (79.7%) than with excision-suture (32.3%) {10}. In the Shahida *et al* series, operative wound infection was noted in 42% of cases, which were mainly observed in cases of resection-anastomosis {3}. Furthermore, the literature suggests that a new post-operative perforation could occur elsewhere than in the excision-suture area, and we had noted two cases in our series (1.46%) {10}.

Finally, the morbi-mortality of non-traumatic intestinal perforations still remains high with an overall mortality rate of between 6 and 27% {17}. It is significantly influenced by advanced age, late diagnosis, delay of surgery, sepsis, the comorbidity and the occurrence of respiratory complications {3}. Finally, the personal experience of the surgeon is a significant prognostic factor.

As in other African countries, educating the population about hygiene, vaccination against tuberculosis and typhoid fever remain our only real alternatives for prevention and thus for improving the prognosis of spontaneous intestinal perforations {2}.

## CONCLUSION

Spontaneous perforation of the small ball is a pathology rarely observed in adults but which can be fatal in the absence of early and appropriate treatment. Peritonitis is generally diffuse, mainly due to the delay in consultation and treatment. The management is medico-surgical.

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## Conflict of interest

The authors contributed equally to the study.

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