

Relevance of Medical Imaging in the Pre-Therapeutic Evaluation of Acute Intestinal Obstruction at CIMED

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Abstract

Objective: We initiated this work with the aim of studying the contribution of imaging in the diagnosis of acute intestinal obstruction at CIMED. **Patients and methods:** This was a prospective, descriptive and analytical study involving 96 patients collected at the radiology and medical imaging department of CIMED, from January 2022 to January 2023. **Result:** The age of our patients varied between 11 and 86 years with an average age of 36 years. There was a male predominance of 64.6% compared to 35.4% for women, *i.e.* a sex ratio of 1.82. The notion of previous surgery was found in 61.5% of our patients. Pain was present in all patients. Radiography of the ASP was performed in 89.6% of patients. It showed hydro-aerial levels in 96.5% of patients. Abdominopelvic CT was performed in 12 patients and made it possible to make the diagnosis of occlusion in all patients. The results of the positive diagnosis were concordant with those intraoperatively in 92% of cases. 8% of our patients, compared to the treatment, spontaneously resumed their transit, 91% benefited from surgical treatment and 1% died before surgery. The outcome was favorable in 80 patients or 83.3%, poor with death in 16 patients or 16.7% of cases. **Conclusion:** Acute intestinal obstruction remains a serious pathology for which ASP radiography often remains the only radiological examination performed urgently. However, abdominopelvic CT seems widely indicated thanks to its contribution both for the positive diagnosis and for the serious and etiological diagnoses. However, this imaging technique is largely underused in our practice due to its high cost and lack of availability.

Keywords

Imaging, Acute Intestinal Obstruction, CIMED

1. Introduction

Acute intestinal obstruction is the complete and permanent cessation of the transit of materials and gases in an intestinal segment by a mechanical obstacle or by the failure of intestinal muscular activity [1]. Despite the progress made over decades in the management of intestinal obstructions, occlusive syndromes pose the most difficult problems to resolve among all abdominal emergencies.

It is not a disease, but a syndrome with multiple causes and varied mechanisms [1]. This syndrome covers very varied clinical situations, some of which require emergency surgical intervention while others allow more in-depth investigations and possibly medical treatment.

They require early diagnosis and adequate care. Their etiologies remain multiple and vary depending on the country or age [2].

The diagnostic approach to intestinal obstruction has been profoundly modified by the emergency use of cross-sectional imaging, in particular high-resolution CT, the only technique allowing the type and location of the obstruction to be clarified.

CT has become an essential tool in this diagnostic approach by allowing a positive, topographical, etiological but also serious diagnosis [3].

The prognosis depends on the occurrence of intestinal necrosis and the effectiveness of treatment [2]. The absence of a similar study on the theme in our region motivated us to choose the theme, the objective of which was to clarify the interest of imaging in the management of intestinal obstruction in the radiology department of CIMED.

2. Materials and Methods

2.1. The Setting and Location of Studies

The study was carried out in the radiology and medical imaging department of CIMED.

2.2. The Period and Type of Studies

This was a prospective, descriptive and analytical study running from January 2018 to January 2019 in collaboration with the emergency reception and surgery departments of CIMED.

2.3. The Study Population

Our study population was made up of patients referred to the radiology and medical imaging department for occlusive syndrome.

2.4. The Inclusion Criteria

Were included in our study, all patients presenting a clinical picture of occlusive syndrome, having undergone three radiology examinations at the same time (XR of the abdomen without preparation, abdominal CT-pelvic and abdominal-pelvic ultrasound).

2.5. Non-Inclusion Criteria

Patients whose files were unusable or incomplete were not included.

2.6. Criteria for Positive Diagnosis of Occlusion in Imaging

- Presence of hydro-aerial levels (NHA).
- Dilation with a caliber greater than 25 mm for small bowel obstructions.
- Dilation with a caliber greater than 50 mm for colon occlusions.

2.7. Signs of Seriousness

- Absence of intestinal peristalsis on ultrasound.
- Hypo-echoic wall thickening on ultrasound.
- “Target” or “halo” enhancement (Target sign).
- Thickening of the walls of the dilated loops (2 - 3 mm).
- Fault in raising the wall of the handles.
- Parietal pneumatization and the airport.
- Mesentery presenting poorly limited densities with venous dilatation.
- Intraperitoneal fluid effusion.
- Pneumoperitoneum.
- Vascular thromboses.

2.8. Data Collection

Data was collected on the survey form, from operative report registers, patient files and radiological files. The elements studied were sociodemographic data, the results of clinical and paraclinical examinations, treatment data and the immediate postoperative course.

2.9. Ethical Considerations

Agreement of hospitalization services; Informed consent of patients; Confidentiality of data and no risk for patients.

3. Results

From January 2018 to January 2019; 4135 patients were registered for imaging examinations in the radiology department including 1500 abdominal examinations.

We included in the study 96 patients whose diagnosis was confirmed by radiological examination and surgery out of 196 clinical occlusive syndromes. The age of our patients varied between 11 and 86 years with an average age of 36

years. There was a male predominance of 64.6% compared to 35.4% for women with a sex ratio of 1.82.

The notion of previous surgery was found in 60.4% of our patients. Pain was present in all patients, cessation of materials and gases in 76 patients or 79.2%, vomiting in 71 patients or 74%, meteorism in 84 patients or 87.5%.

On physical examination, we noted the presence of the abdominal scar in 59 patients or 60.4%, abdominal defense in 28.1% of patients, abdominal contracture in 8.3%, tympanism in 78.1%. Of patients and hydro-aerial sounds on auscultation in 44.8% and rectal examination was normal in 90 patients or 93.7%.

The imaging examinations were dominated by the ASP X-ray performed in 86 patients or 89.6%. She observed hydro-aerial levels in 83 patients or 96.5% (**Table 1, Figure 1 and Figure 2**).

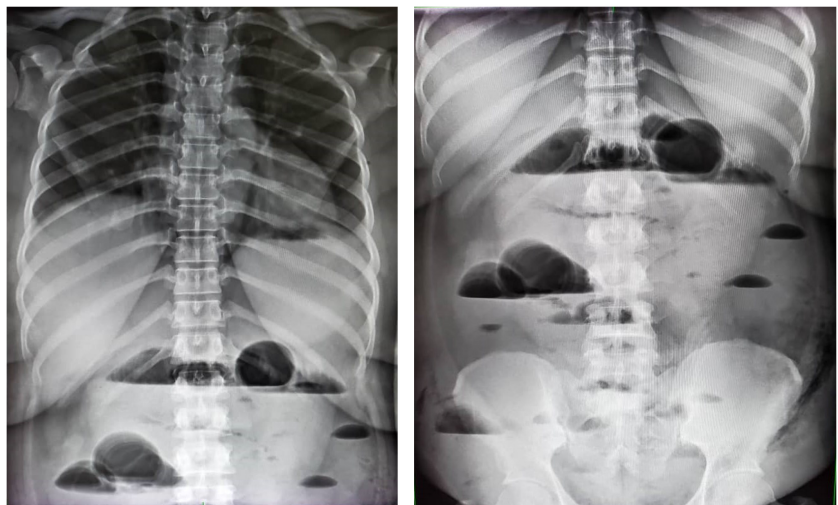


Figure 1. Thoraco-abdominal X-ray and ASP from the front, patient standing, showing centro-peripheral hydro-aerial levels wider than high of hail origin.



Figure 2. Frontal ASP, standing patient showing an asymmetrical inverted U-shaped colonic air image: arch image in the case of sigmoid volvulus.

Table 1. Distribution according to the results of the ASP radiography.

ASP X-ray Results	Workforce (n = 86)	Percentage (%)
Absence of NHA	3	3.5
NHA taller than wide	20	23.3
NHA wider than tall	35	40.7
Mixed NHA	28	32.5
Total	86	100

These NHAs were wider than tall in 35 patients or 40.7%; higher than wide in 20 patients or 23.3% and mixed in 32.5% (**Table 1, Figure 1**).

The hydro-aerial levels typically presenting folds of haustrations in 44.8% and folds of connivent valves in 55.2% (**Table 1, Figure 2**).

The central distribution of NHA was found in 55.2% of our patients compared to a peripheral distribution in 44.8% of cases (**Table 1**).

We did not record any subdiaphragmatic air crescent sign on the ASP (**Table 1**).

On detailed analysis of the ASP of our patients we did not notice any sign of typical aerobiology or airportia (**Table 1**).

Abdominal ultrasound performed at the request of clinicians in 23 of our patients without any particular preparation, revealed dilation of the loops in 13% and associated peritoneal fluid effusion in 30.5% of cases (**Table 2**).

The intussusception tube was the cause of occlusion in 4.35% of our patients on ultrasound (**Table 2**).

Abdominopelvic CT scan performed in 12 patients in our series confirmed the occlusive syndrome in all cases with small bowel dilatation of more than 25 cm upstream of the transition zone in 67% of our patients (**Table 2**). Colon dilatation of more than 50 mm upstream of the transition zone was found in 33% of our patients (**Table 2**). NHA in the digestive tract were an important argument for the diagnosis on CT and represented 83% of cases (**Table 4, Figures 3-5**). The sublesional syndrome, particularly the non-dilated digestive loops downstream of the transition zone, was found in 42% of our patients but the downstream digestive segment was dilated in 58% of cases (**Table 3, Figure 5**). The transition zone was identified in the 12 patients and the site was slender in 48 patients or 55.2% and colic in 39 patients or 44.8% (**Table 3**). The etiologies were dominated by flanges in 46 patients and tumors in 9 patients (**Table 5, Figure 5**).

The serious signs on CT were dominated by signs of distress in the upstream loops such as a lack of enhancement in 8.3%, target enhancement in 8.3% and thickening without enhancement anomaly in 10 cases, *i.e.* 83, 33% (**Table 4**).

Parietal pneumatosis, pneumoperitoneum or digestive perforation were not found in our patients (**Table 4**).



Figure 3. Abdominal CT axial section without PDC injection showing distended digestive loops presenting a saw-toothed mucosal fold (arrow) indicating their slender nature.

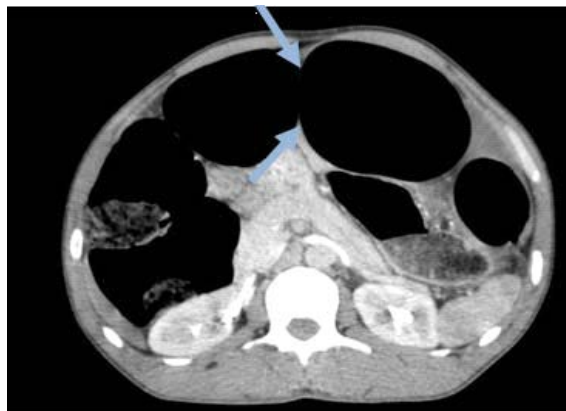


Figure 4. Abdominal CT axial cut with PDC injection showing distended loops with haustrations (arrow) indicating their colic nature.



Figure 5. Abdominal CT axial section without PDC injection showing a transition zone made of stenotic thickening of the rectosigmoid hinge.

After surgery, 83% of our patients actually had a digestive obstruction compared to 17%, *i.e.* a sensitivity of 95% and a specificity of 58.8% (PPV: 92% and NPV: 71%), therefore the reliability of the scanner is 86% (**Figure 6**).



Figure 6. Volvulus of the sigmoid colon intraoperatively with the necrotic loop.

Table 2. Distribution according to the results of the abdominopelvic ultrasound.

Abdominopelvic ultrasound results	Yes n (%)	No n (%)
Loop peristalsis disorder	3 (13)	20 (87)
Intraperitoneal effusion	7 (30.5)	16 (69.5)
Intussusception sausage	1 (4.35)	22 (95.65)
Dilation of the handles	23 (100)	00 (0)

Table 3. Distribution according to the results of abdominopelvic CT.

Abdominopelvic CT results	Yes n (%)	No n (%)
Hail expansion > 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 wall of the loops at the transition zone	10 (83)	2 (17)
Hydro-aerial levels	10 (83)	2 (17)
Sublesional syndrome (flat digestive loops)	5 (42)	7 (58)

Table 4. Distribution according to severity diagnosis on CT scan.

Severity diagnosis using scanner	Workforce n = 12	Percentage (%)
Wall thickening of the loop upstream of the transition zone	10	83.33
Lack of enhancement	01	8.33
Target enhancement	01	8.33
Total	12	100

We did not note any perforation, wall pneumatosis, pneumoperitoneum, peritoneal effusion or wall thinning.

The results of the positive diagnosis were concordant with those intraoperatively in 92% of cases.

Out of a total of 96 patients, the surgical outcomes were good with radiological control in 80 patients or 83.3% and 16 cases of death or 16.7% (Figure 6).

4. Discussion

Carrying out this study was not without difficulties. These difficulties hampered our work somewhat, but we nevertheless managed to obtain some conclusive results. At the forefront of our difficulties, we can cite the crucial problem of incomplete files.

During our study, acute intestinal obstructions represented 2.32% of all examinations carried out in the department during the period.

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

This low frequency could be explained by the fact that most patients are operated on urgently on the basis of 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 superimposable with that reported by Harouna Y. [5], who found an average age of 32 years. The young age of patients would be linked to the youth of the African population in general and that of Mali in particular. In conclusion, 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. This could be explained by the fact that the male sex is more exposed to the factors favoring acute intestinal obstruction. The main antecedent to look for in an occlusive syndrome is a previous surgery which would be responsible for occlusion by flanges and/or adhesions; in our study we noted 60.4% of notion of previous surgery. This rate differs from that of certain African studies [7].

Among the functional signs, abdominal pain was present in all patients, cessation of matter and gas in 76 patients or 79.2%, vomiting in 71 patients or 74% and meteorism in 84 patients or 87.5%.

Pain is the main symptom and always motivates the consultation, the cessation of gas is the most characteristic and the most analyzable symptom while the cessation of materials is more random [8].

On physical examination, we noted the presence of the abdominal scar in 59 patients or 60.4%, abdominal defense in 28.1% of patients, abdominal contracture in 8.3%, tympanism in 78.1% of patients, and hydro-aerial sounds on auscultation in 44.8%. Rectal examination was normal in 90 patients or 93.7%.

The imaging examinations were dominated by the ASP X-ray carried out in 86 patients or 89.6%. The radiography showed hydro-aerial levels in 83 patients or 96.5% (Table 1).

These NHAs were wider than tall in 35 patients or 40.7%; higher than wide in

20 patients or 23.3% and mixed in 32.5%. The hydro-aerial levels typically presenting folds of haustrations in 44.8% and folds of connivent valves in 55.2%.

The central distribution of NHA was found in 55.2% of our patients compared to a peripheral distribution in 44.8% of cases (**Table 1**).

We did not record any subdiaphragmatic air crescent sign in the ASP of our patients, which notes that no digestive perforation was noted.

Upon detailed analysis of the ASP of our patients, we did not notice any sign of typical aerobilia or airportia. These signs should be systematically looked for when analyzing the ASP because they indicate a biliary or vascular complication (**Table 1**).

Abdominal ultrasound performed at the request of clinicians in 23 of our patients without special preparation, revealed dilation of the loops in 13% and associated peritoneal fluid effusion in 30.5% of cases (**Table 1**).

The intussusception tube was the cause of occlusion in 4.35% of our patients on ultrasound (**Table 2**). These patients were all of pediatric age.

Abdominopelvic CT (**Table 3**) performed in 12 patients in our series confirmed the occlusive syndrome in all cases with small bowel dilatation of more than 25 cm 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 (**Table 3**).

NHA in the digestive tract were an important argument for the diagnosis on CT and represented 83% of cases (**Table 3**).

The sublesional syndrome, particularly the non-dilated digestive loops downstream of the transition zone, was found in 42% of our patients but the downstream digestive segment was dilated in 58% of cases, which shows that this sublesional syndrome is a diagnostic element of late onset (**Table 3**).

The transition zone was identified in the 12 patients and the site was slender in 48 patients or 55.2% and colic in 39 patients or 44.8% (**Table 3**). This result is consistent with those reported in the literature [9].

The etiologies were dominated by flanges in 46 patients and tumors in 9 patients. This result is superimposable to those of Markogianakis *et al.* [2].

The serious signs on CT were dominated by signs of distress in the upstream loops such as a lack of enhancement in 8.3%, target enhancement in 8.3% and thickening without enhancement anomaly in 10 cases, *i.e.* 83, 33% (**Table 4**).

Parietal pneumatosis, pneumoperitoneum or digestive perforation were not found in our patients (**Table 4**).

After surgery, 83% of our patients actually had a digestive obstruction compared to 17%, *i.e.* a sensitivity of 95% and a specificity of 58.8% (PPV: 92% and NPV: 71%), so the reliability of the scanner was 86% (**Table 5**).

The results of the positive diagnosis were concordant with those intraoperatively in 92% of cases. This result agrees with those of Megibow *et al.* [7] who reported 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 including 64 cases constituted mechanical occlusion (**Table 5**).

Table 5. Distribution according to radio-surgery concordance.

	Results of the 3 examinations	Intraoperative result	Concordance
Diagnostic positif (mécanique)	87 cas	80	92%
Seat of occlusion	Colic: 39 Hail: 48	Colic: 39 Hail: 48	100%
Severity of occlusion	Wall: Thickening:12	17	90%
Flange	46	25	54.34%
Acute intestinal intussusception	1	1	100%
Tumor	09	08	90%
Hernias	03	03	100%

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

Sensitivity = 95% Specificity = 58.82%; VPP = 92%; VPB = 71%; Reliability = 86%.

Out of a total of 96 patients, the surgical outcomes with radiological control were good in 80% of patients or 83.3% and poor with death in 16 patients or 16.7% of cases (**Table 5**). This rate is lower than that of Harouna Y [5] who reported 41% of cases.

This high frequency of mortality could be explained by the delay in treating patients.

5. Conclusion

Acute intestinal obstruction remains a serious pathology for which the ASP x-ray often remains the only radiological examination carried out urgently. However, abdominopelvic CT seems widely indicated thanks to its contribution both for the positive diagnosis and for the serious and etiological diagnoses. However, this imaging technique is largely underused in our practice due to its high cost and lack of availability.

Conflicts of Interest

The authors declare that they have no conflict of interest.

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