Early diagnosis of bowel motility disorders, with US in urgency, compared to conventional X-ray investigation



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Personal collection and literature

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Early diagnosis of bowel motility disorders, with US in urgency, compared to conventional X-ray investigation. Personal collection and literature review

BACKGROUND AND OBJECTIVES: Ultrasound investigation is more and more useful instrumental investigation, for early detection of rising signs of bowel occlusion, if compared to conventional abdominal x-ray.

MATERIALS AND METHODS: A personal collection of 25 intestinal occlusions is reported, comparing the conventional radiographic and ultrasonographic essays.

RESULTS: The static x-ray of abdomen didn't reveal adynamic condition in 11/15 patients, confirmed by US supporting clinical examination; 4/25 has been even treated conservatively, completely restored, though radiological diagnosis of occlusion, relying on clinical and sonographic reports. In 9/25 subjects x-ray hasn't been performed, relying on US only to achieve instrumental diagnosis.

CONCLUSIONS: The most important advantage of echography, such as dynamic evaluation, allows the study of potential mechanical peristaltic disorders, revealing the stratification of liquid and gas enteric contents, one of the most peculiar sign of intestinal occlusion. Supporting clinical suspect, in the reported collection, it recruited on one hand early surgical solution for the most of them and conservative approach for five patients on the other.

KEY WORDS: Bowel occlusion, Surgery, Ultrasound.

Introduction

The use of ultrasound to confirm the clinical suspicion of anamnestic bowel obstruction, in which early diagnosis is crucial for successful therapy, is asserting itself as a complementary technique to traditional instrumental investigative protocol, basically represented by abdominal white x-ray, improving surgical prognosis.

Still, perhaps due to a cultural heritage hardly changed, diagnostic role of ultrasound raises quite a few reservations, concerning the pathology in the viscera (excluding of course the most well-established role in the study of parenchyma, such epatopancreatic lesions or genitourinary system), considering the air interference with the sensibility of the procedure and, parameter still negligible, the well-known dependence of diagnostic accuracy on skilled operator. However, the same technique can effectively take place alongside conventional radiography (white abdominal x-ray), in recognition of the layers of particulate content within the enteric loops, which often escape to the same standard radiographic procedures in the early stages of enteric paralysis, as demonstrated by this case collection.

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Materials and methods

Table I summarizes a personal collection, comprehending 25 patients, 12 males and 13 females, aged between 3 months and 93 years, of which 12 have already undergone laparotomy of various types (1 nephrectomy, 1 colostomy for derivative "frozen pelvis", 1 umbilical hernioplasty, 3 cholecystectomies, 1 inguinal hernia repair, 1 gastrectomy, 1 subtotal gastric resection, 2 cesarean sections, 1 isteroannessiectomy), and a bearer of access for peritoneal dialysis. They have been studied with conventional radiological approach (abdominal white-x ray) and with ultrasound scan in emergency, comparing the results of the two techniques, both in terms of diagnostic confidence that of rate of acquisition of information necessary for treatment planning. Exhibit for brevity, were not reported details of the physical examination and blood chemistry assays, except in particular circumstances.

Patients have been received at our unit, complaining of abdominal pain, dating from a period between 1 hour (3 months-old infant) and a maximum of 120 hours (79 year-old woman suffering from stenosis of the duodenal bulb by inflammatory exacerbation of peptic ulcer), variously associated with constipation related to gas and stools, sensation of early post-prandial fullness (case 2, a patient already undergoing radical gastrectomy for adenocarcinoma 4 years before the current syndrome). Physical examination appeared highly probative in 17/25, with subjective abdominal tension, accompagnied by defense reaction, circumscribed or diffuse increased enteric tympanism, food vomiting 15/25, constipation in feces and gas, silenced abdominal peristalsis or poorly detectable with a metal rumor on 13/25 pts. All of the subjects, on the basis of clinical clues medical history, underwent blood chemistry samples, ultrasound and x-ray investigation; in 9 cases the white X-ray was not performed, including 2 individuals directly undergoing CT for suspected mesenteric ischemia and abdominal aortic aneurysm (also included), while echographic investigation was exhaustive in the remaining subjects.

The laboratory set-up in the initial occlusive status (<12 hours from clinical onset) has not provided any discriminating evidence, resulting normal in 4 subjects, while a marked leukocytosis, ranging from 19,500 GB / mm cube (in case 4), to 24,300 GB / mm / cube, associated with hemoconcentration (HCT equal to 57.1%, Hb 19.3 g / dl and GR 6,380,000 mm / cube) in case 1, marked by substantial endoperitoneal effusion, was detected in 4 / 25 patients, reaching a significant diagnostic reliability in only 3 individuals, in which the peritonitis clinical findings were accompanied by the ane-choic inflammatory effusion, prolonged expression of enteric ischemia itself.

The conventional x-ray, was completely negative in the 11/16 pts, indicating only in one subject, (who was

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Patient	Gender	Age	Previous laparotomies	Lasting symptoms	Physical examination	X ray	US	Conservative	Surgery therapy
VC	F	28	YES	72 h	+++	NO	+++		YES
BG	М	49	YES	24 h	+	+	+++		YES
LC	F	79	NO	120 h	+		+++		YES
VL	М	76	YES	12 h	+++	+	+++		YES
LM	М	89	YES	10 h	+++	NO	+++		YES
LP	F	60	YES	12 h	++-	NO	+++	YES	
FM	М	3 months	NO	1 h	+++	NO	+++		YES
A D'O	F	67	NO	8 h	+	NO	+++		YES
CC	М	82	NO	3 h	+++	NO	+++		YES
CM	F	70	YES	12 h	+++		+++		YES
PR	F	93	NO	8 h	+	+	+	YES	
TC	М	83	YES	24 h	+++		+++		YES
GP	М	70	YES	6 h	+	+++	+	YES	
NQ	М	74	YES	6 h	+++	+	++-		YES
LP	М	82	NO	14 h	+++	NO	+++		YES
GA	М	48	NO	6 h	+++	+	+++		YES
RC	F	52	NO	24 h	+++	+	+++		YES
EC	F	51	YES	24 h	+++	NO	+++		YES
EC	F	78	NO	12 h	++-	+++	+++		YES
GP	F	68	NO	48 h	+++	+	+++		YES
EC	F	36	NO	24 h	++-		+++	YES	
BP	F	29	YES	12 h	+++		+++		YES
NM	М	72	NO	3 h	+++		+++		YES
RB	F	64	YES	14 h	+++		+++	YES	
GC	М	62	NO	72 h	+++	NO	+++		YES

already stomach resected for peptic ulcer), several air-fluid levels; the U.S. recognition of an ongoing peristaltic activity has suggested conservative treatment with gastric aspiration, solving the clinical syndrome after 2 hours, allowing the resignation of the patient himself, after a short observation period (18 hours).

In 11 patients the echography showed adyinamia of the loops, at the state of repletion, whose direct abdominal radiography was completely negative, while in 7 patients also underwent radiological investigation found negative, an important focal fluid-gas stratification, clinically relevant, has been identified. The endoperitoneal inflammatory pattern of anechoic perivisceral collection, was detected in 13 of the 20 eco graphically candidates for surgery; it was classified "moderate" (ie restricted to ground hazards) in 3 patients, and "severe" in remaining 10, or interposed between the loops and collecting in the parietocolic spaces, (semiotics ultrasound element, allowing you to quantify the volume of the collection of more than 1000 ml).

20 subjects were initiated in the emergency surgical resolution, resulting in 6 adhesiolysis (all of them have already undergone previous laparotomy), 1 Billroth II gastrectomy, 5 inguinal hernioplasties, 2 ileal resections, 1 appendectomy (male aged 48), 1 discharge colostomy (case 16, a woman in peritoneal dialysis, which after several sub occlusive episodes, will develop an adynamic ileus), 1 right hemicolectomy for stenosing carcinoma, 3 duodenal ulcer raffias.

In 9 patients the ultrasound was the only instrumental support to the clinical diagnosis of obstruction, starting directly at laparotomy 8 subjects and allowing a control of the resolution with conservative therapy in the last one.

Discussion

Reported experience confirmed the role of previous laparotomies or the minimally invasive procedures (cholecystectomy) such as significant risk parameters for the transit of food disorders; diabetes mellitus, renal failure, chronic liver disease in older individuals have also contributed to the turbidity of the symptoms, justifying (case 3) the long interval between the rising signs and the access to first aid, including up to 5 days. The clinical and laboratory equipment, however, dominated by pain, (generalized in 17 patients and localized in the remaining 8 of them, in the incisional hernia doors, unaccompanied by the late symptoms of obstruction, such as vomiting, absent in 10/25 (in 15 positive cases, biliary type in 4 people and food in 11 of them), or constipation, reported in the only one half of the sample (12/25), (with the recent reported evacuation a few hours before EU access by case $\hat{4}$), has shown early intestinal paralysis then highlighted instrumentally. To this end, the dynamic echographic assessment proved crucial in

the recognition of preocclusive status, documenting a significant slowdown, or, on the contrary, allowing positive prediction of clinical resolution, in 5 / 25 individuals. The instrumental detection of intestinal motility disorders relies on the conventional protocol: - x-ray of the abdomen, which demonstrates the pathognomonic stratification of the fluid levels in loops, indicating also the seat of mechanical obstruction, or enteric dilatation, with leveling valves or colonic conniving haustra in adynamic variants - the barium enema, if you exclude a perforation, for the definition of possible intrinsic causes of paresis, such as stenosis or protruding endoluminal tumors or by extrinsic factors, such as compression of vascular clamps, fibrotic laciniae, etc.. - to abdominal CT contrast-enhanced, for closer relations with adjacent structures or suspected bowel infarction (intraparietal pneumatosis), as in cases 6²⁴, in which ultrasound was directly followed by tomography, for accessing, over time, to invasive procedures such as laparoscopy or endoscopy, up to biopsy for evidence of injury or of doubtful interpretation, concerning conditions that are due to repeated subocclusive phenomena (adhesiolysis) At present, U.S. still difficultly earns the role which it should deserve, in the approach to intestinal disease, 1.2, as its discriminative efficacy is severely prejudiced by interposed air flaps, of course typical of the viscera or cavities containing gas (gut, chest), not excluding cultural impediments, especially at the older generation of players. However, as demonstrated by the reported cases, the very early subocclusive stages can benefit from ultrasound investigation, instrument revealing promising prospects, by providing real-time imaging, closed to the usual investigative techniques ^{3,4,5}. The application of ultrasound also does not require any technical devices requested by standard radiology, such as the patient tilting maneuvers, also allowing a "real-time" assessment of kinetic enteric function. It also offers indisputable advantage, regarding radiobiological protection in the monitoring of the effectiveness of therapeutic procedures, such as conservative ones, like gastric aspiration, or its failure requiring a surgical resolution in reasonably short time (3 hours), to prevent the irreversible impairment of the anatomical structures involved, which is extremely sensitive to hypoxic damage. Pregnancy and pediatric age are elective objects of ultrasound in the first instance, as shown by diagnostic approach to a baby (3 months), one hour after onset of pain, confirming a valuable aid in the therapeutical planning, reducing the time of acquisition of information in an organism particularly vulnerable to ischemia and blood sequestration. In the reported experience, briefly listed in the summary table (Table I), it appeared certainly worthy of greater importance the reliability of ultrasound in the evaluation of peristalsis in the first place, which, supported by significant clinical and medical history and compared to a negative white RX, allowed a timely therapeutic approach, sometimes limited to conservative therapy (5 / 25 pc), just under

the window of reversibility of the complication, but in the most of cases represented by surgery.

The earlier diagnosis could therefore result in the reduction of surgical rate and its potential risks involved in emergency, such as sepsis, inadequate correction of electrolyte imbalances, and iatrogenic, secondary to chronic renal failure or diabetes mellitus, invariably related to sequestration of electrolyte volume, especially in older or debilitated patients, ¹, representing a fair amount of sick people who come to emergency departments; this time gain would make the best preoperative medication be set.

The described collection also confirmed the increased susceptibility of the small intestine to peristaltic disorders, especially in those ones who already had undergone laparotomy, or by the creation at angles, necking, adynamic (sometimes iatrogenic) electrolyte disorders (hypokalemia with diuretic therapy in heart disease), more frequent in this enteric district, compared to the colon, predisposing anatomical conditions found in the native range and flexibility of the mesenterium. The plastic responsiveness to mechanical or chemical insults of various kinds results in the development of adhesions, that in some instances evolves into adhesive peritonitis, or long-term tenacious adhesions, justifying the occurrence of sub-occlusive phenomena (cases 1, 4 and 14) The ileal mucosa is also particularly vulnerable to local ischemia, resulting in the increased wall tension caused by the edema, electrolyte depletion associated with osmotic and prokinetic effect (hypokalemia, hyponatremia and hypocalcemia mark consistently metabolic acidosis of intestinal obstruction, sometimes aggravated by iatrogenic electrolyte disorders in chronic diuretic and antihypertensive drug therapies); deprivation within the first hour of the mucosal film exposes enterocytes to digestive enzymes, with direct translocation of bacteria and toxic catabolites in systemic circulation, conditions for the gradual onset of peritonitis and septic shock, with irreversible damage after 4 hours of the onset of ischemia. The increase of lactate and alkaline phosphatase, in addition to the already mentioned reduction of plasma electrolytes, can be a diagnostic aid, but in reality it should be remembered, unlike current practice, as no haematochemical index takes diagnostic value, especially in rising syndrome, being well known among other things, the discrepancy between the clinical condition of the immunocompromised subjects or suffering from severe comorbidity (diabetes, diseases of the central nervous system), and the underlying hysthologic alteration.

In this context, clinical examination reaffirms its irreplaceable value, driving on the one hand the choice of appropriate diagnostic tests, allowing you to not procrastinate those other invasive procedures such as laparoscopy or open surgery, which represent the only therapeutic resolution. Emblematic was the management of 9 / 25 patients in whom the sonographic finding was very striking, overcome by the use of the traditional stan-

dard abdominal x-rays, at the same time, in contrast to the positivity of the latter; the recognition of a sufficient peristaltic activity in a patient who was also recovering from previous laparotomy (case 13), allows the clinical resolution simply by gastric aspiration.

Therefore we understand the usefulness of a careful management of all diagnostic opportunities available in this connection; the apparent negative white X-ray of the abdomen in individuals undergoing emergency laparotomy, however, already recognized in some trials, encounters percentages of 40% to 97% on postoperative histological response ^{6.7}.

The unexpectedly poor sensitivity of CT (43 and 46% respectively) in the detection of ischemia or volvulus, although offset by high specificity (98%)⁸, stresses the importance of integration with other instrumental methods, as exemplified by paraduodenal hernia (case 10), for which the diagnostic reliability would not exceed 70% ⁹. The finding of indirect signs of commitment in the paraduodenal hernia, such as packaging or stretching of mesenteric vessels, dislocation of the transverse colon or fourth duodenal portion, interposed between the stomach and ileal hank and pancreatic tail, can prelude to the volvulus and subsequent infarction of involved intestinal segment, in about 2 / 3 of patients ^{10,11,12} In parts of the body particularly challenging, both for the depth, or the abundance of anatomical structures, such as the epiploic recess, where the hernial incarceration mortality rate may amount to 50% 13, could be strongly suggestive serpiginous appearance of the mesenteric vessels (specificity 89-94%), documented by CT scan, especially when associated with color-flow Doppler evaluation, which shows the turbulence of blood flow up to the lack of local perfusion 14,15,16.

The incarceration of a hernia may result in clogged apparent negativity of the white-rx, which can not rely on the stratification of the enteric content, for mechanical reasons, in consideration of the potential combination of vomiting. This was evident in the case 5 (Fig. 3a), in which only ultrasound in the urgency has been able to document the absence of peristaltic activity of the loop with corpusculated repletion and thickened wall, surrounded at its once by a thin hypoechoic layer, synonymous of reactive exudate.

Ultrasound waves can reach a remarkable accuracy in the identification of paralytic (54%) and mechanical ileus (71.4%) ^{17.18}, considering the thickness of the intestinal walls, dilatation of bowel loops, air fluid levels and, in the context of the particular endoluminal fluid, the presence or absence of intrinsic kinetic activity or caused by manual compression of the operator. It's not to be excluded the predictive value of the reducibility of herniated bowel and to assess the effects of external manual operations in real time, even after measurement of size, reasonable or not, of the aponeurotic defect. Deliberately attached iconography has joined common outcomes among the patients studied, such as the pack-



0-11-194011 a) 9-10-11-194011 19,44.49 b) +Lunch. = 5:44 m c)

Fig. 1: Case 1: obvious state of fecal repletion of ileal loops, almost without any peristaltic activity, in which there is still no layering fluidgas blown by occlusion of the advanced stages. Note the wall thinning of large disbursements and the presence of anechoic inflammatory collection, non-hemorrhagic in nature (as already suggested by the finding clinical and laboratory).

b) Case 1: instrumental control run after 10 months, for further abdominal colic, self-exstinguishing, which identifies discrete overlaps of uterine adhesions in the rear, with small amount of the inflammatory anechoic effusion in Douglas

c) Case 2: right upper quadrant, contigous to postgastrectomy scars, in addition to inflammatory hypoechogenic layer that sits between the loops, and will be found in Morrison space, in parietocolic spaces and in Douglas too, the ileal loops appear dilated (transverse diameter of about 7 cm) and fully occupied by digestive material that abdominal radiography is unable to appreciate, as yet absent in the well-known layering fluid levels. This pattern recalls the similar appearance of the bowel strangulated hernia to the state of repletion.

Fig. 2: a) Case 3: large gastrectasya exceeding the limits of convex probe, which is just extended from the stomach to hypochondriac left region, presenting an internal visible gaseous fluid stagnation, with no propulsive activity.

b) Case 3: transverse scan of the mesogastric region, showing a conglomerate of dilated ileal loops, air entrapment, thin-walled folds and flattening of conniving valves, in which there would be no peristaltic activity. They 'are distinguishable ingested residues

c) Case 4: sections of ileal loops without peristalsis, containing ingested in the initial stratification (intraluminal hyperechoic spots), as a result of prolonged compression due to adynamia and whose hypogastric and left iliac fossa evokes discrete tenderness.



Fig. 3: a) Case 5: transverse scan of obstructed inguinal hernia, having passage problems created by the dislocation of network implanted in the previous intervention, with kidney-shaped appearance and content of fine cotton, indicative of detained material, without peristalsis. Compared to the previous patient, the complete obliteration of the lumen by enteric content justifies the absence of the interface gas above it, in support of the loop throttling state of repletion.

b) Case 6: The two rounded images, occupied by particulate content, projecting rear wall reinforcement, correspond to two enteric repleted loops, as part of a massive median hernia, whose size allows the easy itself reducibility. The state of repletion and the lack of constraining local phenomena justify the lack of air-fluid layering and / or the presence of any perivisceral fluid, which could point towards a diagnosis of strangulation. c) Case 7: Scan across the inguinoscrotal right region, which confirms the presence of ileal loops corresponding to the image of anechoic tubular shapes 3.36 cm in diameter, slipped through rubble wall, with no selfpulsation and propulsive activity, not yet surrounded by a layer of fluid inflammation, which hasn't any continuity with the elements of the spermatic cord. Despite the adoption of convex probe for adults, early identification of akinesia in the remaining abdominal quadrants is detected.



Fig. 4: Case 8: transverse scan of left lower quadrant which identifies, hard swelling at the elastic palpation irreducible, incarcerated in the sigmoid wall defect in the form of mushroom image of 4 x 4.5 cm, broadbased, (pseudokidney), corresponding to the neck of the hernia; evident stratification of intraluminal contents and intestinal gas overlying aquifer, which, together with the turbidity of peristalsis and the surrounding inflammatory effusion already collected in parietocolic spaces, testifies to the sub early occlusive condition, despite the absence of florid duct disorders and leukocyte reaction (GB 7610 / cubic mm).

b) Case: 9: Scan transverse of aponeurotic defect of the right inguinal region, the maximum diameter of 7.5 cm, through which the ileal loops were strangulated as inguinoscrotal giant right hernia, with loss of the right of residence. The ultrasound finding suggests similar considerations about the incarceration of bowel loops to the state of repletion of synechiae by adhesions from the previous case, which lacks an obvious air-fluid stratification. Only the kinetic study allows you to discover the intestinal adynamia and complete irreducibility of the hernia swelling.

c) Case 9: Image evocative of considerable distension of the enteric loops (diameter 7.41 cm) of strangulated inguinal hernia case, where the wall thickness is minimized, virtually indistinguishable from the wall, that was reduced to thin layer, surrounding the hyperechoic rounded anechoic area, with no pulsing activity, corresponding to the gut lumen.



Fig. 5: Case 10: The transverse scan showed a swelling pararectal ileal loop, enteric material repleted, represented by finely granular contents, in which the hyperechoic spots showed no peristalsis, reflecting the state of paralysis that is also found in the contigous loops. Obvious is the disparity in size between the hernia and the breach of aponeurotic, which did not allow any spontaneous reduction of the same. You can also see a thin perivisceral layer having no internal echoes, suggestive of hemorragic exudate, confirmed by exploratory laparotomy.

Case 11: significant expansion of ileal loop, whose average size is over 6 cm, with a clear sediment content, which varies with pressure sores of the sick. The persistence of peristaltic activity, due to the concomitant pathology of the patient (chronic renal failure, insulin-dependent diabetes), predisposing factors for bowel motility disorders, and advanced age of woman, will favor conservative treatment

c) Case 12: transverse scan of the ascending colon, in which haustra are undistinguished, due to the expansion of local clear air-fluid layer, which, combined with the pattern of generalized adynamia, suggests a frankly occlusive condition.



Fig. 6: a) Case 13: transverse scan that allows you to appreciate the peristaltic conservation, with mixing of the ingested material, although significantly reduced and that, in contrast to the static X-ray findings, to exclude a state of complete intestinal obstruction, supports a conservative approach.

b) Case 14: Longitudinal scan, showing preocclusive phase of enteric loops with conniving well represented valves, thickened walls, but no peristalsis, as documented by the immobility of the ingested material, recording dynamic aspect of flocculation, predominantly hypoechoic type

c) Case 15: transverse scan of inguinal hernia incarcerated through the ileostomy breach, without any peristaltic activity, having clear fluid-air interface and surrounded by intraluminal inflammatory perivisceral exudate.



Fig. 7: Case 16: Longitudinal scan that records the presence of small anechoic free inflammatory exudate between the ileal loops, in the right iliac fossa-hypogastric region, that appears slightly higher than normal. Evident is the appendix which forms serpiginous formation immersed in the context of fluid collection.

Case 17: remarkable peritoneal collection due to intestinal adynamia (> 24h), associated with intense back pain, will justify the use of CT in emergency, (as in the later case), after the ultrasound findings. Drilling, apparently a result of the prolonged intestinal paresis , will be confirmed at laparotomy

c) Case 18: large hypoechoic effusion of finely granular appearance, which, combined with the finding of subacute anemia (Hb 7.8 mg / gl), initially suggested hemoperitoneum. The laparotomy revealed perforation of ileal loop, with the spreading of ingested material by actinic ileitis post-radiotherapy.



Fig. 8: Case 19. The numerous hyperechoic artifacts, overlapping liver parenchyma, correspond to air bubbles by jejunal perforation post-radio ablation of liver metastasis. It is also appreciable the anechoic inflammation surrounding the entire gland Case 20: the fecal repletion of the loops justifies the absence of fluid

Case 20: the fecal repletion of the loops justifies the absence of fluid levels and the apparent negativity of white x-ray. The worsening of symptoms after 48 hours and the kinetic study, that keeps track of the loops adynamia, recognizable in round mixed-content images, direct the patient to viscerolysis

c) Case 21: the repletion of the loop herniated through the aponeurotic defect (Spigelian hernia), which casts some artifacts from thin intraluminal gas level, justified the negativity of the abdominal x-ray. Conservative therapy will allow surgery in elective regimen

d) Case 22: The morphology of the obstructed loops of bowel paralysis, not directly given to the abdominal x-ray to the lack of intraluminal stratification, is also repeated in this patient, accompanied by inflammatory intraperitoneal collection.



Fig. 9: Case 23: adynamic gut with the pathognomonic sign of packing of the loops, in right hemiabdomen

b) Case $2\dot{4}$: focal dilation of colonic loop (5.79 cm diameter) within its projecting lesion with irregular margins, mixed echogenicity, and a large base, associated with sub occlusive syndrome: the patient will prefer to delay the surgery after resolution of symptoms with medical therapy. It will unfortunately lost to follow-up

c) Case 25: Image of pseudokidney charged to the ascending colon, corresponding to clinically palpable swelling in his right side, which, combined with history of colic irregularities and the intervening major laboratory of anemia in the absence of melena or hematemesis reported, in a patient of 62 years, justified the suspicion of esophytic adenocarcinoma of the ascendant colon, then confirmed by laparotomy. Apparent infiltration of its wall and mesocolon, with hyperechoic appearance is appreciable. In this patient ultrasound in emergency will be considered the only comprehensive examination for admission to the urgency of the patient. aging of dilated loops (Figg. 1, 2) that seem to float in inflammatory effusion, or mushroom or pseudokidney pattern of incarcerated hernia (Figg. 3, 4, 5).

The disappearance of the physiological mucosal folds is another element of radiological semiotics, corresponding to local edema, prolonged paralysis, pathological findings better understood, through comparison with the normal appearance of enteric normocinetic loops (Fig. 6). The acoustic impedance of perivisceral effusion allows the dating of the damage, with reasonable time lag; the early occlusion or ischemia are infact accompanied by hypoanechogenicity of collected effusion. (cases 1 and 15), which changes gradually to the hyperechogenicity, for the gradual emergence of hemorrhagic exudate or fibrin debris and tissue in the process of disintegration, becoming pabulum for bacterial contamination with the development of phlegmon and abscess, similar to that observed in the evolution of appendicitis (Fig. 7a).

The dynamic ultrasonographic study, which were widely appreciated in the study of the musculotendinous pathology, is more and more acquiring wide consensus; in some series ^{19.20} the level of obstruction has been recognized on ultrasound in 76% of cases vs 51% of the white-x-ray, and the etiopathogenetic factors have been explained by ultrasonography in 20% of patients, vs. 2% of radiography. Some comparative studies 21,22,23,24 between the diagnostic reliability of CT scan, ultrasound and conventional x-ray in obstructive bowel disease have preferred the ultrasound, showing a sensitivity rate for the site of occlusion of 93% for TAC, 70% for ultrasonography and 60% for radiography. To confirm the absence of predictive value in case of low fluid levels for recognition of intestinal adynamia, appeared striking the negativity of the 3 sequential x-ray exams performed within 72 hours in dialyzed woman (case 20. Fig. 8b) whose ultrasound monitoring, performed by the same operator, allowed to estimate a significant worsening of peristalsis up to a full-blown adynamia. In light of these observations, it would therefore be useful a critical review of the interpretation of the absence of fluid levels in the common x-white, as the traditional diagnostic instrumental criterion to rule out clinical suspicion of intestinal obstruction, (while their presence is certainly evidence of occlusion, with positive predictive value 100%); the negative predictive value of their absence should not be considered as absolutely reliable, as unfortunately it still happens again, based on a cultural background hardly changing (Figg. 8, 9).

Timely echographic investigation improves the survey especially in the pediatric population (3 months infant in reported cases), in which the indiscriminate application of common radiographic method imposes severe limitations on the nature of radiobiological protection, on the one hand, leading to also not negligible artifacts, due to lack of cooperation from the young patient, on the other. Often the need to transfer those patients to centers having pediatric surgery, (not evenly distributed throughout), is supported by the reproducibility of US at the receiving unit, with the possibility of short-term controls, without any additional risk in terms of biological protection. Equally significant is the echographic confirmation to clinical suspicion of neoplastic diseases (Figg. 9b, 9c) in sub occlusive syndromes occurred by ascending colon cancer and polyps of the sigmoid, respectively, where the common x-ray wouldn't have provided any further information. Ultimately, the parameters of ultrasound semiotics predicting bowel occlusion are summarized, in ascending order of prognosis, in:

- Increased size of the loops (focal in mechanical types, global in adynamic types)
- Wall thinness
- Smoothing folds or leveling of the conniving colic haustra
- Perivisceral inflammatory layer
- Edit the transonic characteristics of the effusion or the enteric contents in relation to the developmental stages of the damage
- Fluid-gas stratification of degradation products of ingested
- No mixing of the propulsive activity or content trapped in loops to the state of repletion (or emptied because of vomiting; in both cases the absence of fluid levels justifies the false negatives in the white x-ray)
- Toughness of loops herniated through wall defects (inguinal hernia, ventral hernia), with the compression exerted by the same operator
- Parietal adynamia
- Significant reduction in blood flow of feeding vessels or its absence to assess color Doppler

With the exception of three overt conditions of occlusion, associated with inflammatory peritoneal deposit, where the merger has achieved remarkable leukocytosis (from 17,700 GB mm / cube up to 19,500 and 24,000 / mm/ cube), the laboratory set-up did not provide any substantive guidance for interpretation.

Conclusions

The prognostic severity of bowel obstruction requires diligent management, rapid diagnosis and monitoring of the patient; early detection of those alterations that precede overt obstruction, usually defined as sub-ileus, which could precipitate an irreparable organ damage, is stressed. As the anatomical alteration precedes the clinical symptoms for a few hours, so the concept of a really early diagnosis is achieved once during the operation, (as demonstrated by the high percentage of minimally invasive approaches converted to open surgery) ²⁵, the use of investigative techniques undervalued by the lack of experience, it comes with larger and larger openings in clinical practice.

The paucity of reported personal collection, although not sufficient to make appraise the role of ultrasound in

emergency as part of a validated diagnostic protocol for disorders of digestive system, appears at least a source of reflections on the advantages of this method in the study of abdominal pathologies in emergency. In fact, some patients proved to be the procedure even more sensitive and specific than traditional abdominal rx, anticipating the radiological confirmation of occlusion, which, if you had not focused on the clinical medical history, would have led to misinterpretation or at least caused an underestimation of the syndrome.

Riassunto

L'indagine ecografica si sta affermando con sempre maggiore incisività nel contribuire alla diagnosi tempestiva dei primi indizi di occlusione intestinale in urgenza, rivelando prerogative finora sottostimate rispetto alla radiologia tradizionale (rx diretta addome). La peculiarità più significativa dell'investigazione con ultrasuoni, ovvero la possibilità di uno studio dinamico in tempo reale, che altre procedure strumentali di tipo statico non offrono, presenta il migliore contributo nella valutazione dei disturbi della canalizzazione, con un più dettagliato studio della iniziale stratificazione in livelli idroaerei degli ingesti, che precorrono lo stato subocclusivo conclamato e nella casistica riportata, sebbene limitata, hanno consentito una anticipazione diagnostica estremamente affidabile, nel confermare il sospetto clinico ed indirizzare il paziente nel più breve tempo possibile alla risoluzione chirurgica. L'esperienza personale relativa a 25 pazienti in urgenza ha confermato queste considerazioni, facendo anzi emergere reperti talvolta contrastanti con la convenzionale rx diretta addome, laddove il sospetto clinico è risultato poi parametro dirimente per la strategia terapeutica.

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Commento e Commentary

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L'impiego dell'ecografia nei dipartimenti di emergenza risulta sempre più diffuso e di grande interesse, in quanto si tratta di una metodica semplice, di basso costo, rapida senza alcuna contro indicazione, puo essere eseguita in gravidanza e nei bambini, e consente diagnosi anche di elevata affidabilità e molto utili nel gestione dei pazienti sia come guida al successivo iter diagnostico sia per la diagnosi finale e la prognosi.

Una delle prime applicazioni nei dipartimenti di emergenza è stata la cosiddetta ecografia" fast" utilizzata direttamente "in sala rossa" per evidenziare in pazienti politraumatizzati la presenza di emoperitoneo o complicazioni addominali L'autrice nel suo elaborata riporta una sua personale esperienza nell'impiego degli ultrasuoni nella patologia occlusiva addominale, certamente alcuni aspetti come la dilatazione delle anse addominali, la riduzione o l'assenza della peristalsi, la scomparsa delle pliche la presenza di liquido libero nella cavità addominale sono elementi evidenziabili con gli ultrasuoni e rappresenta dati significativi nel valutare un ileo. Altra peculiarità della metodica e quella di poterla riproporre più volte e quindi poter monito rare la situazione addominale del paziente soprattutto in quelle situazioni "borderline" dove la semplice radiografia diretta dell'addome non risulta dirimente.

Per tali motivi gli ultrasuoni possono trovare una loro valida applicazione anche nei casi di occlusione.

I limiti sono rappresentati dai cosiddetti pazienti difficili, obesi, ipermeteorici con perforazione intestinale dove l'ecografia può dimostrare notevoli difficoltà interpretative.

Înoltre, grande limite della metodica, soprattutto nella valutazione delle occlusione intestinale è l'esperienza dell'operatore che si ottiene con un lungo training nelle sale ecografiche e nei reparti di emergenza.

The use of ultrasound in emergency departments is becoming more widespread and of great interest because it is a simple, low cost, fast, devoid of contraindications as it can 'be performed also in pregnant women and children, and allows diagnosis also very reliable and very useful in the management of patients both as a guide to the next diagnostic procedure for the final diagnosis and to define the prognosis.

One of the first applications in emergency departments was the so-called ultrasound "fast" (Focused Abdominal Sonography for Trauma) used directly "in the red room" to highlight the presence in polytrauma patients of hemoperitoneum or abdominal complications.

The Author developed in his reports her personal experience in the use of ultrasound in abdominal occlusive disease. It is true that some aspects such as the dilation of the abdominalloops, the reduction or absence of peristalsis, the disappearance of the Jolds, the presence of free jluid in the cavity abdominal, ali ultrasound detectable elements, represent ali significant data in assessing ileum.

Another Jeature of the methodology is the possibility of its repetitive use, more 'times subsequently, and then to monitor the situation of the patient's abdomen especially in the "borderline" situations where the simple plain radiograph of the abdomen is not diriment.

For these reasons, ultrasound can find their proper application also in cases of occlusion.

The limits are represented by so-called difficult patients, that is the obese ones, those with gas bowel accumulation, and those with intestinal perforation where the U.S. can't overcome significant difficulties in interpretation.

In addition, major limitation of the method, especially in the evaluation of bowel obstruction, is the experience of the operator that requires a long training in ultrasound rooms and emergency departments.