

Diagnostic imaging methods in the examination of the digestive tract

RDG examination of the esophagus and stomach

Template:Zkontrolováno

Skiagraphy

The esophagus can only be displayed on a plain image if it is pathologically altered.

- With large hiatal hernia, an oval formation with a surface may appear in the heart shadow
- You can also see a significantly enlarged esophagus with food residues in achalasia.
- During perforation of the esophagus, a pneumomediastinum is formed, which creates a double contour around its edge, or pneumocolum.
- A large gastric bubble with a surface is displayed during gastric "distension".

Skiagraphy

Although sciascopy is partly replaced by endoscopic examination, it still has a range of indications.

- **Swallowing and esophageal X-ray:** X-ray examination of the esophagus with a barium contrast medium under sciascopic control. It is possible to prove, for example, diverticulum, hiatal hernia, esophageal varices and reflux esophagitis also have a characteristic picture. Oesophageal X-ray is a key examination for tumorous stenoses when planning interventional treatment - the introduction of an esophageal stent.
- **Esophageal X-ray with an aqueous contrast agent:** It is indicated, for example, in post-operative conditions to exclude anastomosis leakage and assessment of its patency, but the evaluation is indicative. This test is also indicated if a bite is suspected in the esophagus (eg herringbone).
- **Gastric X-ray:** This examination is almost completely replaced by endoscopy. But for example, the extent of tumor infiltration and ulcers can be assessed.
- **Videofluoroscopy:** A special examination for swallowing disorders, where the act of swallowing is recorded with a high time resolution (20 fps) for the functional evaluation of the individual phases of swallowing.

Ultrasonography

Ultrasonographically, you can see the part of the esophagus to the left, behind the thyroid gland. The stomach can also be visualized, but there is a very limited evaluation: the back wall may not be fully visible for the filling. Gastroesophageal reflux in neonates and infants can also be seen on USG, but the use of this method is not currently recommended due to its low specificity. ^[1]

Endoscopic ultrasonography

Endoscopic ultrasonography has as a very good resolution for pathologies on the mucous membranes of the esophagus, stomach, duodenum and the surrounding area (pancreas, nodes).

Computed tomography (CT)

Esophageal CT is most often performed during tumor staging. Just before starting the examination, the patient swallows a sip of contrast medium, to visualize the lumen. CT of the stomach is performed after an oral intake of 500-1000 ml of water, which ensures its good distension.

Angiography

Angiographic examination is usually indicated with a view to interventional performance in bleeding, where endoscopy has failed, and a high risk of surgery.

RDG examination of the small intestine

Anatomy of the small intestine

 For more information see *Small intestine*.

X-ray image of native abdomen

Native abdominal imaging is the basic examination method for acute conditions to exclude ileitis or pneumoperitoneum. It is also suitable for controlling the development of the ileitis. Radiation load for this method is approx. 1 mSv.

Ultrasound



USG: zánětlivé zesílení stěny aborálního ilea u Crohnovy nemoci (<http://atlas.mudr.org/Case-images-Crohn's-disease-of-terminal-ileum-and-colon-494>)

Ultrasound is a basic examination method, but the small intestine usually cannot be visualized fully - as of it part is covered by gas, and in obese patients it is not possible to use linear probes with a higher frequency (better resolution for shallower structures). Detects wall enlargement, hypervascularization in inflammation (color mapping), surrounding fluid (ascites), distension of loops by fluid (but not air - this limits investigability). There is no radiation exposure.

GIT passage

Dynamic examination, in which the patient is orally administered with a contrast agent, the passage of which through the digestive tract is monitored under sciascopic control and documented by sciagraphy. Indicated in patients with passage disorder (subileotic conditions). Radiation load estimated at 2-3 mSv.

Enteroclysis

After insertion of the nasojejunal probe into the duodenojejunal bend under sciascopic control, a bar contrast agent is administered to the probe, followed by methylcellulose solution. The contrast agent gradually fills the small intestine and displays its relief. Indicated for suspected small bowel disease (typically Crohn's disease). It is not indicated as an acute examination. The radiation exposure is estimated at 2-3 mSv, however, the ICRP in its 2008 report states 7.8 mSv.

CT of the small intestine



CT enterografie: zánětlivé postižení kliček ilea při Crohnově chorobě (<http://atlas.mudr.org/Case-images-Crohn's-disease-of-the-small-bowel-44>)

- **CT enteroclysis:** As with conventional enteroclysis, a nasojejunal tube is inserted to administer methylcellulose solution (2000 mL). An antispasmodic (Buscopan) is given intravenously to slow the intestinal passage and affect the spasms, and CT of the abdomen and small pelvis with contrast agent is performed iv
- **CT enterography:** Mannitol solution (usually) in an amount of 1500-1700 ml the patient drinks for 45-55 minutes, then an antispasmodic (Buscopan) is administered intravenously and a CT of the abdomen and small pelvis with contrast agent is performed iv
- **CT of the abdomen (routine):** Classic CT of the abdomen and small pelvis with an effect is usually indicated in acute cases.

The disadvantage of CT is the higher radiation exposure (approx. 7 mSv), but this can be reduced to 3 mSv in lean patients using a low-dose technique. During the examination, both the intestinal wall and extraintestinal structures (abscess, ascites, skeletal involvement, parenchymal organ involvement) are displayed. CT enterography is more pleasant for the patient than CT enteroclysis, but he must drink the required amount of mannitol solution (it is slightly sweet). Because mannitol and methylcellulose are not absorbed, most patients develop diarrhea after examination. In non-acute cases, CT or MR enterography is the method of choice.

MRI of the small intestine

Small intestinal distension is also used, e.g mannitol solution is given orally, antispasmodic and clump. Rapid sequences are ideal, there is no radiation exposure. MR enterography is the method of choice for the imaging of the small intestine in the diagnosis of IBD (inflammatory bowel disease).

RDG examination of the large intestine

Template:Zkontrolováno

Anatomy of the colon

 For more information see *Large intestine*.

Native abdomen imaging

Native abdominal imaging is the basic examination method for acute conditions - to exclude ileitis , **pneumoperitoneum** (e.g diverticulum perforation), colon distension in pneumonitis, toxic megacolon. The image of edematous hauster (so-called "thumbprinting") can be found in inflammatory or ischemic changes. A serious symptom is the **finding of gas** in the intestinal wall, which, however, is usually more visible on CT. The amount of stool formed is found in constipation.

Ultrasound

Ultrasound is a **first-line method** for acute conditions, but its informative value is often limited by the patient's investigability (obese patients with pneumatosis are practically unexplained). Ultrasound can detect:

- **Inflammation of the colon wall (colitis):**widening of the intestinal wall over 3-4 mm, infiltration of the submucosa (hyperechogenic layer), increased vascularization in the color record.
- **Diverticulitis:** segmental edematous changes usually in the sigmoid or the aboral descendant. Inflammatory altered diverticulum ev. with the reaction of the surrounding fat.
- **Epiplonic appendicitis:** a district of hyperdense leaked fat on the antimesenteric side of the large intestine (usually the sigmoid) at the site of maximal pain.
- **Appendicitis:** the appendix wall and its thickening (diameter over 6 mm)
- **Ileus:** only **sometimes** can fluid distension of the colon be seen - usually more gas is present and the large intestine cannot be examined well.
- **Tumors:** only **rarely** manage to show ev. colon tumor , most colorectal cancers are located aborally (rectum, sigmoid colon) and out of reach. However, ultrasound shows, for example, liver metastases.

Irrigography

Irrigation is a **two-stage examination of the large intestine** . The patient must be emptied or flushed before the examination - preparation with Fortrans or MgSO 4 solution (as before colonoscopy).

After insertion of the rectal tube, a **barium suspension** is applied and then **air is insufflated** . The patient must be positioned during the examination - the BaSO 4 solution is liquid and "water flows downhill" - so that there is an even two-contrast filling of the entire large intestine. A sign of filling the entire colon is the reflux of the contrast agent into the terminal ileum or filling the appendix (if any).

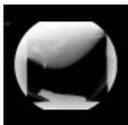
The examination is suitable for **imaging tumorous changes , polyps** , it can also be used to visualize post-inflammatory changes and the extent of disability in diverticulosis. The superior method is, of course, classical (fibro-optical) colonoscopy and the examination is therefore performed on patients who do not agree with classical colonoscopy, or this cannot be performed completely due to unfavorable anatomical conditions (sharp bending, adhesion). In workplaces where CT colonography is available, CT colonography should be preferred because it has a higher yield.

Defecography

Defecography is a sciascopic examination of the defecation mechanism. The rectal tube is filled with the rectal ampoule and part of the aboral sigmoid with a contrast agent which is thickened.

The examination monitors:

- pelvic floor movements
- rectal wall arching during defecation: ventral and dorsal rectocele,
- rectal mucosal prolapse
- anorectal angle: underdevelopment in puborectal spasticity
- residue after defecation: significant above 1/3 of the initial filling.



Defecography: second degree intussusception, pelvic floor drop (<http://atlas.mudr.org/Case-images-Rectal-intussusception-second-degree-defecography-382>)

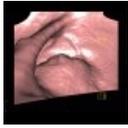
CT Colonography

This is a CT examination of the abdomen and small pelvis with a special prior preparation of the large intestine . The patient must be "flushed" again (preparation with Fortrans, MgSO 4 solution or other laxatives). In some workplaces, so-called "fecal tagging" is done, where an orally administered contrast agent increases the density of the residual colon content, which can thus be better distinguished from polyps. Prior to the examination itself, the colon is insufflated with air or CO 2 by rectifying the tube. The examination can be performed either natively (as a screening with the question of the presence of polyps) or with the administration of an iodine contrast agent, also for other indications. A total of two scans are performed, first on the back, then on the abdomen - there is usually some fluid left in the large intestine, which in one position could cover the ev. pathology. The evaluation is performed by an experienced radiologist (at least 50 examinations are performed under the supervision of another radiologist).

The basic method of CT colonography evaluation is the method of virtual endoscopy, the found lesions are further evaluated in 2D (multiplanar reconstruction, thin sections). The disadvantage of CT colonography is the radiation exposure (however, the second scan is usually performed in low-dose mode, in the case of a screening indication both scans) and the inability to perform a biopsy. The advantage is the display of extraintestinal structures (mesenterium, nodes, liver - staging), the display of a slightly larger area of the intestinal wall than allowed by optical colonoscopy and greater comfort during examination (than during optical colonoscopy).

CT colonography is not an acute examination. If Crohn's disease and incomplete colonoscopy are suspected, it is more appropriate to indicate CT enterography, which shows both the small intestine and, in many cases, the large intestine - but it is not possible to evaluate ev. polyps.

CT colonography should be performed no earlier than one and a half months after the end of acute diverticulitis due to the increased risk of perforation in insufflation.



CT colonography: rectal tumor (<http://atlas.mudr.org/Case-images-Rectal-tumour-virtual-colonography-1113>)

CT of the abdomen and pelvis (routine)

Routine CT of the abdomen and pelvis works well in acute conditions. Prior to the examination, an **iodine contrast agent solution** (10-20 ml in 500-1000 ml) is administered orally; During the examination it is possible to display:

- Even a minimal amount of free air (pneumoperitoneum).
- Distension of the large (but also small intestine) by fluid and gas in ileosal conditions.
- Zone of transition between distended and undistended intestine: site of obstruction.
- Infiltration of the colon wall: colitis, ischemia.
- Larger colon tumors (but not smaller polyps, difficult even flat lesions).
- Gas in the intestinal wall, absence of saturation of the intestinal wall, occlusion of arteries and veins (according to the examination phase) in intestinal ischemia.
- Diverticula: if more frequent or in an inflammatory infiltrate in **diverticulitis**.
- Appendicitis in otherwise healthy individuals.

MRI of the large intestine

MRI is indicated in the staging of rectal and rectosigmoid tumors. There is also an examination similar to CT colonography - MR colonography, which is not routinely performed.

Links

References

1. VANDENPLAS, Yvan - RUDOLPH, Colin D. Pediatric gastroesophageal reflux clinical practice guidelines: joint recommendations of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN). *J Pediatr Gastroenterol Nutr* [online]. 2009, y. 49, vol. 4, p. 498-547, Available from <https://journals.lww.com/jpgn/Fulltext/2009/10000/Pediatric_Gastroesophageal_Reflux_Clinical.22.aspx>. ISSN 0277-2116.