

Reliability of Medical Imaging in the Pre-Therapeutic Assessment of Acute Intestinal Obstruction at the Centre Hospitalier Universitaire Du Point “G”

Abdoulaye Koné^{1,2*}, Mahamadou Daou², Youssouf Koné³, Moussa Traoré⁴, Moussa Konaté², Ouncoumba Diarra⁵, Ibrahima Coulibaly⁵, Youssouf Diawara², Amadou Doumbia⁶, Cheick Oumar Touré⁷, Kassim Sidibé⁸, Mody A. Camara⁹, Oumar Aba Ata², Mahamadou Diallo⁵, Adama Diaman Keita², Salia Coulibaly¹⁰, Zimogo Zié Sanogo¹¹, Siaka Sidibe^{1,2}

¹Faculty of Medicine and Odontostomatology, Bamako, Mali

²Medical Imaging Department of the University Hospital of Point G, Bamako, Mali

³Radiology Department of the Jacques Boutard Hospital, Saint-Yrieix-la-Perche, France

⁴Medical Imaging Department of GABRIEL TOURE Hospital, Bamako, Mali

⁵Radiology Department of CSREF Commune III, Bamako, Mali

⁶Medical Imaging Service Health Center of Ref Commune VI, Bamako, Mali

⁷Medical Imaging Service Health Center of Ref Commune IV, Bamako, Mali

⁸DCSSA, Kati, Mali

⁹Medical Imaging Department of Mali Hospital, Bamako, Mali

¹⁰Medical Imaging Department of Kati Hospital, Bamako, Mali

¹¹Department of General Surgery of Point G University Hospital, Bamako, Mali

Email: *achok83@yahoo.fr

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Abstract

Introduction: Acute intestinal obstruction is a serious pathology, a surgical emergency for which medical imaging plays an important role in the management. We initiated this work in order to study the contribution of imaging in the diagnosis of acute intestinal obstruction at the Point-G University Hospital. **Patients and Methods:** This was a prospective, descriptive and analytical study of 96 patients collected at the radiology and medical imaging department of CHU Point-G from January 2018 to January 2019. **Results:** The age of our patients varied from 11 to 86 years, with an average of 36 years old. There was a male predominance of 64.6% against 35.4% for women, *i.e.*, a sex ratio of 1.82. Previous surgery was found in 61.5% of our patients. The pain was present in all patients. An unprepared abdominal X-ray was performed in 89.6% of patients. Hydroaerobic levels were found in 96.5% of patients. Abdominopelvic CT scans were performed on 12 patients, all of whom



were diagnosed with occlusion. These positive diagnostic findings were consistent with intraoperative findings in 92% of cases. The causes were dominated by bridges in 46 patients and tumors in 9 patients. Signs of severity on CT were dominated by signs of distress of the upstream bile ducts in 8.3%. Exactly 8% of our patients spontaneously resumed transit, 91% received surgical treatment and 1% died before surgery. The outcome was favorable in 80 patients (83.3%) and poor with death in 16 patients (16.7%). **Conclusion:** Acute intestinal obstruction remains a serious pathology for which the X-ray of the PSA is often the only radiological examination performed in an emergency. However, abdominopelvic CT seems to us to be widely indicated thanks to its contribution both to the positive diagnosis and to the diagnosis of severity and etiology. However, this imaging technique is widely underused in our practice because of its high cost and lack of availability.

Keywords

Medical Imaging, Acute Intestinal Obstruction, Abdominal CT, Reliability

1. Introduction

Acute intestinal obstruction is the complete and permanent cessation of the transit of matter and gas through an intestinal segment due to mechanical obstruction or failure of intestinal muscle activity [1]. Despite decades of progress in the management of intestinal obstructions, obstructive syndromes pose some of the most challenging problems of all abdominal emergencies.

It is not a disease but a syndrome with multiple causes and varied mechanisms [1]. This syndrome covers a wide range of clinical situations, some of which require emergency surgical intervention, while others allow for further investigation and possible medical treatment.

These cliques require an early diagnosis and adapted management. Their causes remain multiple and vary according to country or age [2].

The diagnostic approach to intestinal obstruction has been profoundly modified by the use of cross-sectional imaging, in particular high-resolution CT, which is the only technique that can determine the type and location of the obstruction.

CT has become an indispensable tool in this diagnostic approach, allowing a positive, topographical, etiological and severity diagnosis [3].

The contribution of imaging to judge the severity of the occlusion has been transformed in recent years thanks to the progress of cross-sectional imaging, in particular CT and ultrasound.

The prognosis depends on the occurrence of intestinal necrosis and the effectiveness of management [2]. The objective of this work was to specify the place of imaging in the management of intestinal obstruction in the radiology and medical imaging department of the Point-G University Hospital.

2. Patients and Methods

The study was conducted in the radiology and medical imaging department of the Point-G university hospital. It was a prospective, descriptive, and analytical study from January 2018 to January 2019 in collaboration with the emergency and surgical departments of the Point-G University Hospital. Our study population consisted of patients referred to the radiology and medical imaging department for the occlusive syndrome. All patients presenting with a clinical picture of the occlusive syndrome and having undergone at least two of the three radiology examinations (PSA, CT, and abdominal-pelvic ultrasound) were included in our study. Patients whose records were not usable or incomplete were not included.

Variables studied:

- Socio-demographic parameters: Age, gender, occupation, residence, risk factors, history.
- Clinical parameters: Functional digestive signs (abdominal pain, cessation of feces and gas, vomiting, meteorism). General signs (fever, asthenia, altered general condition). Physical signs (abdominal scarring, abdominal guarding, abdominal contracture, tympanic and hydro-aeric noises on auscultation and rectal examination).
- Biological parameters: CBC, CRP and D Dimers.
- ASP parameters: Hydro-aeric levels, connivative valve lines, haustration lines and subdiaphragmatic crossing sign.
- CT parameters: Grecic dilatation of more than 25 mm, colonic dilatation of more than 50 m, transition zone, hydroaeric level and digestive wall.

The criteria for a positive diagnosis of occlusion on imaging were the presence of hydro-aerosic levels (HAL). Dilatation with a caliber greater than 25 mm for small bowel occlusions and dilatation with a caliber greater than 50 mm for colonic occlusions.

The signs of severity retained for imaging were the absence of intestinal peristalsis on ultrasound, hypoechoic parietal thickening on ultrasound, “target” or “halo” enhancement (Target sign), thickening of the walls of the dilated coves (2 - 3 mm), defect in the enhancement of the wall of the coves, parietal pneumatization and aeroportia. Presence of poorly bounded densities in the mesentery with venous dilatation. The presence of peritoneal fluid effusion, pneumoperitoneum, and vascular thrombosis.

The data were collected on the survey form, from the operative report registers, the patients’ files, and the radiological files. The elements studied were socio-demographic data, the results of clinical and paraclinical examinations, treatment data and the immediate postoperative evolution.

We sought and obtained the agreement of the hospital wards, and the informed consent of the patients. Confidentiality of the data was guaranteed, and the study posed no risk to the patients. Data analysis (sociodemographic, clinical, biological, and radiological) was performed using SPSS version 22.0 soft-

ware. The threshold of 5% was decided for the significance of the analyzed variables. The sensitivity of medical imaging was calculated using the relationship: $\text{Sensitivity} = \text{VP}/(\text{VP} + \text{FN})$, VP: true positive CT: patients with a positive CT and positive intraoperative diagnosis and FN: false negative CT: patients with a negative CT and positive intraoperative diagnosis.

3. Results

From January 2018 to January 2019, 4135 patients were registered for imaging examinations in the radiology department, including 1500 examinations on the abdomen.

We included in the study 96 patients whose diagnosis was confirmed by radiological examination and surgery on 196 clinical occlusive syndromes. The age of our patients ranged from 11 to 86 years with an average age of 36 years. There was a male predominance of 64.6% against 35.4% for women with a sex ratio of 1.82.

Previous surgery was noted in 60.4% of our patients. The pain was present in all patients, cessation of matter and gas in 76 patients (79.2%), vomiting in 71 patients (74%) and meteorism in 84 patients (87.5%). On physical examination, we noted the presence of abdominal scarring in 59 patients (60.4%), abdominal guarding in 28.1% of patients, abdominal contracture in 8.3%, tympany in 78.1% of patients and hydroaerobic sounds on auscultation in 44.8%, and the digital rectal exam was normal in 90 patients (93.7%).

Imaging examinations were dominated by abdominal radiography without preparation performed in 86 patients (89.6%). It showed hydro-aerobic levels in 83 patients (96.5%).

These hydro-aerobic levels were wider than high (**Figure 1**) in 35 patients (40.7%), higher than wide in 20 patients (23.3%) and mixed in 32.5% (**Table 1**).

The hydro-aerial levels typically had haustration folds in 44.8% and connotative valve folds in 55.2%. Central distribution of hydroaerial levels was found in 55.2% of our patients versus a peripheral distribution in 44.8%.

We did not record any evidence of subdiaphragmatic air crescents on the abdomen without preparation. On close analysis of the abdominal radiographs of our patients, we did not find any signs of typical aerobladder or aeroporphyrria.

Abdominal ultrasound performed at the request of the clinicians in 23 of our patients without any preparation showed dilatation of the coves in 13% and associated peritoneal fluid effusion in 30.5% of cases.

Intussusception was the cause of the obstruction in 4.35% of our patients on ultrasound. Abdominal CT scans of 12 patients in our series confirmed the occlusive syndrome in all cases, with bowel dilatation of more than 25 cm anterior (**Figure 2**) to the transition zone in 67% of our patients. Colon dilatation of more than 50 mm (**Figure 3**) distal to the transition zone was found in 33% of our patients' **Table 2**. Bowel caliber disparity with segmental distension of the bowel diameter downstream of the intestinal obstruction was a reliable diagnostic argument with a diagnostic sensitivity of 98% and a specificity of 86%.



Figure 1. Front view of a standing patient showing central hydro-air levels that are wider than they are tall and are of a greasy nature.



Figure 2. Abdominal CT axial section without PDC injection showing distended digestive tracts with a sawtooth-like mucosal fold (arrow) indicating their greasy nature.



Figure 3. Abdominal CT axial section with PDC injection showing distended coves with haustrations (arrow) indicating their colonic nature.

Table 1. Distribution according to the results of the X-ray of the Abdomen.

Results of the radiograph	Number n = 86	Percentage (%)
Absence of Hydro-air levels	3	3.5
Hydro-air levels more High than Wide	20	23.3
Hydro-air levels wider than tall	35	40.7
Mixed Hydro-air levels	28	32.5
Total	86	100

Table 2. Distribution according to abdominal-pelvic CT findings.

Abdominal and pelvic CT findings	Yes n (%)	No n (%)
Graveslope dilation > 25 cm upstream of the transition zone	8 (67)	4 (33)
Colonic dilatation > 50 cm upstream of the transition zone	4 (33)	8 (67)
Thickening of the cove wall at the transition zone	10 (83)	2 (17)
Hydro-air levels	10 (83)	2 (17)
Sublesional syndrome (flat bowels)	5 (42)	7 (58)

Hydroaerobic levels in the gastrointestinal tract were an important argument for the diagnosis of CT and accounted for 83% of cases. This sign had an important role in the positive diagnosis; its sensitivity was 78% for a specificity of 38%.

The sublesional syndrome, in particular the non-dilated digestive tract downstream of the transition zone, was found in 42% of our patients, but the downstream digestive segment was dilated in 58% of the cases. The transition zone (**Figure 4**) was identified in all 12 patients, and the site was the gallbladder in 48 patients (55.2%) and the colonic in 39 patients (44.8%). The causes were dominated by bridges in 46 patients and tumors in 9 patients.

The signs of severity on the CT scan were dominated by signs of the suffering of the upstream intestinal tract, with 8.3% of cases showing no enhancement, 8.3% showing target enhancement, and 10 cases (83.33%) showing thickening without enhancement abnormalities.

Parietal pneumatosis, pneumoperitoneum or digestive perforation were not found in our patients.

In general, all patients with intestinal distress on CT had parietal abnormalities on intraoperative inspection, which gives sensitivity and specificity of 100%.

After surgery, 83% of our patients had a digestive occlusion (**Figure 5**) compared to 17%, which gives a sensitivity of 95% and a specificity of 58.8% and reliability of the scanner of 86% (**Table 3**).

Out of a total of 96 patients, the postoperative follow-up was good with radiological control in 80 patients, *i.e.*, 83.3%. Sixteen (16) cases of death (16.7%) were reported.

4. Discussions

The study was not without its difficulties. These difficulties hampered our work somewhat, but we did manage to obtain some conclusive results.

In our study, acute intestinal obstructions accounted for 2.32% of all examinations performed in the department during the period.

This frequency is lower than the hospital frequencies reported in the literature, which range from 11.88% to 43.7%. [4].

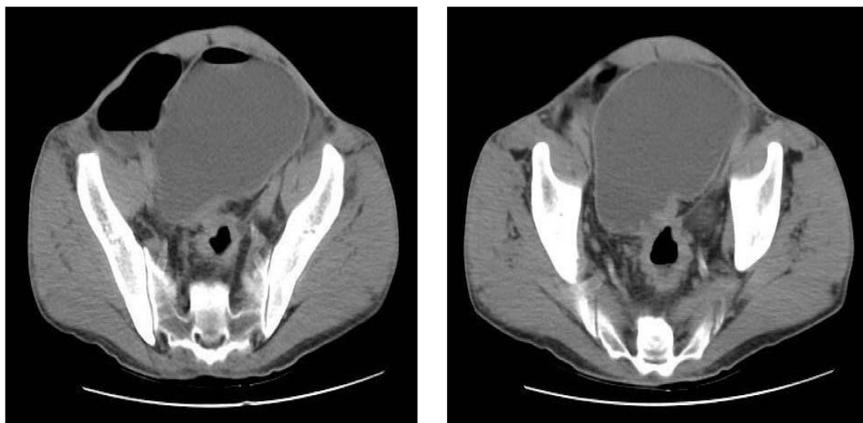


Figure 4. Abdominal CT axial section without PDC injection showing a transition zone of stenosing thickening (white arrow) of the recto sigmoid hinge.



Figure 5. Volvulus of the sigmoid colon at Surgery with necrotic loop.

Table 3. Distribution according to radiosurgery concordance.

Surgery Imaging	Positive	Negative	Total
Positive	79	7	86
Negative	4	10	14
Total	83	17	100

Sensitivity = 95%; Specificity = 58.82%; PPV = 92%; NPV = 71%; Reliability = 86.

This low frequency could be explained by the fact that most patients are operated on urgently based on clinical diagnosis without any imaging in our countries.

The age of our patients varied between 11 and 86 years with an average age of 36 years. This result is superposable with that reported by Harouna Y. [5], who

found an average age of 32 years. The young age of the patients would be linked to the youth of the African population in general and that of Mali in particular. In any case, age is not a risk factor for this syndrome. There was a clear male predominance with a sex ratio of 1.82 in favor of men. This result is comparable to that of Harouna Y [6], who reported a sex ratio of 2.64 for men.

The main antecedent to look for in the case of an occlusive syndrome is a previous surgery which would be responsible for occlusion by flanges and/or adhesions. In our study, 60.4% of cases had previous surgery. This rate differs from that of some African studies [7].

Among the functional signs, abdominal pain was present in all patients, cessation of matter and gas in 76 patients (79.2%), vomiting in 71 patients (74%) and meteorism in 84 patients (87.5%). If pain is the main symptom and always motivates the consultation, the cessation of gas is the most characteristic symptom and the most analyzable, whereas the cessation of the matter is more random [8]. On physical examination, we noted the presence of abdominal scarring in 59 patients (60.4%), abdominal guarding in 28.1% of patients, abdominal contracture in 8.3%, tympany in 78.1% of patients, and hydro aerobic sounds on auscultation in 44.8%. The rectal examination was normal in 90 patients (93.7%).

Imaging examinations were dominated by the X-ray of the PSA performed in 86 patients (89.6%). The X-ray showed hydroaerobic levels in 83 patients (96.5%).

These AHNs were wider than high in 35 patients or 40.7%, higher than wide in 20 patients or 23.3% and mixed in 32.5%. The hydro-aeric levels were typically haustrated in 44.8% and valvular connivance in 55.2%. The central topography of HAIN was found in 55.2% of our patients, compared to a peripheral distribution in 44.8% of cases. There was no objective evidence of digestive perforation. On detailed analysis of the PSA of our patients, we did not notice any signs of typical aero bladder or aeroporty. These signs should be systematically looked for on the PSA as they indicate a biliary or vascular complication.

Abdominal ultrasound performed at the request of the clinicians in 23 of our patients without any preparation showed dilatation of the coves in 13% and associated peritoneal fluid effusion in 30.5% of cases. The invagination coil was the cause of the occlusion in 4.35% of our patients on ultrasound. These patients were all pediatric age. Abdominopelvic CT scans performed in 12 patients in our series confirmed the occlusive syndrome in all cases, with more than 25 cm of dilatation of the bowel upstream of the transition zone in 67% of our patients. Colon dilatation of more than 50 mm upstream of the transition zone was found in 33% of our patients.

Hydro-air levels in the gastrointestinal tract were an important argument for the diagnosis of CT and accounted for 83% of cases. The sub-lesion syndrome, in particular the non-dilated digestive tract downstream of the transition zone, was found in 42% of our patients, but the downstream digestive segment was dilated in 58% of cases. This shows that this sub-lesional syndrome is a late-onset diagnostic element. The transition zone was identified in all 12 patients, so the

site was greaves in 48 patients or 55.2% and colic in 39 patients or 44.8%. This result is consistent with those reported in the literature [9]. The causes were dominated by flaws in 46 patients and tumors in 9 patients. This result is similar to those of Markogianakis *et al.* [2].

Signs of severity on CT were dominated by signs of distress in the upstream bile ducts, with 8.3% of cases showing a lack of enhancement, 8.3% showing target enhancement, and 10 cases (83.33%) showing thickening without enhancement anomalies.

Parietal pneumatosis, pneumoperitoneum or digestive perforation were not found in our patients. After surgery, 83% of our patients had a digestive occlusion compared to 17%, *i.e.*, a sensitivity of 95% and a specificity of 58.8% (PPV: 92% and NPV: 71%).

The results of the positive diagnosis were consistent with the intraoperative findings in 92% of cases. This result is consistent with those of Megibow *et al.* [7], who report an accuracy of 95%, a total sensitivity of 94% and a specificity of 96% for the diagnosis of acute occlusion in a series of 83 CT examinations for occlusion of which 64 cases were mechanical occlusions.

Out of a total of 96 patients, the postoperative follow-up with radiological control was good in 80% of patients, *i.e.*, 83.3%, and poor with death in 16 patients, *i.e.*, 16.7% of cases. This rate is lower than that of Harouna Y [5], who reported 41% of cases. In all cases, we note that mortality related to acute intestinal obstruction is still high in our practice. This high frequency of mortality could be explained by the delay in the management of patients.

5. Conclusion

Acute intestinal obstruction remains a serious pathology for which the X-ray of the PSA is often the only radiological examination performed in an emergency. However, abdominopelvic CT seems to be widely indicated thanks to its contribution both to the positive diagnosis and to the diagnosis of severity and etiology. However, this imaging technique is widely underused in our practice because of its high cost and low availability.

Conflicts of Interest

The authors declare no conflict of interest.

Authors' Contributions

All authors contributed to the acquisition of data, the analysis and interpretation of the data and the writing of the article.

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