Follow-up CT evaluation of hypodense parenchymal areas in the setting of necrotizing pancreatitis: could these changes be reversible?

Poster No.: C-1453
Congress: ECR 2015
Type: Scientific Exhibit
Authors: E. Kasatkina¹, M. Klauss¹, T. Hackert¹, T. Rieden², H. U. Kauczor¹, V. Sinitsyn², L. Grenacher¹;¹Heidelberg/DE, ²Moscow/RU
Keywords: Pancreas, CT, Drainage, Acute, Outcomes, Inflammation
DOI: 10.1594/ecr2015/C-1453

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 is 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 slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Aims and objectives

Objectives:

Today the generally accepted CT-criteria for diagnosis of pancreatic necrosis are defined as focal or diffuse zones of non-enhanced pancreatic parenchyma or areas with highly decreased attenuation depicted on the images with intravenous contrast administration [1, 2]. It is agreed that the lack of contrast enhancement of the pancreatic parenchyma indicates decreased blood perfusion and correlates with the development of necrosis [1].

Aim:

The aim of our study was to find whether the areas with decreased attenuation in pancreatic parenchyma found on images with contrast administration in patients with acute necrotizing pancreatitis always correspond to pancreatic necrosis or could be reversible.
Methods and materials

Data-sets of 30 patients with confirmed diagnosis of acute necrotizing pancreatitis were reviewed retrospectively. Mean age of the patients was 56.3±12.9 years, among them 23 male and 7 female. All of them underwent intensive treatment in Surgical Clinic of Heidelberg University in 2010-2013 including non-operative management with supportive care and antibiotics, as well as CT-guided percutaneous drainages and operative necrosectomy.

25 of these patients were included in the study as they had both initial and follow-up contrast-enhanced CT-examinations. Pre-pancreatitis imaging was not available, initial CT-scans were obtained within 72-96 hours' timeframe after the onset of a bout of acute pancreatitis, all the patients had clinical evidence of an acute pancreatitis at the time point of initial CT-scanning. 7 patients undergone operative treatment including necrosectomy (5) and hemi-colectomy (2), 11 patients were treated with percutaneous drainage, 3 of them had an abscess formation.

Two independent observers with 4 and 19 years of experience in abdominal radiology analyzed both initial and follow-up CT-scans. As it was difficult to accurately assess post pancreatitis images all controversy cases were discussed together in consensus. We precisely evaluated the size and the change in attenuation values (HU) of hypodense areas in the gland. The necrotic zone was manually delineated as a ROI on the axial images; size of the ROI, as well as its area and the percentage of involved pancreatic parenchyma were evaluated.
Results

Areas with decreased attenuation of pancreatic parenchyma in arterial phase were found in all the patients on initial contrast enhanced CT-scans. The extent of pancreatic necrosis was estimated as a single region (pancreatic head, body or tail), two regions or three regions of the gland [3-4]. In 8 patients the hypodense parenchymal areas were found in one region of the gland, in 11 patients - in 2 regions and in 6 - throughout the entire gland.

On follow-up CT-scans 7 of 25 patients (28%) showed the increase in HU density in the areas with decreased attenuation identified within initial CT-examinations. Accordingly to the latest Balthazar classification with CT-severity index these cases corresponded the areas with involvement of less then 30% of pancreatic parenchyma and in single case - with involvement from 30%-50% of pancreatic parenchyma.

We divided the patients into two groups:

- **Group 1** included the patients who increased the HU-values on the follow-up CT studies and was defined as a group with the reversible changes
- **Group 2** included the patients who didn't increase the HU-values in the hypodense areas and was defined as a group with the stabilization or progression of disease

There was a statistically significant difference between Group 1 and Group 2 by the size of primary area and by HU-delta, which is demonstrated in Fig. 1 on page 5 and Fig. 2 on page 5. Mean size of the hypodense areas for Group 1 with reversible changes was 33,9 mm, for Group 2 - 72,8 mm (by size: t-test - p=0,006, Mann-Whitney U test - p=0,01; by HU-delta: t-test - p=0,00, Mann-Whitney U test - p=0,00).

An example of a male patient with repeated bouts of acute pancreatitis and an area with decreased CT-attenuation on primary scan that was defined as a reversible change is shown in Fig. 3 on page 6. Next example shown in Fig. 4 on page 7 is a female patient with acute pancreatitis and two different hypodense areas in the head and the tail of the pancreas. These two areas showed different patterns of development: the smaller one located in the pancreatic head was defined as a reversible change and the bigger one located in the tail of the pancreas showed a pseudocyst formation.
Fig. 1: Box-plot graph demonstrates the difference between Group 1 and Group 2 according to the size of hypodense areas in pancreatic parenchyma. Mean size of the hypodense areas for Group 1 with reversible changes was 33.9 mm, for Group 2 - 72.8 mm.

© Diagnostical and Interventional Radiology, Heidelberg University - Heidelberg/DE
Fig. 2: Box-plot graph demonstrates the difference between Group 1 and Group 2 according to the HU-delta on initial and follow-up CT-scans.

© Diagnostical and Interventional Radiology, Heidelberg University - Heidelberg/DE
**Fig. 3:** CT-scans of a male patient (39 years) with repeated bouts of acute pancreatitis obtained with intravenous contrast material and oral hydration within two different time points. 1 - primary CT-examination: axial image (A) and curved coronal reformat (B) reveal a small hypodense area in body of the pancreas (arrows), infiltration and fluid collections in peripancreatic fat. 2 - follow-up CT-examination within 8 months: on axial image (A) and coronal reformat (B) the hypodense area in the pancreatic body is not longer visible. Note the mild enlargement of the pancreas and peripancreatic fat stranding as well as fluid collections, which are the signs of interstitial pancreatitis.

© Diagnostical and Interventional Radiology, Heidelberg University - Heidelberg/DE
**Fig. 4**: CT-scans of a female patient (63 years) with two different hypodence areas in the pancreas obtained with intravenous contrast material and oral hydration. 1 - primary CT-examination: A - a small hypodense area in the head of the pancreas (arrow) is visible, note the peripancreatic fat stranding. B - more prominent changes in the pancreatic tail (small arrows) with the presence of fluid collections along the pancreatic tail. 2 - follow-up CT-examination within 3 months: A - hypodense area in the pancreatic head is not longer visible (arrow). B - the changes in the pancreatic tail resulted in formation of a pseudocyst.
Conclusion

Our results suggest that small areas with decreased attenuation in pancreatic parenchyma may not always represent the areas of pancreatic necrosis as they can show a reversible pattern.

Pancreatic ischemia or decreased perfusion of pancreatic parenchyma could be considered in cases with small hypodense areas in the setting of acute pancreatitis.
Personal information

Dr. Ekaterina Kasatkina
E-mail: Ekaterina.Kasatkina@med.uni-heidelberg.de
Diagnostic and Interventional Radiology, Heidelberg University Clinic
Im Neuenheimer Feld 110, 69120 Heidelberg, Germany

PD Dr.med. Miriam Klauss
E-mail: Miriam.Klauss@med.uni-heidelberg.de
Diagnostic and Interventional Radiology, Heidelberg University Clinic
Im Neuenheimer Feld 110, 69120 Heidelberg, Germany

Prof. Dr.med. Thilo Hackert
E-mail: Thilo.Hackert@med.uni-heidelberg.de
Diagnostic and Interventional Radiology, Heidelberg University Clinic
Im Neuenheimer Feld 110, 69120 Heidelberg, Germany

Prof. Dr.med. Tatiana Rieden
E-mail: riedenta@gmail.com
Radiology Department, Russian Medical Academy of Postgraduate Education
Barrikadnaya 2/1, 125993 Moscow, Russia

Prof. Dr.med. Hans-Ulrich Kauczor
E-mail: Ulrich.Kauczor@med.uni-heidelberg.de
Diagnostic and Interventional Radiology, Heidelberg University Clinic
Im Neuenheimer Feld 110, 69120 Heidelberg, Germany
Prof. Dr.med. Sinitsyn Valentin
E-mail: vsini@mail.ru
Radiology Department, Federal Center of Medicine and Rehabilitation
Ivankovskoe 3, 125367 Moscow, Russia

Prof. Dr.med. Lars Grenacher
E-mail: Lars.Grenacher@med.uni-heidelberg.de
Diagnostic and Interventional Radiology, Heidelberg University Clinic
Im Neuenheimer Feld 110, 69120 Heidelberg, Germany
References