Emergency MDCT in case of right lower quadrant pain

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Learning objectives

The most common signs of tumors and inflammation of RLQ on CT images are bowel thickening, stranding of surround fat and enlarged lymph nodes. The analysis of bowel thickens shows that it was more prominent in tumors than in inflammatory. Pattern of bowel wall thickening of tumors is more irregular and asymmetric in contrary to symmetrical wall thickening in inflammatory diseases.

The enlargement of appendix is a strong indicator of its inflammation, but other inflammatory diseases and tumors can also cause it. The most significant enlargement of appendix occurs in patients with acute appendicitis and its complications. Other signs of inflammation include thickening of appendiceal and caecal wall, presence of appendicoliths and periappendiceal fat infiltration.

The degree of fat stranding adjacent to the thickened wall can help the diagnostics. More significant increase of fat density is seen in inflammatory diseases, especially in cases of complication of acute appendicitis, often accompanied with fluid collections. In tumors, the fat stranding is less prominent or absent.

The lymphadenopathy is often seen in inflammatory diseases and malignancies, but it cannot always be useful for establishment of the right diagnosis.
Background

Right lower quadrant pain (RLQ) includes diseases of terminal ileum, ileocecal valve, cecum and appendix. It can be involved in variety of different diseases and pathological conditions as tumor and inflammation. High-resolution volumetric images obtained with MDCT can improve and speed-up the diagnostic triage in patients with RLQ pain.

Malignancies

Colon carcinoma - is present with asymmetric or circumferential mural thickening of the caecum, pericaecal lymph nodes adjacent.

The analysis of bowel thickens shows that it is more prominent in tumors than in inflammatory, often more than 10mm. Fig. 1 on page 6.

The pattern of bowel wall thickening of tumors is more irregular and asymmetric. Fig. 2 on page 6.

The fat stranding is seen in ca. 30% of patient with tumors, but it is less prominent then in patients with inflammatory conditions.

The distal ileum may be affected and abnormally thickened as a result of tumor extension or, less commonly, a nontumoral process (congestion and edema).

Secondary Malignant Involvement

Neoplastic lesions may spread to the caecum hematogenously, by means of direct invasion, or by intraperitoneal invasion. Metastases to caecum are typically not confined and often occur in patients with a history of primary malignancy that is compatible with such metastases. Direct invasion from the right ovary or retroperitoneal area usually involves the cecum and distal. Fig. 3 on page 7.

Inflammatory

Inflammatory diseases are most common present with symmetrical wall thickening. The lymphadenopathy and the fat stranding are often seen in inflammatory diseases.

Acute appendicitis - the inflammation of appendix, due to its luminal obstruction or superimposed infection. Acute appendicitis is the most common inflammatory condition of RLQ.

Acute appendicitis manifests as:
- enlargement of the appendix to a diameter greater than 7 mm
- thickening of appendiceal wall with enhancement
- periappendiceal fat stranding
- thickened caecal wall
- appendicolith may be present
- enlarged lymphnodes
- sometimes, focal thickening of the terminal ileum or caecum. Fig. 4 on page 8

The most significant enlargement of appendix and more significant increase of fat density, accompanied with fluid collections, is seen in cases of complication of acute appendicitis. The signs of perforation of the appendix are:

- A focal defect in an enhancing appendiceal wall
- extraluminal air near the appendix
- an extraluminal appendicolith Fig. 5 on page 8
- Periappendiceal abscess or a pericaecal phlegmon. Fig. 6 on page 9
  
Right-sided colonic diverticulitis.

The diverticula are small colonic outpouchings with irregular wall thickening. CT findings of acute diverticulitis consist of asymmetric or circumferential colonic wall thickening associated with focal pericolic fat stranding and demonstration of diverticula. Inflamed diverticula are usually located at the level of maximum pericolic inflammation and maximum wall thickening.

The right colon and caecum may be involved by diverticula less often than the left and sigmoid colon. The diverticulitis of the right colon presents with RLQ pain and clinically mimicking appendicitis. Fig. 8 on page 10

Crohn's disease

Crohn's disease is a type of inflammatory bowel disease that may affect any part of the gastrointestinal tract, caused by a combination of environmental, immune and bacterial factors. One of the most commons sites of involvement is ileocaecal area presenting with RLQ pain.

The two most common CT findings of Crohn's disease are eccentric wall thickening and mucosal hyperenhancement due to intramural edema. Fig. 9 on page 11

Intussusception
Intussusception is invagination or telescoping of a proximal segment of the bowel into lumen of the distal segment. Adult intestinal intussusception is represented by prolapse of a part of the intestine into the adjoining intestinal lumen. In adults, intussusceptions are in most cases secondary to an underlying pathologic condition such as a benign or malignant neoplasm. Fig. 10 on page 12

**Infectious Enterocolitis** - infectious terminal ileitis is usually caused by Yersinia, Campylobacter, or Salmonella organisms. The clinical presentation is shown with acute diarrhea symptoms, nausea and vomiting. Symptoms may be indistinguishable from those of appendicitis when right lower quadrant pain is the major complaint.

The typical CT features include: Fig. 11 on page 13

- circumferential wall thickening of the terminal ileum and cecum
- moderate or marked enlargement of the mesenteric lymph nodes in the right lower quadrant.

**Isolated Infarction of the cecum**

The causes of colonic ischemia can be classified in terms of occlusive and nonocclusive states.

The specific CT findings include right ileocolic artery occlusion or arterial embolism and portal or mesenteric venous gas. Without intravenous contrast enhancement the CT findings are unspecific and include bowel wall thickening, perifocal fat stranding and enlargement of the mesenteric lymph nodes; thus can be mistaken for other inflammatory and noninflammatory diseases. Fig. 12 on page 14
Fig. 1: Adenocarcinoma of the caecum. Axial MDCT image (venous phase) shows asymmetric mural thickening of the caecum (green arrows) with surrounding fat stranding due to tumor invasion blue arrows) in patient with adenocarcinoma of the caecum.

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Fig. 2: Adenocarcinoma of the caecum. The axial MDCT image shows asymmetric caecal wall thickening (red arrow) and enlarged lymph node (yellow arrow).

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**Fig. 3:** The oblique and the axial reformatted images (venous phase) show caecal soft-tissue mass (red arrows), causing the small bowel obstruction. The histopathological study demonstrated the metastasis of leiomyosarcoma.

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**Fig. 4:** Coronal oblique and axial CT images show the enlarged appendix with its wall thickening (purple arrows), an appendicolith in the lumen of appendix (yellow arrow), periappendiceal fat infiltration (blue arrow) and the caecal wall thickening (green arrow).

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**Fig. 5:** Coronal oblique reformatted image shows the enlarged appendix (purple arrows) and an extraluminal appendicolith (yellow arrow). The axial CT image shows, extraluminal
air and a focal defect of appendiceal wall (white arrow) and periappendiceal fat stranding (blue arrow)

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**Fig. 6:** Sagittal oblique reformatted image and axial image show enlarged appendix (green arrows), a focal defect of appendiceal wall in the base of appendix with extraluminal air (red arrows). The yellow arrows show the abscess in pelvis

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Fig. 7: Perforated appendicitis with periappendiceal abscess. Axial image shows an abscess (yellow arrows) in RLQ. The inflamed appendix is not seen.

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Fig. 8: The axial and the sagittal oblique CT images show acute diverticulitis of the caecum (red arrows associated with focal pericolic fat stranding (blue arrows).

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Fig. 9: Axial CT image shows a thickened caecal wall with mucosal hyperenhancement (red arrows). The green arrow.

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Fig. 10: Non-obstructive short segment intussusception. Axial and sagittal images show bowel within bowel (small green arrows).
Fig. 11: Coronal MDCT with peroral contrast enhancement (MIP 5mm) shows circumferential wall thickening of the terminal ileum with mural stratification (red arrow) and enlargement of the mesenteric lymph nodes (green arrow).

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Fig. 12: Coronal MDCT images show segmented caecal wall thickening (yellow arrows) and ileocolic lymphnodes (purple arrows).

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Findings and procedure details

Materials and methods

Retrospective study included 135 patients with RLQ pain admitted to the emergency department of a public hospital from 2009 to 2013. The median age of patients was 35.5 years. The result of abdominal MDCT was compared to hystopathological examination in 93%. The unenhanced MDCT was performed in 35% cases and the CT with intravenous contrast enhancement - in 64%.

In all patients the analyses of caecum, ascending colon, terminal ileum, ileocecal valve, appendix, surrounding fat and lymph nodes was performed using dedicated workstation.
Conclusion

MDCT could serve as a method of choice for diagnostic workup of emergency patients admitted to a hospital with RLQ pain.
Personal information

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References


