Ultrasonographic aspects in Crohn's disease in pediatric patients

Poster No.: C-1550
Congress: ECR 2015
Type: Educational Exhibit
Authors: A. M. Dee, O. Fufezan, C. Caraiani; Cluj-Napoca/RO
Keywords: Abdomen, Small bowel, Lymph nodes, Ultrasound, Ultrasound-Colour Doppler, Diagnostic procedure, Localisation, Safety, Inflammation, Fistula, Abscess
DOI: 10.1594/ecr2015/C-1550

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method ist strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slide shows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

Learn the ultrasonographic changes of the bowel wall and of the extradigestive structures in children with Crohn's disease.

Learn the contribution that ultrasound can have in diagnostic and evaluation of abdominal pathology in Crohn's disease in the pediatric age.
Background

Crohn's disease is an idiopathic inflammatory bowel disease with a chronic recurrent evolution. It affects the wall of any segment of the digestive tract, the peritoneal serous membrane, the mesentery or the regional lymph nodes. The onset of the disease is around the age of 20-30 years old (but it can occur at any age) with digestive and extradigestive manifestations.

The abdominal ultrasonography is the best imaging technique indicated in the diagnosis of Crohn's disease in children, because it is not irradiating or invasive, it does not need sedation and in some cases it does not even need the introduction of water in the intestine in order to perform a hydrosonography.
Findings and procedure details

The ultrasonographic normal aspect of the bowel wall consists in 5 layers which are visualized with 5 or 7 MHz transducers.

The 5 layers from exterior to interior are:

- an outer hyperechoic layer - the serous layer, the border to the peridigestive fat
- a hypoechoic layer - the muscular layer with a thickness depending upon the segment of the digestive tract
- a hyperechoic layer - the submucosa
- a hypoechoic layer - the mucosa, commonly thin
- a hyperechoic inner layer - the border between the digestive fluid and the mucosa.

The aspects seen in Crohn's disease through ultrasonography are: alteration of the bowel wall (Fig.3, Fig.4, Fig.5) like loss of the stratification (Fig.7) and ulcerations, changes in the parietal vascularisation (vasa recta) (Fig.6), narrowing of the lumen. There are also peri intestinal manifestations - lymph nodes, fibro-fatty infiltration, diminution/disappearance of the intestinal peristaltic (Fig.7) and complications like stenosis (Fig.8), fistulae (Fig.9, Fig.10), or abscesses (Fig.10, Fig.11). The flow in the mesenteric arteries is higher in children with intestinal bowel disease.

It is important to search for the signs of "activity" of the disease given by mural inflammation (in this case Doppler ultrasound is not enough, MRE or contrast enhanced ultrasonography is needed) in which case drug therapy it is used, whereas in cases with fibrosis surgical treatement is required.

In few cases the ultrasonography is inconclusive or can not be properly conducted and thus other complementary examination needs to be done.

Other imaging techniques that can be used are:

- Magnetic resonance enteroclysis/enterography (MRE) - preferable in children because of the lack of irradiation.
- Computed tomography enteroclysis/enterography are important because of the information they give (localisation, complications), but, due to irradiation and sedation issues, they are usually avoided in children.
- Barium X-ray series (conventional enteroclysis) is mainly not used any more because even though it gives information about the anatomical localisation it does not see the bowel wall and the peri intestinal changes.

- Dynamic Enhanced MRI, MR perfusion - can be used in improving the ability to predict response to therapy.

- Molecular Imaging might improve the initial evaluation of patients with Crohn's disease.

- PET/scintigraphy - detection of active bowel inflammation.

- Advanced Endoscopic Mucosal Imaging permits the detection of subtle mucosal lesions.

- Videocapsule - expensive and mostly unreliable in cases with lumen stenosis.

The differential diagnosis of Crohn's disease is mainly done with the ulcerative colitis (Fig.12), but there are other diseases where the bowel wall is affected and thus a differential diagnosis with Crohn's disease needs to be done like: intestinal tuberculosis, diverticulitis, infectious gastroenteritis/colitis, ischemic colitis, pseudomembranous colitis, chronic radiation enteritis, irritable bowel syndrome, Behcet's disease, celiac disease, anal fissures, cancers/carcinoid intestinal tumors, limfoma, endometriosis, giardiasis, amoebiasis, ascariasis (Fig.13) or acute appendicitis.

The main advantages in using ultrasonography in children with Crohn's disease are that it is widely available, not affected by patient motion (truely important in the pediatric age), cheap, repeatable, non-invasive (if colon hidrosonography is not performed) and most of all non irradiating.

Also ultrasonography has an important role not only in depicting the abdominal changes at the onset of the disease but also it holds a great place in following the response to therapy and detecting the recurrence of inflammation after surgical treatment.

Like every other imagin technique, ultrasonography has disadvantages also like that it is operator-dependent (the doctor needs some experience with this type of ultrasonography), it is time-commitment and the rectal and perianal areas are difficult to explore.
Images for this section:

**Fig. 1:** Normal aspect of the bowel wall in the terminal ileum.

© Children's Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
Fig. 2: Normal aspect of the bowel wall of the colon with haustra coli.

© Children's Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
**Fig. 3:** Visualisation of all the bowel wall layers at the level of the ileum with thickened submucosa and lymph node adjacent, in the surrounding fat.

© Children's Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
**Fig. 4:** Submucosal thickening and hypervascularisation at the level of the right colon.

© Children's Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
Fig. 5: Hypervascularisation of the submucosa in the right colon.

© Children’s Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
Fig. 6: Vasa recta (dilatation and tortuosity of the small arteries that supply the intestine) - specific in Crohn's disease.

© Children’s Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
**Fig. 7:** Loss of normal stratification of the bowel wall, lack of peristalsis, fibro-fatty infiltration and lymph nodes.

© Children's Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
Fig. 8: Loss of stratification of the bowel wall; stenosis as complication of the disease.

© Children’s Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
Fig. 9: Entero-mesenteric fistula at the level of the ileum.
Fig. 10: Fistula with abscess formation - complications of Crohn's disease, at the level of the lower right quadrant.

© Children's Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
**Fig. 11:** Ischiorectal abscess seen by ultrasound and confirmed by the MRI.

© Children’s Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
Fig. 12: Patient with ulcerative colitis (differential diagnosis with Crohn's disease). Loss of haustra coli. Wall thickening with an irregular margin - a non specific finding in an inflammatory bowel disease, aspect probable in favour of small ulcerations.

© Children’s Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
Fig. 13: An image of an Ascaris lumbricoides, found in an intestinal lumen. The disease can give the same changes we find in Crohn's disease, therefore, being a diagnosis to be taken under consideration.

© Children's Hospital. 3rd Pediatric Clinic. Department of Radiology. Cluj-Napoca. Cluj
Conclusion

Abdominal ultrasonography is the preferred imaging technique in children with Crohn’s disease. It can be used in the initial assessment of the disease and in monitoring after surgical treatment or assessment of response to drug therapy.

Not only that the information that it brings are reliable but most important of all - it lacks radiation.
References


