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Corresponding author: Henry Chukwuemeka Okafor

RADIOGRAPHICAL EVALUATION OF INTESTINAL OBSTRUCTION

Dr Henry Chukwuemeka Okafor[1], Ikpeama Osita John[2], Okafor Jane Nkechinyere[3], Okafor Rita Ifeyinwa[4]

[1]Department of Surgery, Alex Ekwueme Federal University Teaching Hospital Abakaliki, Ebonyi State
[2]Department of Public Health, Imo State University, Owerri;
[3]Biochemistry Department, Abia State University, Uturu;
[4]Pharmacy Department, Abia State University Teaching Hospital, Aba;

RESEARCH ARTICLE

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Abstract: Intestinal obstruction is a very common case seen all around the world. The diagnosis is very essential to adequate management of such cases. Abdominal radiographs go a long way in making an early and adequate diagnosis of the various types of intestinal obstruction. The most common and cheapest abdominal radiographs needed is the plain abdominal X-Ray, which shows various findings usually in keeping with those seen in other cases of intestinal obstruction. Hence, the importance of abdominal radiographs especially the plain abdominal X-Ray cannot be overemphasized in the proper management of intestinal obstruction.

Keywords: Abdominal X-Ray, Intestinal Obstruction, Abdominal Radiography, Abdominal Ultrasonography, Computed Tomography Scan

INTRODUCTION:

The intestine is a large long tube inside the abdomen. Any obstruction will prevent the passage of faeces and flatus; hence leading to dilation of the part of the intestine just above the level of obstruction. Small bowel obstruction continues to be a substantial cause of morbidity and mortality, accounting for 12-16% of hospital admission for the evaluation of acute abdominal pain in the United States (Nicolaou et al 2005). The management of intestinal obstruction has evolved from immediate surgical repair to initial use of nasogastric tubes for decompression with follow-up abdominal radiography and electrolyte levels. Surgery is now the last option and used in patients who have a significant lesion causing complete obstruction as well as those who fail to respond to nasogastric tube decompression or electrolyte deficit correction and those who also have a complication like strangulation, perforation, ischaemia, or vascular compromise.

Most patients suspected of having intestinal obstruction undergo abdominal radiography largely because it is accurate, widely available, and inexpensive (Thompson et al 2007). There are four densities seen on plain abdominal radiographs; white for bone, grey for soft tissue, slightly darker grey for fat and black for air. It shows the abdominal visceral and bowel as well as every other abnormality or foreign object in the abdomen. The diagnosis is improved substantially if radiographs are obtained in both dependent (supine/erect) and non-dependent (upright/decubitus) views (Thompson et al 2007).

Technical Consideration

A comprehensive diagnostic approach to intestinal obstruction includes clinical history, physical examination, and radiological investigations (Shakil et al 2011). The radiological investigations include abdominal X-Ray, ultrasound, and computed tomography scan. The sensitivity of plain film radiography combined with the clinical background was only 46%, whereas CT had a sensitivity of 100% (Frager et al 1994).

Abdominal X-Ray

Plain Abdominal Radiography (PAR) is often the initial diagnostic imaging tool for patients with acute abdominal pain (Gans et al 2012). It is still used in many practices as the initial imaging modality for patients experiencing acute abdominal pain due to its low cost and wide availability (Thompson et al 2007). A more recent report showed a sensitivity of only 66% for plain abdominal X-Ray (Shrake et al 1991). In the use of abdominal X-Ray to make a diagnosis of intestinal obstruction, a clear understanding of the normal abdominal X-Ray is important. The small bowel usually lies more centrally, with the large bowel framing it. The upper limits for the normal diameter of different bowel segments are designated by the '3/6/9 rule' as follows: small bowel-3cm, colon-6cm, caecum-9cm.

In the acute setting, a plain abdominal X-Ray may consist of a supine and erect abdominal radiograph and an erect chest radiograph. (Mirvis et al 1986). The erect chest view is recommended for diagnosing chest pathologies such as pneumonia, that mimic the symptoms of an acute abdomen (Mayumi et al 2015). The exposure parameters of the chest X-

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Ray also give greater visualization of free gas under the diaphragm when a hollow visceral perforation is suspected (Alazzawi et al 2010).

The abdominal X-Ray findings differ depending on the type of obstruction majorly based on the location of the obstruction. Small bowel obstruction typically produces gaseous distension of the bowel loops proximal to the obstructing lesion. Dilated loops of the small intestine usually can be recognized within 3-5 hours after the onset of complete obstruction (Herlinger et al 1989). The number of bowel loops seen is related to the level of obstruction. The higher the obstruction, the less number of loops seen, and the lower the obstruction, the more number of loops seen. If the obstructing lesion is somewhat distal, as more loops of the bowel become distended with air, they may appear to be stacked on top of each other in a characteristic stepladder configuration (Eisenberg et al 1996). In small bowel obstruction, the supine findings include dilated gas/fluid-filled small bowel stretch sign, dilated stomach, absence of rectal gas. The "stretch sign" refers to small bowel gas arranged as low attenuation stripes perpendicular to the long axis of the bowel. It is due to the small amount of gas separated by valvulae conniventes in primarily fluid-filled bowel (Maglinte et al 1996). The erect findings include multiple fluid air levels, strings of bead sign, air-fluid levels longer than 2.5cm, air-fluid levels in the same loop of small bowel of unequal heights. The string of bead sign is due to the fluid-filled loops of the bowel, with a small amount of remaining gas trapped in folds between valvulae conniventes, which resembles a string of bead (Thompson et al 2008). The four signs on erect radiographs have a high sensitivity and specificity for establishing the diagnosis of small bowel obstruction. The other three signs are much more common than the strings of bead sign (Thompson et al 2007).

The distended bowel also contains fluid in addition to air which is usually seen as air-fluid levels on abdominal X-Ray. The dilation of the small bowel stimulates the mucosa to secrete fluid (Nevitt et al 2000). Air-fluid levels are only seen on the erect abdominal radiography and are a significant radiological sign for diagnosing acute small bowel obstruction (Lasspas et al 2001).

In cases of large bowel obstruction, there are some radiological signs seen in abdominal X-Rays. The large bowel has a distinct transverse band called haustra which does not cross the full diameter of the bowel; unlike the small bowel which has transverse valvulae conniventes (Bickle et al 2002). Immediate life-saving surgical intervention is required in some cases of bowel obstruction. (Dite et al 2003). Doctors with less experience may find it difficult to interpret abdominal radiographs that appear to have normal anatomy but have an unused bowel gas pattern (Lim et al 2006). The limitation of plain abdominal radiographs includes the inability to diagnose the cause of obstruction in most cases, the inability to reliably detect the presence of ischaemic complications, difficulty to differentiate between obstruction and ileus, the possibility of missing obstruction or the location (Jackson et al 2018).

Abdominal Ultrasonography

Another radiological approach is abdominal ultrasonography. However, sonography is not commonly used for the evaluation of small bowel obstruction mainly because most of the time, the bowel loops are filled with gas, producing non-diagnostic sonograms, and because adhesions, the most common cause of mechanical small bowel obstruction are not detected with this technique (Lim et al 2007). However, when the obstructed bowel segments are dilated and filled with fluid, not only can the level of obstruction be recognized but the cause of the obstruction can also be demonstrated by using the fluid-filled bowel as a sonic window (Maglinte et al 2008). In sonography, bowel obstruction is present when the lumen of the fluid-filled small bowel loops is dilated to more than 3cm, the length of the segment is more than 10cm, and peristalsis of the dilated segment is increased, as shown by the to-and-fro or whirly motion of the bowel contents (Meiser et al 1985).

The presence of an akinetic dilated loop distal to dilated loops with peristaltic activity was a sensitive and specific finding associated with strangulation, and the presence of peritoneal fluid also was a sensitive indicator of the possible presence of strangulation (Ogata et al 1994).

Computed Tomography Scan

A strong radiological investigation which aids in the diagnosis of intestinal obstruction is the computed tomography scan. Several studies have demonstrated the value of CT scan in confirming the diagnosis (site and level) and revealing the cause of small bowel obstruction, with a sensitivity of 94-100% and an accuracy of 90-95% (Maglinte et al 1993). CT scan provides much more information about the site, cause, and complication of intestinal obstruction. Hence, in suspected obstruction patients, abdominal X-ray may just prolong the evaluation period while adding radiation exposure (ACR Appropriateness 2013). In CT, there should be the presence of dilated small bowel loops (diameter >2.5cm from the outer wall to outer wall) promixally to normal caliber or collapsed loops distally (Fukuya et al 1992).

Discussion

The radiological approach was used for a 16-year-old female who presented to the emergency department with acute abdominal pain, abdominal distension, and clinical symptoms of intestinal obstruction. Other parts of the history and physical examinations were taken. Various investigations were

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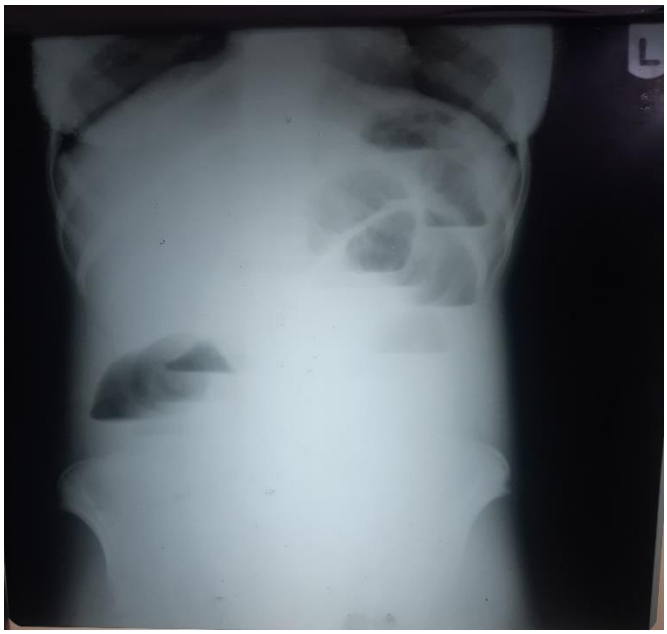
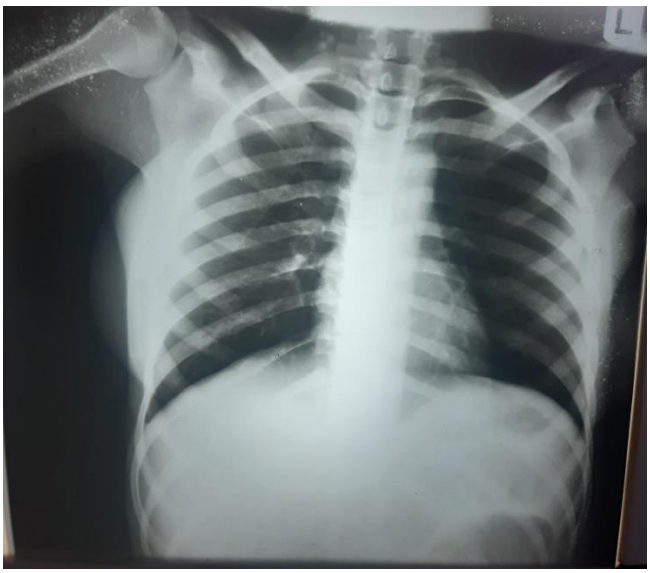
also requested.





The radiological approach first used was an abdominal X-ray. This is in keeping with Ellis H 1982: "For many decades, plain film radiography has been considered the most valuable initial diagnostic tool in addition to a carefully taken history and a meticulous physical examination in the diagnosis of intestinal obstruction".

Her plain abdominal X-Ray revealed gaseous dilated bowel loops with multiple air-fluid levels wider than 2.5cm. The findings were in keeping with Lappas et al 2001 which says "In plain abdominal radiograph, the most significant findings which are predictive of obstruction are the presence of more than two air-fluid levels, air-fluid levels wider than 2.5cm, and air-fluid levels differing more than 2cm in height from one another within the small bowel loop. The swift investigations and its findings enabled early management of the disease condition; hence further complications were prevented.

Conclusion

The diagnosis of bowel obstruction is usually done following adequate patient history, clinical symptoms and signs, and subsequent investigation.

Abdominal radiography serves an important role in the diagnosis and management of intestinal obstruction. Abdominal X-Ray features of small bowel obstruction include dilation of the small bowel and much more prominent valvulae conniventes. In healthy individuals, only the inner wall of the bowel should be visible on an abdominal X-Ray. However, in cases of perforation of the bowel, there will be the presence of free air within the abdomen leading to the visibility of both sides of the bowel wall.

The Conservative method of treatment in intestinal obstruction is usually effective. However, surgical methods may be necessary due to difficulty in diagnosing the patient as well as

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the possibility of other complications.

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