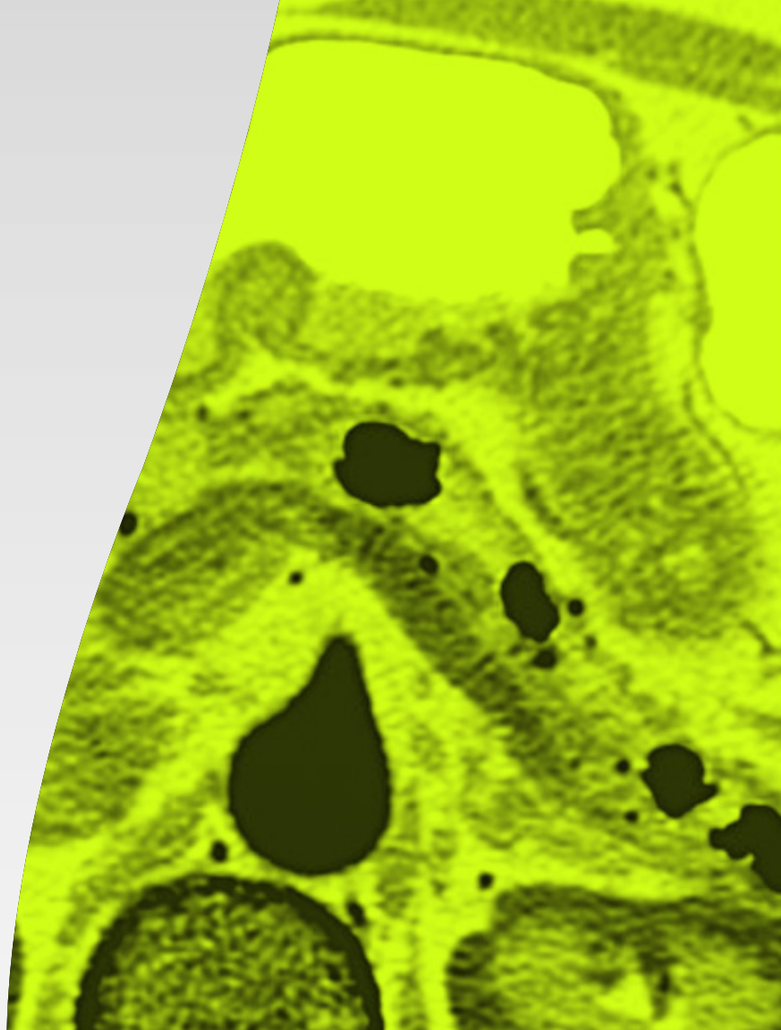
MODERN RADIOLOGY eBook

Pancreas and Spleen Imaging

胰腺和脾脏影像学

EUROPEAN SOCIETY OF RADIOLOGY



Preface

Modern Radiology is a free educational resource for radiology published online by the European Society of Radiology (ESR). The title of this second, rebranded version reflects the novel didactic concept of the ***ESR eBook*** with its unique blend of text, images, and schematics in the form of succinct pages, supplemented by clinical imaging cases, Q&A sections and hyperlinks allowing to switch quickly between the different sections of organ-based and more technical chapters, summaries and references.

Its chapters are based on the contributions of over 100 recognised European experts, referring to both general technical and organ-based clinical imaging topics. The new graphical look showing Asklepios with fashionable glasses, symbolises the combination of classical medical teaching with contemporary style education.

Although the initial version of the ***ESR eBook*** was created to provide basic knowledge for medical students and teachers of undergraduate courses, it has gradually expanded its scope to include more advanced knowledge for readers who wish to 'dig deeper'. As a result, *Modern Radiology* covers also topics of the postgraduate levels of the *European Training Curriculum for Radiology*, thus addressing postgraduate educational needs of residents. In addition, it reflects feedback from medical professionals worldwide who wish to update their knowledge in specific areas of medical imaging and who have already appreciated the depth and clarity of the ***ESR eBook*** across the basic and more advanced educational levels.

I would like to express my heartfelt thanks to all authors who contributed their time and expertise to this voluntary, non-profit endeavour as well as Carlo Catalano, Andrea Laghi and András Palkó, who had the initial idea to create an ***ESR eBook***, and - finally - to the ESR Office for their technical and administrative support.

Modern Radiology embodies a collaborative spirit and unwavering commitment to this fascinating medical discipline which is indispensable for modern patient care. I hope that this ***educational*** tool may encourage curiosity and critical thinking, contributing to the appreciation of the art and science of radiology across Europe and beyond.

Minerva Becker, Editor
Professor of Radiology, University of Geneva, Switzerland

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

前言

*《现代放射学》*是由欧洲放射学协会 (European Society of Radiology, ESR) 在线发布的免费放射学教育资源。第二版（更名版）标题反映了 ***ESR 电子书***新颖的教学概念，它以简洁页面的形式巧妙地融合文本、图像和示意图，并辅以临床影像学案例、问答部分和内容超链接，使读者能够在各基于器官的部分、更具技术性的章节、摘要以及参考文献之间快速切换浏览。

其章节以 100 多名公认欧洲专家的优秀稿件为根基，涉及各类一般技术和基于器官的临床影像学主题。同时采用了全新的图形外观，展示了佩戴时尚眼镜的 Asklepios，象征着传统医学教学与现代风格教育的结合。

虽然初版 ***ESR 电子书***旨在为医学生和本科生教师提供医学基础知识，但现已逐渐扩充其知识领域，为希望“深入挖掘”的读者提供了更多高阶技术知识。因此，*《现代放射学》*还涵盖了***欧洲放射学培训课程***研究生水平的各类主题，旨在解决住院医师的研究生教育需求。此外，书中还囊括了全球医疗专业人士的反馈，他们希望更新自己在医学影像特定领域的知识，并对 ***ESR 电子书***在基础和高等教育水平上的深度和清晰度表示高度赞赏。

我要衷心感谢所有为这项非营利活动自愿贡献时间和专业知识的作者，以及最初提出创作 ***ESR 电子书***的 Carlo Catalano、Andrea Laghi 和 András Palkó，最后还要感谢 ESR 办公室所提供的技术和行政支持。

*《现代放射学》*充分体现了医者的协作精神和对这门热门医学学科坚定不移的承诺，这是现代患者护理必须具备的优秀精神品质。我希望这款***教育***工具能够激励各位始终保持好奇心和批判性思维，从而促进整个欧洲乃至欧洲以外地区对放射学艺术和科学的认识。

Minerva Becker，编辑
瑞士日内瓦大学放射学教授

Copyright and Terms of Use

How to cite this work:

Christoph D. Becker (2025)
ESR Modern Radiology eBook:

- **Pancreas and Spleen Imaging.**
  DOI 10.26044/esr-modern-radiology-19

CHAPTER OUTLINE:

版权和使用条款

章节大纲：

本作品引用方式：

Christoph D. Becker (2025)
ESR Modern Radiology eBook:

- **Pancreas and Spleen Imaging.**
  DOI 10.26044/esr-modern-radiology-19

Translation Credits

This is a translation of the Chapter of the **Modern Radiology eBook.**

ORIGINAL TITLE:
Pancreas and Spleen Imaging

TRANSLATED BY:
Prof. Xinming Zhao, Cancer Institute and Hospital, Chinese Academy of Medical Sciences
Prof. Zhongqiu Wang, Jiangsu Province Hospital of Chinese Medicine
Prof. Zhongxiang Ding, Hangzhou First People's Hospital

COORDINATED BY:
Prof. Shiyuan Liu, Shanghai Changzheng Hospital
Prof. Yi Xiao, Shanghai Changzheng Hospital

ENDORSED BY:
Chinese Society of Radiology

NOTE FROM THE COORDINATORS:
Thank you to Chinese radiology experts for bridging languages and open the world-class English resource by ESR to every Mandarin-speaking student, fueling global radiology talent with a single click

<↑> HYPERLINK

xinmingzh@sina.com
zhq2001us@163.com
hangzhoudzx73@126.com

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

翻译致谢

本章节为《现代放射学电子书》的部分译文。

原文标题：
胰腺和脾脏影像学

翻译：
赵心明教授，中国医学科学院肿瘤医院肿瘤研究所
王中秋教授，江苏省中医院
丁忠祥教授，杭州市第一人民医院

联合翻译：
刘士远教授，长征医院
萧毅教授，长征医院

审定：
中华医学会放射学分会

译者寄语：
感谢中国放射学专家们的倾力奉献！你们跨越了语言的鸿沟，将欧洲放射学会 (ESR) 的世界级学术宝库呈献给广大中文学子。

<↑> 超链接

xinmingzh@sina.com
zhq2001us@163.com
hangzhoudzx73@126.com

Signage

<▪> CORE KNOWLEDGE

<!> ATTENTION

<↑> HYPERLINKS

>▪< FURTHER KNOWLEDGE

>|< COMPARE

<∞> REFERENCES

<?> QUESTIONS

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

导示

<▪> 核心知识

<!> 注意

<↑> 超链接

>▪< 进阶知识

>|< 比较

<∞> 参考文献

<?> 问题

MODERN RADIOLOGY eBook

Based on the ESR Curriculum for Radiological Education

Pancreas and Spleen Imaging

AUTHORS

Christoph D. Becker

AFFILIATION

Faculty of Medicine, University of Geneva, Switzerland

<↑> HYPERLINK

Christoph.Becker@unige.ch

CHAPTER OUTLINE:

章节大纲：

基于 ESR 课程的放射学教育

胰腺和脾脏影像学

作者

Christoph D. Becker

所属机构

瑞士日内瓦大学医学院

<↑> 超链接

Christoph.Becker@unige.ch

Chapter Outline

- Anatomy
  - Pancreas
  - Spleen
- Imaging Techniques
  - Computed Tomography (CT) for the Pancreas
  - Ultrasound (US) for the Pancreas
  - MRI for the Pancreas
  - Other Imaging Techniques for the Pancreas
  - Imaging Techniques for the Spleen
- Variants of Diagnostic Importance
  - Pancreas Divisum
  - Annular Pancreas
  - Accessory Splenic Tissue
- Acute Pancreatitis
  - Imaging in Acute Pancreatitis
  - Local Complications
  - Image-guided Fluid Aspiration
  - Percutaneous Drainage of Complicated Fluid Collections
- Chronic Pancreatitis
  - Imaging Features
  - Focal Chronic Pancreatitis in Pancreas Divisum
  - Paraduodenal (“Groove”) Pancreatitis
- Pancreatic Neoplasms
  - Pancreatic Ductal Adenocarcinoma
  - Ampullary Adenocarcinoma
  - Neuroendocrine Neoplasms
  - Cystic Neoplasms
  - Analysis of Aspirated Material in Cystic Lesions
- Splenic Pathologies
  - Splenomegaly
  - Focal Benign Splenic Lesions
  - Focal Malignant Splenic Lesions
- Blunt Trauma
  - Pancreatic Injuries
  - Splenic Injuries
  - Interventional Radiologic Treatment
- Take-Home Messages
- References
- Test Your Knowledge

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲

章节大纲：

- 解剖结构
  - 胰腺
  - 脾脏
- 影像学检查技术
  - 胰腺计算机断层扫描 (CT) 检查
  - 胰腺超声 (US) 检查
  - 胰腺 MRI 检查
  - 胰腺的其他影像学检查技术
  - 脾脏的影像学检查技术
- 具有诊断重要性的变异
  - 胰腺分裂
  - 环状胰腺
  - 副脾组织
- 急性胰腺炎
  - 急性胰腺炎的影像学检查
  - 局部并发症
  - 影像引导下液体抽吸术
  - 复杂性积液的经皮穿刺引流
- 慢性胰腺炎
  - 影像学特征
  - 胰腺分裂合并局灶性慢性胰腺炎
  - 十二指肠旁（“沟槽状”）胰腺炎
- 胰腺肿瘤
  - 胰腺导管腺癌
  - 壶腹部腺癌
  - 神经内分泌肿瘤
  - 囊性肿瘤
  - 囊性病变穿刺抽取物分析
- 脾脏疾病
  - 脾肿大
  - 脾脏局灶性良性病变
  - 脾脏局灶性恶性病变
- 钝性损伤
  - 胰腺损伤
  - 脾脏损伤
  - 介入治疗
- 核心要点
- 参考文献
- 知识测试

Anatomy

Pancreas and Spleen Imaging

胰腺和脾脏影像学

CHAPTER OUTLINE:

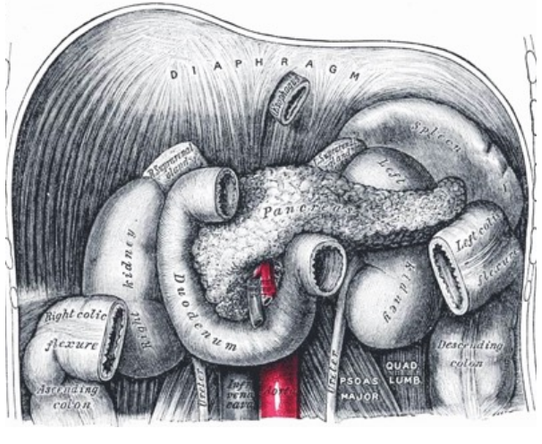
章节大纲：

解剖结构

/ Pancreas

/ Anatomy Overview

The pancreas is a gland with exocrine and endocrine functions located at the level of L1/L2 mostly within the retroperitoneal space. It has four parts: the head with the uncinate process as its posterior lower portion, the neck, the body and the tail.



The pancreatic head is adjacent to the duodenal loop and contains the distal common bile duct, its junction with the common pancreatic duct and the sphincter Oddi. The pancreatic tail is situated in close vicinity to the splenic hilum and may be partially located intraperitoneally.

The pancreatic parenchyma is surrounded by the peripancreatic fatty tissue. Other characteristic adjacent anatomical landmarks that are visible on cross-sectional imaging include the splenic vein (SV) the celiac axis (CA) and the superior mesenteric artery (SMA).

The arterial supply of the pancreas is derived from branches of the CA (gastroduodenal and splenic arteries) and the SMA.

The venous drainage occurs mainly via the SV and SMV, and the portal vein.

The lymphatic drainage of the pancreas follows both intraperitoneal and retroperitoneal pathways, to the portal, celiac, superior mesenteric, para-aortic and aortocaval lymph nodes.

Case courtesy of Gray's Illustrations, Radiopaedia.org, rID: 36234

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺** 和**脾脏** 影像学

章节大纲：

/ 胰腺

/ 解剖结构概览

胰腺是一个兼具外分泌和内分泌功能的腺体，主要位于腹膜后间隙，约平第一、二腰椎水平。胰腺由四个部分组成：胰头以及向后方及内侧延伸的钩突、胰颈、胰体和胰尾。

胰头邻近十二指肠曲，包含远端胆总管、其与胰管的汇合处以及 Oddi 括约肌。胰尾靠近脾门，可能部分位于腹膜内。

胰腺实质被胰周脂肪组织包绕。横断位成像可见的其他特征性邻近解剖标志包括脾静脉 (SV)、腹腔动脉 (CA) 和肠系膜上动脉 (SMA)。

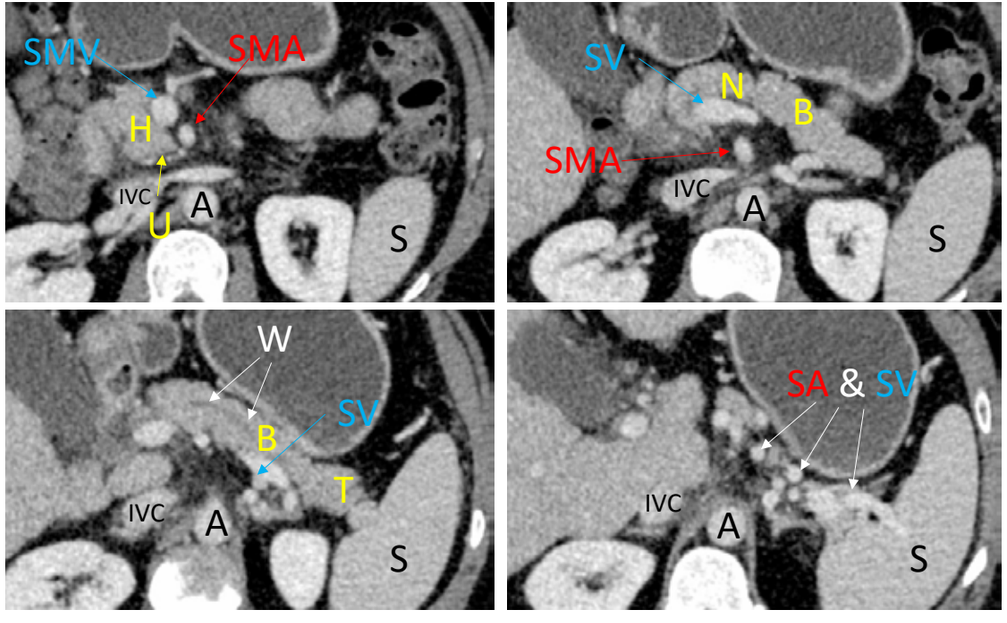
胰腺的动脉血供来自腹腔动脉分支（胃十二指肠动脉和脾动脉）和肠系膜上动脉。

静脉引流主要经由脾静脉（Splenic Vein，SV）、肠系膜上静脉（Superior Mesenteric Vein，SMV），最终汇入门静脉（Portal Vein，PV）。

胰腺的淋巴引流系统通过腹膜内和腹膜后双重途径，主要汇入门静脉淋巴结、腹腔干淋巴结、肠系膜上淋巴结、主动脉旁淋巴结及主动脉-腔静脉淋巴结群。

病例来源：Gray's Illustrations，Radiopaedia.org，rID：36234

/ Anatomy at Cross-Sectional Imaging



CT showing the pancreas with its adjacent structures.

A = aorta; B = body of pancreas; H = head of the pancreas; IVC = inferior vena cava; N = neck of the pancreas; S = spleen; SA = splenic artery; SMA = sup mesenteric artery; SMV = superior mesenteric vein; SV = splenic vein; T = tail of the pancreas; U = uncinate process; W = duct of Wirsung

CHAPTER OUTLINE:

/ 横断位成像解剖结构

章节大纲：

CT 显示胰腺及其邻近结构。

A = 主动脉；B = 胰体；H = 胰头；IVC = 下腔静脉；N = 胰颈；S = 脾脏；SA = 脾动脉；SMA = 肠系膜上动脉；SMV = 肠系膜上静脉；SV = 脾静脉；T = 胰尾；U = 钩突；W = 主胰管

/ Anatomy of Endocrine and Exocrine Components

Most of the pancreatic tissue (acinar cells and ductal cells) serves the exocrine function, producing pancreatic juice that is drained by the pancreatic ductal system. The pancreatic juice contains enzymes for protein, lipid and carbohydrate digestion. The exocrine pancreatic ductal system consists of minor (second order) pancreatic ducts which drain into the main pancreatic ductal system and into the duodenum.

The pancreas has also an endocrine function for the production of peptide hormones such as insulin, glucagon, or somatostatin. These hormones are produced in the **islets of Langerhans** (groups of about 100-200 cells), which are embedded in the exocrine pancreas and constitute about 1-2% % of the total organ mass.

Although scattered throughout the entire organ, islet cells are more concentrated in the **pancreatic tail** compared with the head and body.

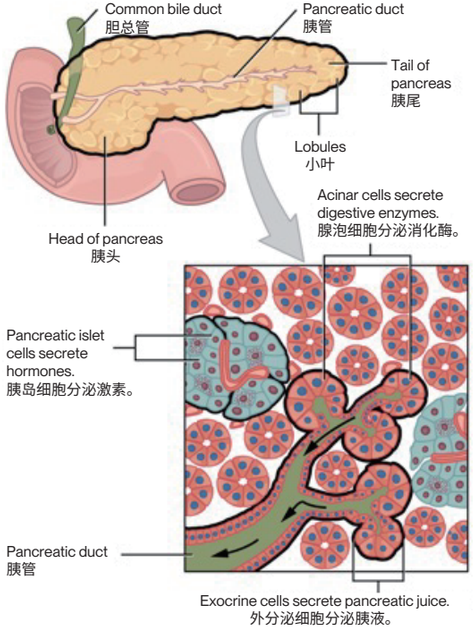


Diagram showing some of the anatomy and the microanatomy of the human pancreas. Reproduced from: https://commons.wikimedia.org/wiki/File:2424_Exocrine_and_Endocrine_Pancreas-ar.jpg

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

章节大纲：

/ 内分泌部和外分泌部的解剖结构

大多数胰腺组织（腺泡细胞和胰管细胞）具有外分泌功能，其生成的胰液经由胰管系统引流。胰液含有蛋白质、脂质和碳水化合物的消化酶。外分泌胰管系统由小（分支）胰管组成，汇入主胰管系统，并汇入十二指肠。

胰腺同时还具有内分泌功能，能够分泌胰岛素、胰高血糖素和生长抑素等肽类激素。这些激素由**胰岛**（约 100-200 个细胞组成的细胞团）产生，这些胰岛结构散布于胰腺外分泌部中，约占胰腺总质量的 1%～2%。

尽管胰岛细胞遍布整个胰腺，但其在**胰尾**的分布密度高于胰头和胰体。

人体胰腺部分解剖及显微解剖示意图。来源：https://commons.wikimedia.org/wiki/File:2424_Exocrine_and_Endocrine_Pancreas-ar.jpg

/ Spleen: Anatomy

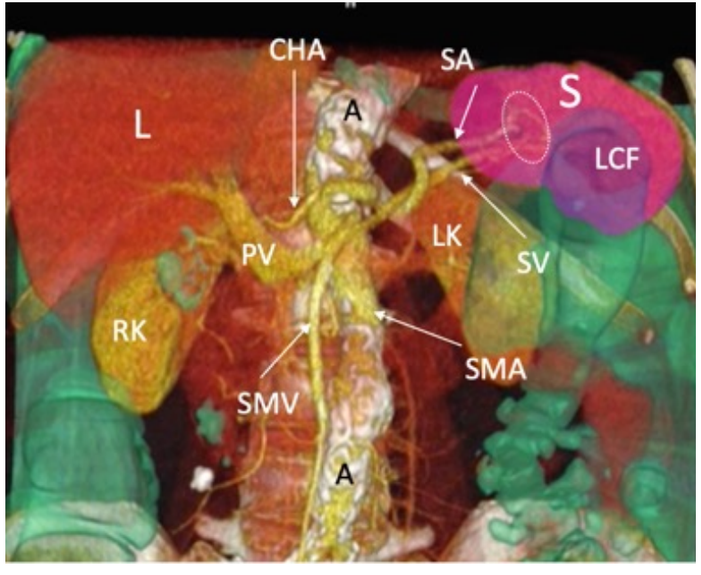
The spleen is a homogeneously structured, intraperitoneal parenchymal organ in the left upper quadrant of the abdomen, adjacent to the pancreatic tail and upper pole of the left kidney.

Its arterial supply is derived from the celiac axis and its venous drainage goes via the splenic vein into the portal system.

It is the **largest organ of the lymphatic system**, and its function consists in immune surveillance, maturation of lymphocytes and degradation of damaged or senescent erythrocytes and platelets.

The spleen parenchyma contains the **white pulp** (lymphocytes around arteries) and the **red pulp** (venous sinuses and cords).

The spleen measures about 9 – 12cm and weighs about 150 – 200g.



Colour-coded 3D Volume Rendering showing the position of the spleen in the upper abdomen (frontal view). A = aorta; CHA = common hepatic artery; L = liver; LCF = left colic flexure; LK = left kidney; RK = right kidney; S = spleen; SA = splenic artery; SMA = sup mesenteric artery; SMV = superior mesenteric vein; SV = splenic vein; Air in the large and small bowel is rendered in green. Spleen hilum within the dotted ellipse.

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

章节大纲：

/ 脾脏：解剖结构

脾脏是一个结构均匀的腹膜内实质器官，位于左上腹，毗邻胰尾和左肾上极。

脾脏动脉血供来自腹腔动脉，静脉引流通过脾静脉汇入门静脉系统。

脾脏是**最大的淋巴器官**，其功能包括免疫监视、淋巴细胞成熟以及清除受损或衰老的红细胞和血小板。

脾实质包含**白髓**（动脉周围的淋巴细胞）和**红髓**（静脉窦和静脉束）。

脾脏大小约为 9～12 cm，重量约为 150～200 g。

彩色编码三维容积重建图像显示脾脏位于上腹部的解剖位置（正视图）。A = 主动脉；CHA = 肝总动脉；L = 肝脏；LCF = 左结肠曲；LK = 左肾；RK = 右肾；S = 脾脏；SA = 脾动脉；SMA = 肠系膜上动脉；SMV = 肠系膜上静脉；SV = 脾静脉；大肠和小肠中的空气显示为绿色。虚线椭圆内所示为脾门。

Imaging Techniques

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

影像学检查技术

/ Imaging Techniques for the Pancreas: Computed Tomography (CT)

<!> ATTENTION

Multiphasic contrast-enhanced CT can be considered as the **method of choice** for imaging the pancreatic parenchyma for the most common indications including acute and chronic pancreatitis and their complications, for pancreatic trauma, and exocrine and endocrine neoplasms. It is a robust, rapid and reproducible imaging technique that offers a complete and rapid overview of the entire abdominal region.

The different dynamic phases after iv. injection of iodinated contrast material include the **arterial, pancreatic (= late arterial) and portal phases**, resulting in optimal depiction of the arterial and portal vessels, as well as of the pancreatic parenchyma. The late arterial (pancreatic) and the portal phase are mandatory, whereas the arterial phase in mainly indicated for angiographic studies.

Multiplanar oblique reconstructions demonstrate specific anatomical details, e.g., ductal or vascular structures.

Besides diagnostic imaging, CT can also be used for **guiding minimally invasive, percutaneous biopsy, as well as aspiration and drainage** of infected and non-infected pancreatic fluid collections.

CHAPTER OUTLINE:

/ 胰腺影像学检查技术：计算机断层扫描 (CT)

章节大纲：

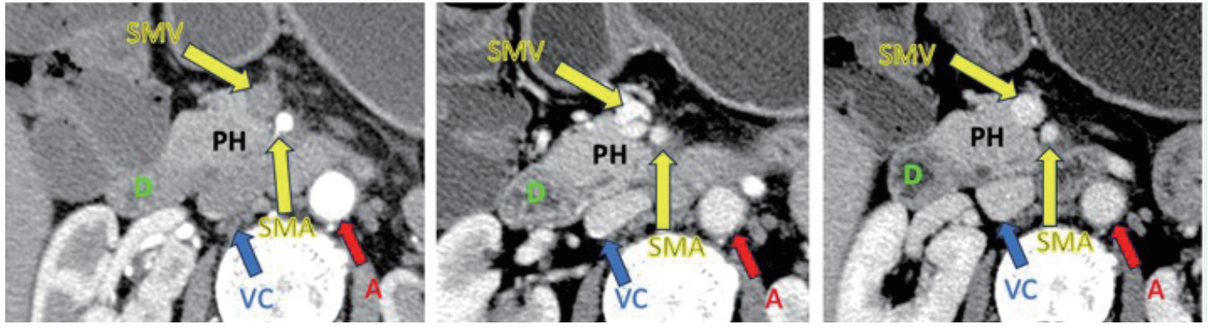
<!> 注意

多期增强 CT 是胰腺实质首选影像学检查方法，其常见的适应证包括急性和慢性胰腺炎及其并发症、胰腺创伤以及外分泌和内分泌肿瘤。该技术是一种稳定、快速且可重复的成像方法，可对腹部全域实现全面快速的评估。

静脉注射碘对比剂后的不同动态增强时相包括**动脉期、胰腺期（即动脉晚期）和门静脉期**，从而最佳显示动脉、门静脉血管以及胰腺实质。动脉晚期（胰腺期）和门静脉期必须采集，而动脉期主要适用于血管造影研究。

多平面斜位重建可清晰显示具体的解剖细节，例如导管或血管结构。

除诊断成像外，CT 还可用于**引导微创经皮活检，以及对感染与非感染胰腺积液的抽吸和引流**。



Arterial phase
动脉期

Pancreatic phase
胰腺期

Portal phase
门静脉期

Multiphasic contrast-enhanced CT of the pancreas. Images obtained at the level of the pancreatic head (PH). A = Aorta; VC = Vena cava; SMA= Superior mesenteric artery; SMV= superior mesenteric vein; D= Duodenum
Images courtesy: Oskar Bozek, MD, Department of Radiodiagnostics and Invasive Radiology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Poland.

Pancreas and Spleen Imaging

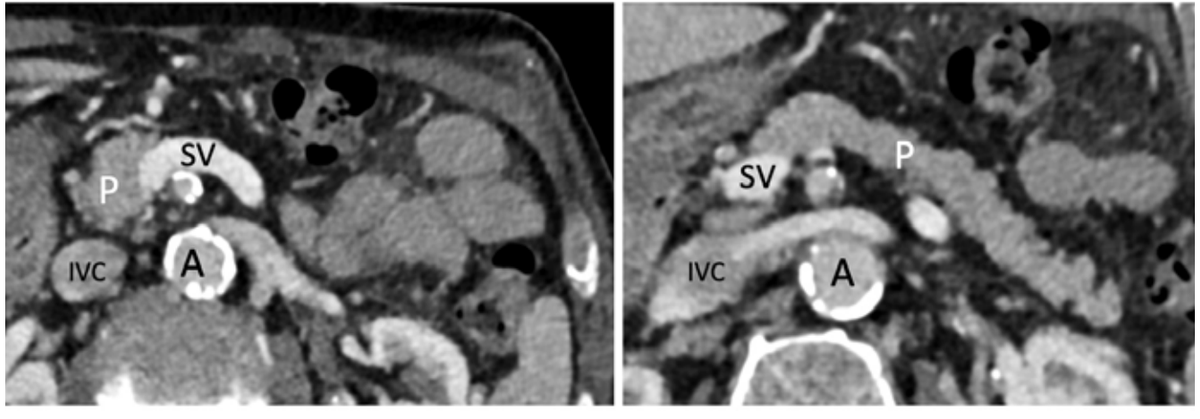
CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

胰腺多期增强 CT。胰头 (PH) 层面影像。A = 主动脉；VC = 腔静脉；SMA = 肠系膜上动脉；SMV = 肠系膜上静脉；D = 十二指肠
图片来源：Oskar Bozek 医学博士（卡托维兹医学院放射诊断与介入放射学系，波兰西里西亚医科大学）。

The head of the pancreas is in a slightly more inferior location in the abdomen in comparison to the pancreas body and tail. Therefore, the head is seen on more caudal axial CT slices, whereas the tail, which extends into the splenic hilum is seen on more cranial images. The pancreas typically has a lobulated appearance.



Axial CT slices (portal phase) obtained at the level of the pancreas head (left image) and pancreas body and tail (right image). Normal lobulated appearance of pancreatic tissue (P); A = aorta; IVC = inferior vena cava; SV = splenic vein

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

与胰体和胰尾相比，胰头在腹部的更低位置。因此，胰头可见于更尾侧的轴位 CT 图像，而延伸至脾门的胰尾则见于在更头侧的轴位 CT 图像。胰腺通常呈分叶状外观。

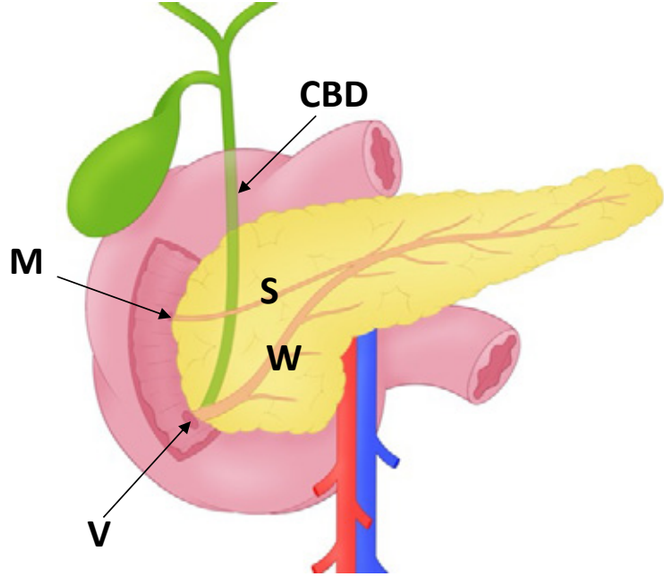
于胰头水平（左图）和胰腺体尾部水平（右图）水平获取的**门静脉期 CT 轴位图像**。胰腺组织正常分叶状外观 (P)；A = 主动脉；IVC = 下腔静脉；SV = 脾静脉

The **main pancreatic duct** runs through the gland from left to right and drains most of the pancreas apart from the inferior portion of the head and uncinate process. Its diameter is larger in the pancreatic head (~3.5mm) and slightly narrower in the body (~2.5mm) and tail (~1.5mm).

Variants exist with regard to the ductal anatomy in the pancreatic head.

In the most common situation, the duct **of Wirsung** joins the distal common bile duct to form the **ampulla of Vater**.

The accessory pancreatic duct **of Santorini** typically communicates with the duct of Wirsung. It drains **separately** into the duodenum via a minor papilla.



Schematic illustration of the normal anatomical relationship between the main pancreatic duct of Wirsung (W) and the accessory pancreatic duct of Santorini, (S), the common bile duct and the duodenum. V = ampulla of Vater; M = minor papilla.
Illustration by Emma Tabone, Mater Dei Hospital, University of Malta, Malta

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

主胰管从左至右贯穿胰腺，引流除胰头下部和钩突之外的大部分胰腺组织。其在胰头的直径较大（约 3.5 mm），而在胰体（约 2.5 mm）和胰尾（约 1.5 mm）略窄。

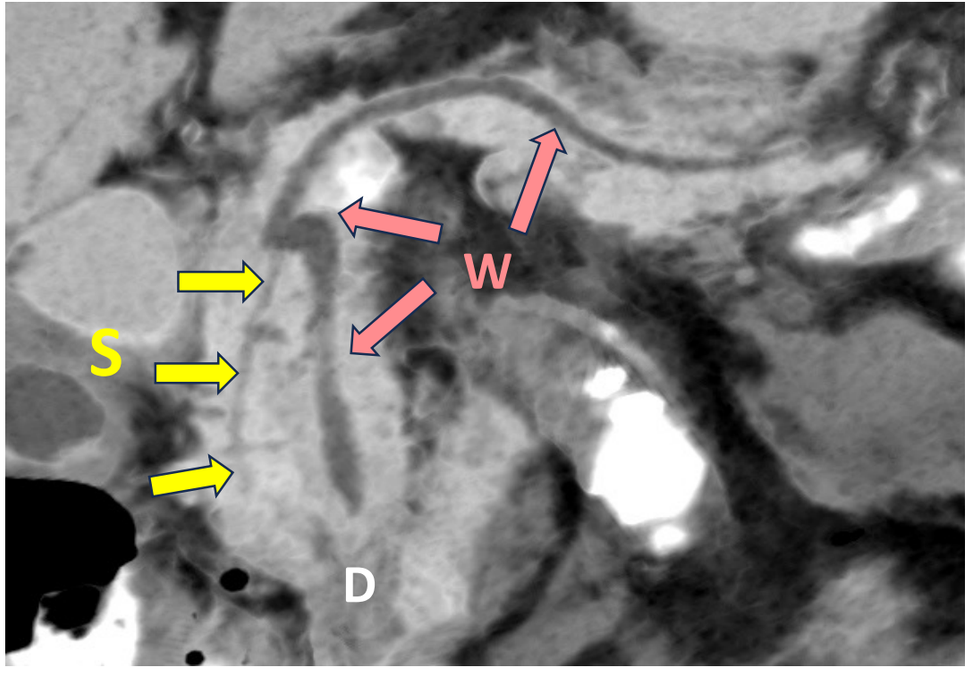
胰头中的胰管解剖存在变异。

最常见的情况是，主胰管汇入远端胆总管形成壶腹。

副胰管通常与主胰管连通。副胰管通过副乳头独立引流至十二指肠。

主胰管 (W) 和副胰管 (S)、胆总管和十二指肠之间正常解剖关系的示意图。V = 壶腹；M = 副乳头。
图片来源：Emma Tabone，马耳他大学 Mater Dei 医院

CT allows visualisation of the main pancreatic duct and its contour. It also allows to measure ductal calibre and assess ductal dilatation. However, CT has an inferior diagnostic performance compared to MRI for precisely assessing ductal changes (see MRI part).



Pancreatic phase CT, oblique reconstruction, minimal intensity projection, demonstrating the pancreatic ductal anatomy. Note that in this (common) variant the duct of Wirsung is larger in calibre than the duct of Santorini. W = Duct of Wirsung; S = Duct of Santorini; D = Duodenum. Image courtesy: Oskar Bozek, MD, Department of Radiodiagnostics and Invasive Radiology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Poland.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

CT 可显示主胰管及其走行轮廓。CT 还可以测量导管口径并评估导管扩张情况。然而，与 MRI 相比，CT 在精准评估导管变化方面的诊断性能较差（见 MRI 部分）。

胰腺和脾脏影像学

章节大纲：

胰腺期 CT（斜位重建），最小强度投影，显示胰管解剖结构。需注意，在这种（常见）解剖变异中，主胰管的直径大于副胰管。W = 主胰管；S = 副胰管；D = 十二指肠。图片来源：Oskar Bozek 医学博士（卡托维兹医学院放射诊断与介入放射学系，波兰西里西亚医科大学）。

>|< COMPARE

ADVANTAGES OF CT:

+ Robust, reproducible, fast, high spatial resolution.
+ Dynamic imaging in different vascular phases in order to detect perfusion anomalies, haemorrhage and thrombosis.
+ Excellent contrast resolution for detection of pancreatic calcifications and inflammatory fluid collections.
+ Includes complete abdominal region, allowing delineation of peri- and extra-pancreatic changes which are common in inflammatory and neoplastic conditions.
+ Can be used for guidance of minimally invasive percutaneous biopsy and drainage.

DISADVANTAGES OF CT:

– Radiation exposure.
– Requires injection of iodinated iv. contrast material.
– Limited delineation of ductal changes.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

>|< 比较

CT 的优势：

+ 稳定、可重复、快速、空间分辨率高。
+ 采用多血管期相动态成像，旨在检测灌注异常、出血和血栓形成。
+ 优异的对比分辨率，可用于检测胰腺钙化和炎性积液。
+ （该检查）涵盖全腹范围，可清晰显示常见于炎症和肿瘤性病变的胰周和胰外改变。
+ 可用于指导微创经皮穿刺活检和引流。

CT 的劣势：

– 存在辐射暴露风险。
– 需要静脉注射碘对比剂。
– 导管改变显示有限。

章节大纲：

/ Imaging Techniques for the Pancreas: Ultrasound (US)

Ultrasound (US) has a **key role** in patients with suspected acute pancreatitis, because it is the method of choice for the detection of cholecystolithiasis, a common cause of acute pancreatitis, as well as bile duct obstruction.

In the case of an adequate sonographic window, Doppler US can be helpful to delineate the presence or absence of blood flow in the major peripancreatic vessels and detect vascular abnormalities such as arterial pseudoaneurysms. Analysis of parenchymal perfusion may be enhanced by the iv. injection of US-specific contrast material.

In addition, US can be used for guiding percutaneous biopsy and drainage procedures.

<!> ATTENTION

A careful US examination may also reveal a variety of pathologic changes in the context of inflammatory and neoplastic pancreatic disease. However, visualisation of the pancreatic region with transcutaneous US is often incomplete because obesity and interposition of bowel gas may partially obscure the pancreas, especially the distal portions.

<∞> REFERENCE

> See also eBook chapter on Contrast Agents

CHAPTER OUTLINE:

章节大纲：

/ 胰腺影像学检查技术：超声 (US)

超声检查 (US) 在疑诊为急性胰腺炎患者中具有**关键作用**，因其是检测胆囊结石（急性胰腺炎的常见病因）以及胆管梗阻的首选方法。

在超声声窗充分的情况下，多普勒超声有助于显示胰周主要血管有无血流，并检测血管异常，如动脉假性动脉瘤。静脉注射超声特异性对比剂可增强实质灌注分析。

此外，超声还可用于引导经皮穿刺活检和引流操作。

<!> 注意

细致的超声检查也可能发现炎性和肿瘤性胰腺疾病中的多种病理改变。然而，由于肥胖和肠道气体的干扰可能部分遮挡胰腺，经皮超声检查通常不能完整显示胰腺，尤其是胰腺远端区域。

<∞> 参考文献

> 另请参阅《对比剂》电子书章节

>|< COMPARE

ADVANTAGES OF US:

+ Wide availability, low cost.
+ No radiation exposure, no iodinated or Gd-based contrast materials.
+ May be used as first-line examination in children.
+ Method of choice for cholecystolithiasis and bile duct obstruction.
+ Careful examination may delineate a variety of pancreatic pathologies (parenchymal masses, fluid collections, thrombosis...).
+ Doppler ultrasound delineates the presence or absence of blood flow in major vessels as well as perfusion abnormalities of parenchyma and may be enhanced by iv. injection of US-specific contrast material.

DISADVANTAGES OF US:

– Operator- and patient- dependent.
– Inconsistent visibility of pancreatic region, especially distal (left) portion of pancreas.
– Limited accuracy for parenchymal changes.

/ **Pancreas and Spleen Imaging**

CHAPTER OUTLINE:

/ **胰腺和脾脏影像学**

章节大纲：

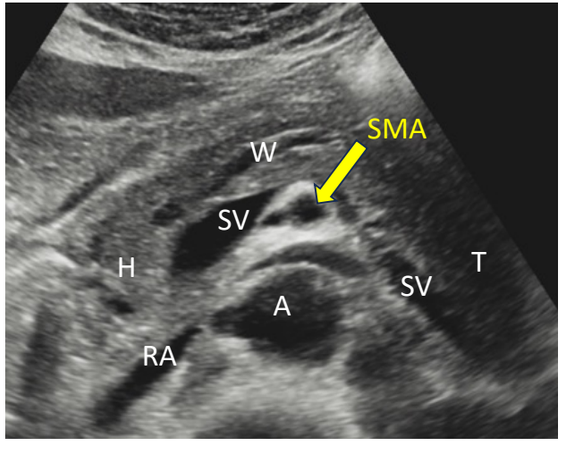
>|< 比较

超声的优势：

+ 广泛普及、低成本。
+ 无辐射暴露，无碘或 Gd 对比剂。
+ 可用作儿童的一线检查。
+ 胆囊结石和胆管梗阻的首选治疗方法。
+ 仔细检查可发现多种胰腺病变（实性肿块、积液、血栓形成等）。
+ 多普勒超声可显示大血管中是否存在血流以及实质的灌注异常，并且可以通过静脉注射超声特异性对比剂来增强显示效果。

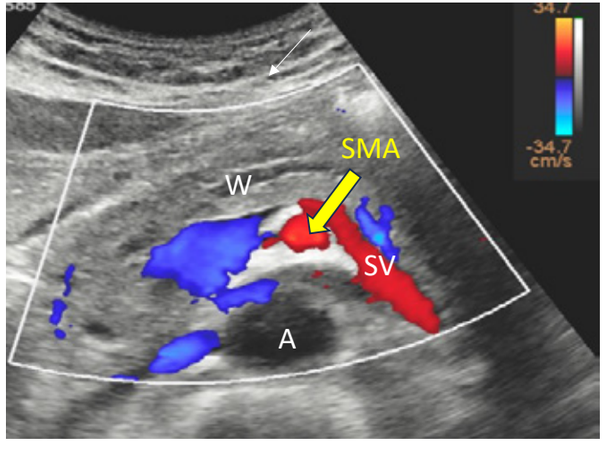
超声的劣势：

– 受操作者和患者共同影响。
– 胰腺区域，尤其是胰腺远端（左侧）部分的可见性不一致。
– 实质变化的准确性受限。



US (grey scale) showing the echogenicity of normal pancreatic tissue. H = head; T = tail; W = main pancreatic duct of Wirsung; A = aorta; SV= splenic vein. RA = right renal artery.

Images courtesy: Gyorgi Varnay, MD, University Hospitals Geneva, University of Geneva, Switzerland



Doppler US showing the vascular flow. SMA = superior mesenteric artery; SV = splenic vein; A = aorta. Note that the direction of the blood flow towards the US probe is encoded in red (positive velocity values), whereas the direction of the blood flow away from the US probe is encoded in blue (negative velocity values). In the SV, the blood, therefore, flows from the right side of the image (tail area) to the left side of the image (head area), which is normal. Likewise, blood flow in the right renal artery is from the aorta away (normal).

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

灰阶超声显示正常胰腺组织的回声强度。H = 胰头；T = 胰尾；W = 主胰管；A = 主动脉；SV = 脾静脉。RA = 右肾动脉。

图片来源：Gyorgi Varnay 医学博士（日内瓦大学医院，瑞士日内瓦大学）

多普勒超声显示血管血流。SMA = 肠系膜上动脉；SV = 脾静脉；A = 主动脉。需注意，流向超声探头的血流方向以红色编码（正速度值），而远离超声探头的血流方向以蓝色编码（负速度值）。脾静脉（splenic vein，SV）内血流从图像右侧（胰尾区）流向左侧（胰头区），此属正常表现。同样，右肾动脉的血流方向背离主动脉（正常）。

/ Imaging Techniques for the Pancreas: MRI

Magnetic Resonance Imaging (MRI) provides equivalent information compared with CT regarding most parenchymal abnormalities. MRI also offers multiphasic perfusion imaging with Gadolinium-based iv. contrast material and offers interrogation of the pancreatic tissue with different T1 and T2 weighted sequences. Diffusion imaging (DWI) may add useful information for the distinction between inflammatory and neoplastic masses.

<!> ATTENTION

Although intraparenchymal calcifications are less well depicted than with CT, MRI is the non-invasive method of choice for the depiction of the pancreatic ducts and allows examination of the biliary tree at the same time. Magnetic resonance cholangiopancreatography (MRCP) is based on the natural high signal of biliary and pancreatic fluid (stationary fluids) on heavily T2 weighted sequences and does, therefore, not require any contrast material.

<!> ATTENTION

Dynamic repetitive MRCP after injection of secretin (hormone regulating water homeostasis throughout the body) allows evaluation of the exocrine pancreatic function because secretin stimulates the secretion of pancreatic juice.

Although MRI can replace CT for the diagnosis of pancreatic disease in most diagnostic settings, image acquisition takes more time than with CT. It also requires patient cooperation and has drawbacks in patients who are equipped with electronic devices, monitoring devices, some pacemaker types, or other electronic implants.

CHAPTER OUTLINE:

/ 胰腺影像学检查技术：MRI

章节大纲：

在显示大多数胰腺实质异常方面，MRI 提供的信息与 CT 相当。MRI 不仅可通过静脉注射钆对比剂进行多期相灌注成像，还能通过不同的 T1 和 T2 加权序列对胰腺组织进行全面评估。弥散加权成像 (Diffusion Imaging, DWI) 可为鉴别炎性肿块与肿瘤性肿块提供有价值信息。

尽管 MRI 在大多数诊断场景中可以替代 CT 用于诊断胰腺疾病，但其影像采集耗时较 CT 更长。

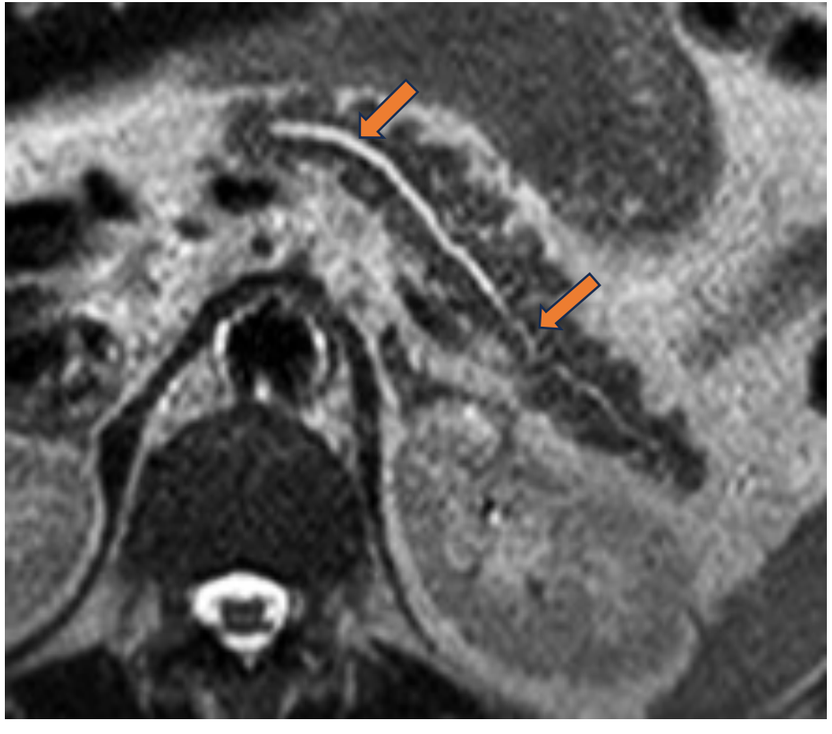
这项检查需要患者配合，也不适用于佩戴有电子设备、监护仪器、某些类型的起搏器或其他电子植入物的患者。

<!> 注意

注射促胰液素（一种调节全身水分稳态的激素）后行动态重复 MRCP，可评估胰腺外分泌功能，因促胰液素可刺激胰液分泌。

<!> 注意

尽管对胰腺实质内钙化的显示效果不及 CT，但 MRI 是显示胰管的首选无创性检查方法，并可同时评估胆道系统情况。磁共振胆胰管成像 (Magnetic Resonance Cholangio-Pancreatography, MRCP) 基于重 T2 加权序列上胆道和胰液（静止液体）的天然高信号特性，因此无需使用任何对比剂。



MRI (transverse T2-weighted image) showing the normal lobulated appearance of the pancreatic body and tail and a normal main pancreatic duct (arrows)

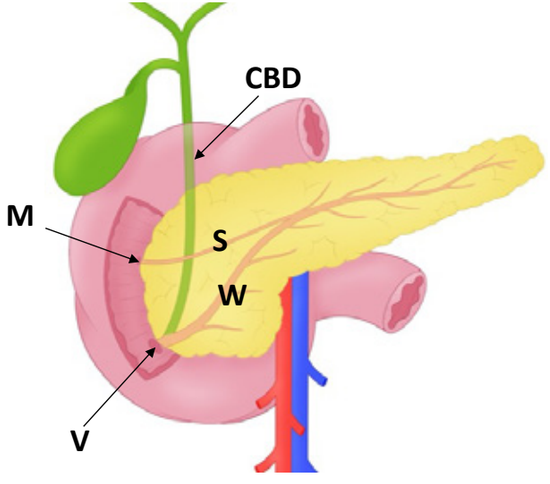
Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

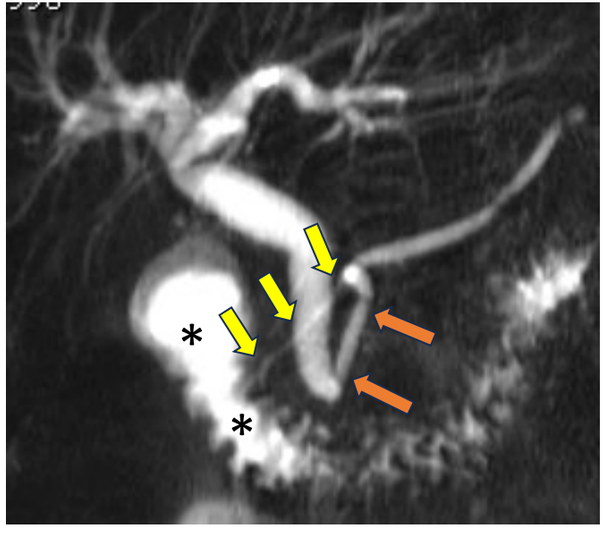
章节大纲：

MRI（横断位 T2 加权图像）显示胰体和胰尾正常呈分叶状，主胰管正常（箭头所示）



Schematic illustration of the normal anatomical relationship between the main pancreatic duct of Wirsung (W) and the accessory pancreatic duct of Santorini, (S), the common bile duct and the duodenum. V = ampulla of Vater; M = minor papilla.

Illustration by Emma Tabone, Mater Dei Hospital, University of Malta, Malta.



MRCP of the normal ductal anatomy with the duct of Wirsung (orange arrows) communicating with the duct of Santorini (yellow arrows). Asterisks correspond to fluid contents in the duodenum.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

主胰管 (W) 和副胰管 (S)、胆总管和十二指肠之间正常解剖关系的示意图。V = 壶腹；M = 副乳头。

图片来源：Emma Tabone，马耳他大学 Mater Dei 医院。

正常导管解剖结构的 MRCP，主胰管（橙色箭头）与副胰管（黄色箭头）相通。星号对应于十二指肠中的液体内容物。

>|< COMPARE

ADVANTAGES OF MRI:

+ No radiation exposure. May be used instead of CT if iodinated contrast material is contraindicated.
+ Interrogation of pancreatic tissue with several different sequences, including perfusion and diffusion mapping allows for differentiated information about inflammatory and neoplastic changes.
+ MRCP enables non-invasive depiction of the pancreatic and biliary ductal pathologies at the same time.

DISADVANTAGES OF MRI:

– Limited accessibility, cost.
– Use of Gadolinium-based iv. contrast material.
– Restrictions in claustrophobic patients and in patients with certain electronic implants.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

>|< 比较

MRI 的优势：

+ 无辐射暴露。如果忌用含碘对比剂，可用其代替 CT 成像。
+ 采用多序列（包括灌注和扩散成像）综合评估胰腺组织，可以获得炎症和肿瘤性病变的鉴别诊断信息。
+ MRCP 能够同时非侵入性显示胰管和胆管病变。

MRI 的劣势：

– 可及性有限，成本较高。
– 使用含钆静脉对比剂。
– 幽闭恐惧症患者和特定电子植入物的患者属检查禁忌证。

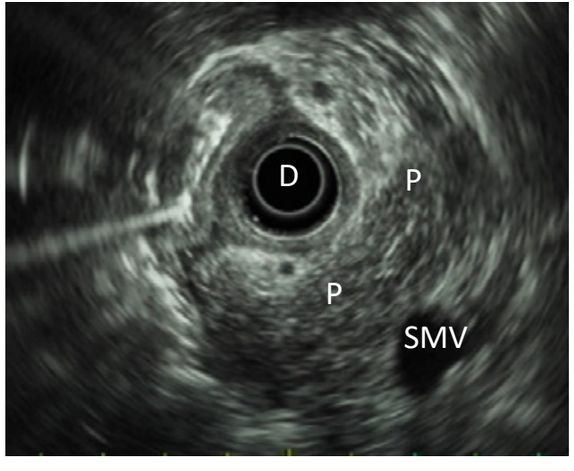
章节大纲：

/ Other Imaging Techniques for the Pancreas

Endoscopic ultrasonography (EUS) uses a transducer which is mounted on a flexible gastrointestinal endoscope which is inserted into the lumen of the upper gastrointestinal tract (stomach and duodenum for pancreas assessment). The ultrasound transducer has a very high resolution at a limited field depth. Since EUS is done from the inside of the stomach and duodenum, it is much less hampered by bowel gas than standard transcutaneous US.

EUS can be used as a complement to CT or MRI for the diagnosis of pancreatic pathologies, including guided biopsy and minimally invasive drainage procedures.

patient cooperation and has drawbacks in patients who are equipped with electronic devices, monitoring devices, some pacemaker types, or other electronic implants.



Radial EUS of the pancreatic head (P) viewed from the position of the endoscope, which is in the duodenum (D). SMV= superior mesenteric vein

CHAPTER OUTLINE:

/ 胰腺的其他影像学检查技术

章节大纲：

超声内镜 (EUS) 使用安装在柔性胃肠内窥镜上的换能器，经上消化道（胃和十二指肠）管腔置入，从而实现对胰腺的评估。超声换能器在有限的探测深度范围内具有极高的分辨率。由于 EUS 经由胃和十二指肠管腔内置入，所以肠道气体对 EUS 的干扰比常规经皮超声小得多。

EUS 可作为 CT 或 MRI 的补充，用于胰腺病变的诊断，包括引导活检和微创引流操作。

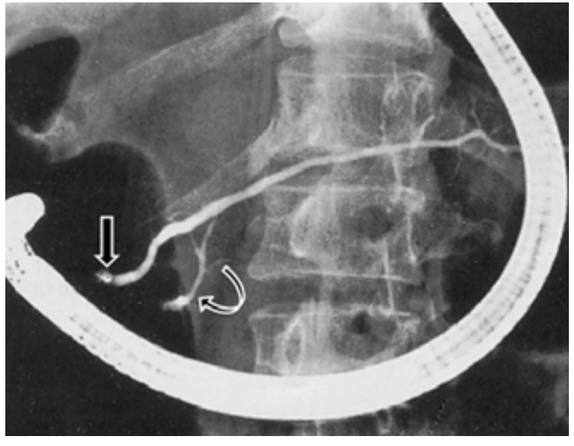
EUS 检查需要患者配合，也不适用于装有电子设备、监护仪器、某些类型的起搏器或其他电子植入物的患者。

从十二指肠 (D) 中的内窥镜位置观察胰头 (P) 的**径向 EUS 图像**。SMV = 肠系膜上静脉

Endoscopic retrograde cholangio-pancreatography (ERCP) is based on the combination of flexible endoscopy of the upper gastrointestinal tract and fluoroscopy. The technique is mainly used for minimally invasive endoscopic interventions. After cannulation of the papilla of Vater, the ductal system is opacified under fluoroscopic control with iodinated contrast material.

Intraductal interventional procedures can be performed through an instrumentation channel under direct and fluoroscopic vision and include electrocautery of the sphincter Oddi (**endoscopic sphincterotomy**), stone extraction, balloon dilatation and stenting of post-inflammatory ductal strictures, ductal system tissue sampling, and internal drainage procedures with catheters.

Although the technical success rate is quite high in experienced hands, ERCP is an invasive technique and may be complicated by bleeding, infection, perforation or acute pancreatitis.



ERCP showing a classic pancreas divisum with major dorsal opening through minor papilla (straight arrow) and ventral duct opening through major papilla (curved arrow). For pancreas divisum see explanations on pages 33-34.

Image reproduced from: Machado N.O., Pancreatic divisum: Beyond what is obvious. Pancreat Disord Ther 2014; 4: 2. http://dx.doi.org/10.4172/2165-7092.1000139

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

经内镜逆行胰胆管造影 (ERCP) 以上消化道柔性内镜和荧光透视检查相结合为基础。该技术主要用于微创内镜介入治疗。在十二指肠乳头插管后，在荧光透视控制下用碘对比剂使导管系统显影。

导管内介入治疗可在直视和透视下通过器械通道进行，包括 Oddi 括约肌电烙术（**内镜下括约肌切开术**）取石、炎症后导管狭窄的球囊扩张和支架植入、导管系统组织采样和导管内引流术。

虽然经验丰富的操作者的技术成功率相当高，但 ERCP 是一种侵入性技术，可能并发出血、感染、穿孔或急性胰腺炎。

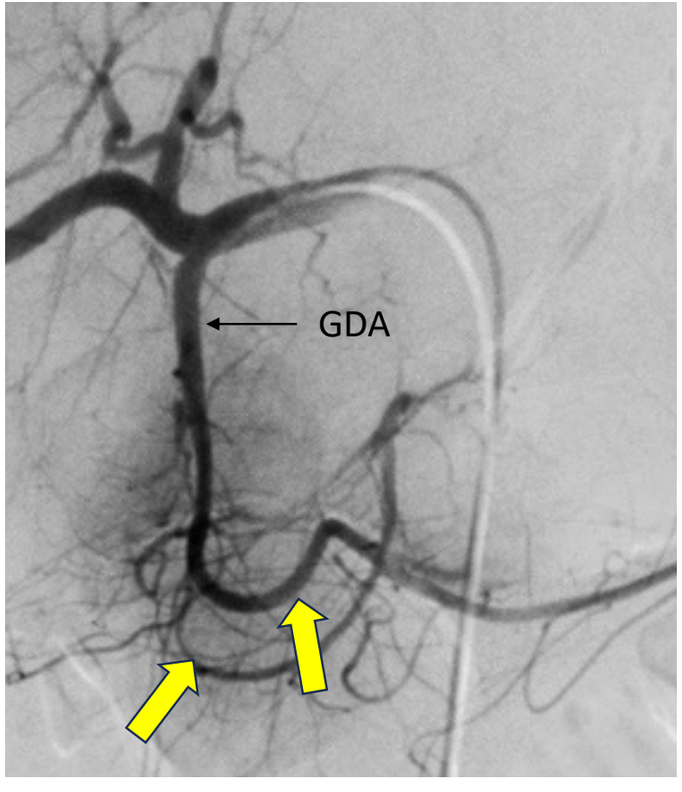
ERCP 显示典型的胰腺分裂，背侧主胰管通过副乳头开口（直箭头），腹侧胰管通过大乳头开口（弯箭头）。关于胰腺分裂，请参见第 33 页至第 34 页的解释。

影像来源：Machado N.O., Pancreatic divisum: Beyond what is obvious. Pancreat Disord Ther 2014; 4: 2. http://dx.doi.org/10.4172/2165-7092.1000139

Digital subtraction angiography (DSA) is a minimally invasive technique in which a 1.7 mm catheter is inserted via the femoral artery into the CA or SMA under fluoroscopic control.

<!> ATTENTION

Because the major pancreatic vessels are well delineated with CT and MRI, DSA is not frequently required for diagnostic purposes. It is mainly indicated in the context of intra-arterial interventions, e.g., for pseudoaneurysms complicating pancreatitis or for haemostatic embolisation in acute haemorrhage.



DSA shows the anatomic detail of pancreatic head including the pancreaticoduodenal arcades (arrows) originating from the gastroduodenal artery (GDA).

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

数字减影血管成像 (DSA) 是一种微创技术，该技术在荧光透视控制下将 1.7 mm 导管经股动脉插入腹腔动脉 (CA) 或肠系膜上动脉 (SMA)。

<!> 注意

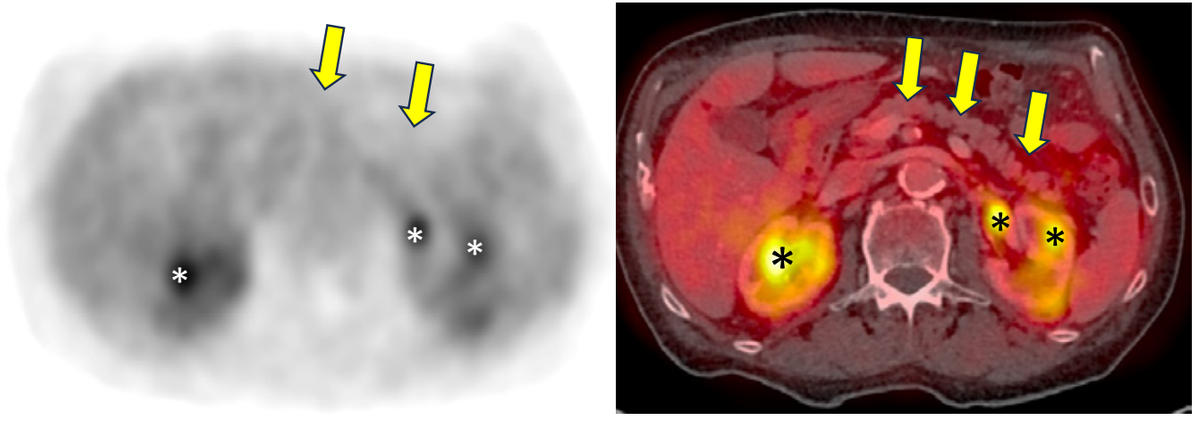
由于 CT 和 MRI 能够很好地显示胰腺大血管，诊断通常不需要 DSA。DSA 主要适用于动脉内介入治疗，例如，胰腺炎并发的假性动脉瘤或急性出血时的止血栓塞。

DSA 清晰显示胰头区解剖细节，包括起源于胃十二指肠动脉 (GDA) 的胰十二指肠动脉弓（箭头所示）。

Positron emission tomography - computed tomography scan (PET/CT) combines PET with CT to provide information about the distribution of radioactive functional biomarkers. The choice of the biomarkers depends on the indication. In the presence of pancreatic tumours, PET with 18F-fluorodeoxyglucose (FDG) can be used to detect intrapancreatic exocrine neoplasms and extra-pancreatic focal uptake in lymph nodes or in distant locations, whereas PET with 68-Ga DOTATATE has the potential to delineate functionally active endocrine pancreatic neoplasms.

<∞> REFERENCE

> See also eBook chapter on Nuclear Medicine



18-FDG PET/CT (axial PET image on the left, fused PET and corresponding CT image on the right) shows a normal pancreas (arrows) without hypermetabolic foci. Note normal FDG excretion via the kidneys (asterisks).

CHAPTER OUTLINE:

正电子发射断层扫描-计算机断层扫描 (PET/CT) 将 PET 与 CT 结合，可提供有关放射性功能性生物标志物分布的信息。生物标志物的选择取决于临床适应证。对于胰腺肿瘤，18F-氟代脱氧葡萄糖 (FDG) PET 可用于检测胰腺内外分泌肿瘤和淋巴结或远处部位的胰腺外局灶性摄取，而 68-Ga DOTATATE PET 可用于有功能活性的胰腺内分泌肿瘤显像。

章节大纲：

<∞> 参考文献

> 另请参阅《核医学》电子书章节

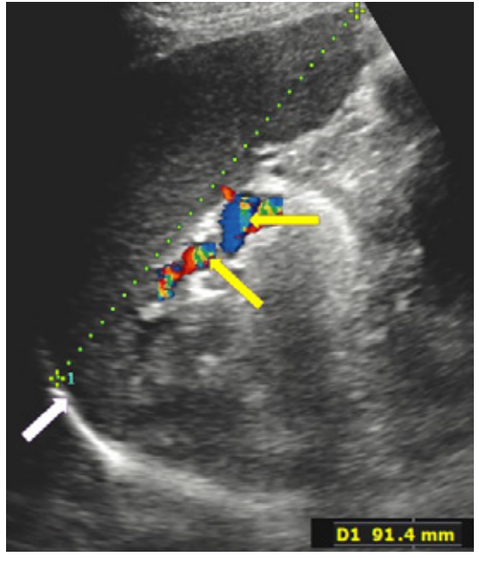
18-FDG PET/CT（左侧为轴位 PET 影像，右侧为融合 PET 和相应 CT 影像）显示胰腺正常（箭头所示），无高代谢病灶。注意：FDG 正常经肾脏排泄（星号所示）。

/ Imaging Techniques for the Spleen

Ultrasonography (US) usually allows visualisation of the splenic tissue via an intercostal acoustic window without interference due to bowel gas. **Doppler-US with or without contrast material** may add useful information about the patency of vessels and the homogeneity of parenchymal perfusion.

Complete, contrast-enhanced CT and MRI of the upper abdomen always include the spleen and the major splenic vessels and can detect a variety parenchymal abnormalities and variants such as ectopic splenic tissue. The advantages and disadvantages of CT and MRI for the spleen are the same as for the pancreas.

Scintigraphy can be used to identify ectopic splenic tissue by the uptake of Tc-99 sulphur colloid.



Doppler US of the spleen (longitudinal view) shows a normal, fine, homogenous organ texture with smooth margins and a pointed inferior edge (asterisk). Splenic hilum with splenic arteries and veins (yellow arrows). White arrow points at the diaphragm. Normal spleen size.

CHAPTER OUTLINE:

/ 脾脏的影像学检查技术

章节大纲：

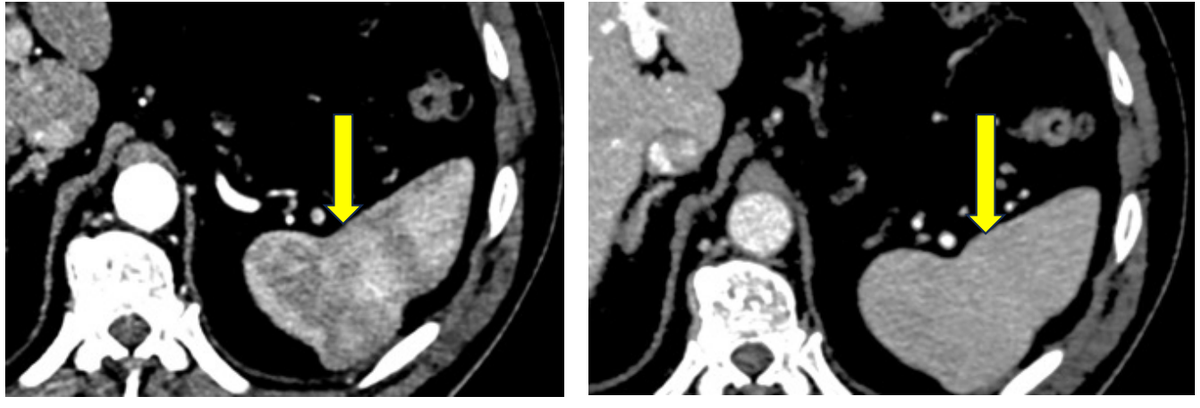
超声检查 (US) 通常可通过肋间声窗显示脾组织，而不受肠道气体的干扰。**使用或不使用对比剂的多普勒超声**可提供关于血管通畅性和实质灌注均匀性的有用信息。

上腹部完整的对比增强 CT 和 MRI 检查均应包括脾脏和脾大血管，可发现多种实质异常和变异，如异位脾组织。脾脏 CT 和 MRI 的优缺点与胰腺相同。

闪烁显像可通过 Tc-99 硫胶体的摄取来识别异位脾组织。

脾脏多普勒超声（纵向视图）显示器官纹理正常、细小、均匀，边缘光滑，下缘尖（星号所示）。脾门及脾动脉和脾静脉（黄色箭头）。白色箭头所指位置为膈肌。脾脏大小正常。

During the arterial phase of contrast-enhanced CT, MRI or US, the spleen shows an inhomogeneous enhancement, also called "**tiger spleen**" or "**zebra spleen**". This enhancement pattern is caused by the fact that red pulp enhances earlier than while white pulp (see anatomy). In the portal venous phase, the normal spleen will typically show homogenous enhancement.



Multiphasic contrast-enhanced CT showing the arterial (image on the left) and portal (image on the right) phases of contrast enhancement. Note inhomogeneous enhancement in the arterial phase and homogenous enhancement in the portal venous phase (arrows).

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

在增强 CT、MRI 或 US 的动脉期，脾脏表现为不均匀强化，也称为"**虎纹脾**"或"**斑马纹脾**"。这种强化模式是由于红髓比白髓增强得更早（见解剖学）。在门静脉期，正常脾脏通常呈现均匀强化。

多期增强 CT，显示增强扫描的动脉期（左图）和门静脉期（右图）。注意：动脉期不均匀强化和门静脉期均匀强化（箭头所示）。

Variants of Diagnostic Importance

Pancreas and Spleen Imaging

胰腺和脾脏影像学

CHAPTER OUTLINE:

章节大纲：

具有诊断重要性的变异

/ Variants of Diagnostic Importance

<!> ATTENTION

Some variants of pancreatic and splenic anatomy are of diagnostic importance, either because they may predispose to complications or because they may give rise to differential diagnosis with other conditions. Such variants include those of the pancreatic ductal system and the parenchyma of the pancreas and spleen.

The pancreatic duct of Wirsung is usually dominant and forms a major papilla with the common bile duct to join the duodenum. Due to fusion of the dorsal and ventral pancreatic ducts, the duct of Santorini usually communicates with the duct of Wirsung and joins the duodenum with a minor papilla. However, many variants exist regarding ductal anatomy.

Pancreas divisum occurs due to non-fusion of the dorsal and ventral pancreatic ducts and results in separation of the ducts of Santorini and Wirsung; this variant may predispose to pancreatitis. Pancreas divisum occurs in about 10% of the population.

Annular pancreas is a variant in which the parenchyma of the pancreatic head encircles the duodenal lumen.

Accessory splenic tissue (splenunculus) may give rise to differential diagnostic problems.

CHAPTER OUTLINE:

/ 具有诊断重要性的变异

<!> 注意

某些胰腺和脾脏的解剖变异具有诊断意义，因其容易引起并发症，或可能需要与其他疾病进行鉴别诊断。此类变异包括胰腺导管系统以及胰腺和脾脏实质的解剖学变异。

主胰管通常占主导地位，并与胆总管形成大乳头，连接十二指肠。由于背侧和腹侧胰管融合，副胰管通常与主胰管相通，并通过副乳头汇入十二指肠。值得注意的是，胰管存在很多解剖变异。

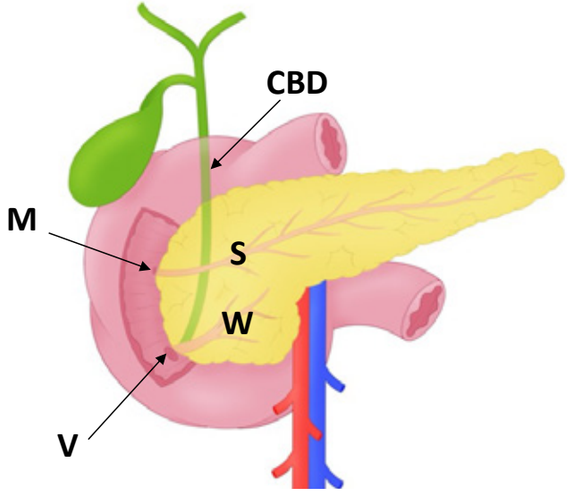
胰腺分裂是由于背侧和腹侧胰管未融合，导致副胰管和主胰管分离；这种变异可能诱发胰腺炎。胰腺分裂的发生率约 10%。

环状胰腺是一种变异，其特征为胰头的实质组织环绕十二指肠管腔。

副脾组织（脾小体）可能造成鉴别诊断难题。

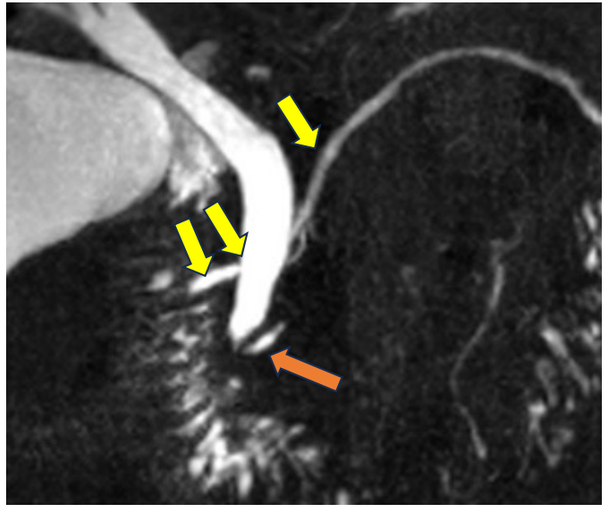
章节大纲：

/ Pancreas Divisum



Schematic illustration of the anatomical relationship between the main pancreatic duct of Wirsung (W), the accessory pancreatic duct of Santorini, (S), the common bile duct (CBD) and the duodenum in pancreas divisum. V = ampulla of Vater; M = minor papilla

Illustration by Emma Tabone, Mater Dei Hospital, University of Malta, Malta.



MRCP showing pancreas divisum. Duct of Santorini drains as main duct into minor papilla (yellow arrows). Duct of Wirsung drains in the lower pancreatic head and joins the common bile duct (orange arrow).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

/ 胰腺分裂

章节大纲：

主胰管 (W)、副胰管 (S)、胆总管 (CBD) 和胰腺分裂十二指肠之间解剖关系的示意图。V = 壶腹；M = 副乳头

图片来源：Emma Tabone，马耳他大学 Mater Dei 医院。

MRCP 显示胰腺分裂。副胰管作为主要管腔引流至十二指肠副乳头（黄色箭头）。主胰管引流胰头下部并与胆总管汇合（橙色箭头）。

/ Annular Pancreas

Annular pancreas is a morphological anomaly that results in pancreatic tissue completely or incompletely encircling the duodenum.

Although it is often asymptomatic it can also be responsible for clinical symptoms such as abdominal pain, postprandial fulness or vomiting due to duodenal obstruction, or pancreatitis. The condition is often recognised in adult life as an unexpected finding on CT or MRI.

Regarding ductal anatomy, the annular duct may either join the duct of Wirsung or the duct of Santorini.

Contrast-enhanced CT (axial image) showing annular pancreas. Pancreatic head tissue (small arrowheads) entirely surrounds the duodenum. Large arrowhead points to contrast-filled duodenal lumen.

Image courtesy: Oskar Bozek, MD, Department of Radiodiagnostics and Invasive Radiology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Poland.

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

章节大纲：

/ 环状胰腺

环状胰腺是一种形态异常，导致胰腺组织完全或不完全包绕十二指肠。

环状胰腺虽然通常无症状，但也可能引发腹痛、餐后饱胀或十二指肠梗阻所致呕吐、胰腺炎等临床症状。环状胰腺常于成年期经 CT 或 MRI 检查偶然确诊。

从胰管的解剖来看，环状胰管可汇入主胰管或副胰管。

增强 CT（轴位影像）显示环状胰腺。胰头组织（小箭头）完全包绕十二指肠。大箭头指向充满对比剂的十二指肠腔。

图片来源：Oskar Bozek 医学博士（卡托维兹医学院放射诊断与介入放射学系，波兰西里西亚医科大学）。

/ Accessory Splenic Tissue (Splenunculus)

Accessory ectopic splenic tissue (splenunculus) are nodules of normal splenic tissue that may occur in many sites of the abdomen, including the peritoneal surface, ligaments, and the omental structures. A common site is the vicinity of the splenic hilum or the pancreatic tail.

At cross-sectional imaging with US, CT or MRI, ectopic splenic tissue shows the same tissular pattern and the same dynamic enhancement pattern as the main splenic tissue. If necessary, **99-Tc sulfur colloid scintigraphy** may be used to confirm the splenic nature of a lesion.

<!> ATTENTION

Although no treatment is usually required, ectopic splenic tissue may be **mistaken for a mass lesion of another origin including neoplasm**. Furthermore, depending on its location, accessoray splenic nodules may cause acute complications such as torsion or infarction, presenting in the form of acute abdominal pain.

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

章节大纲：

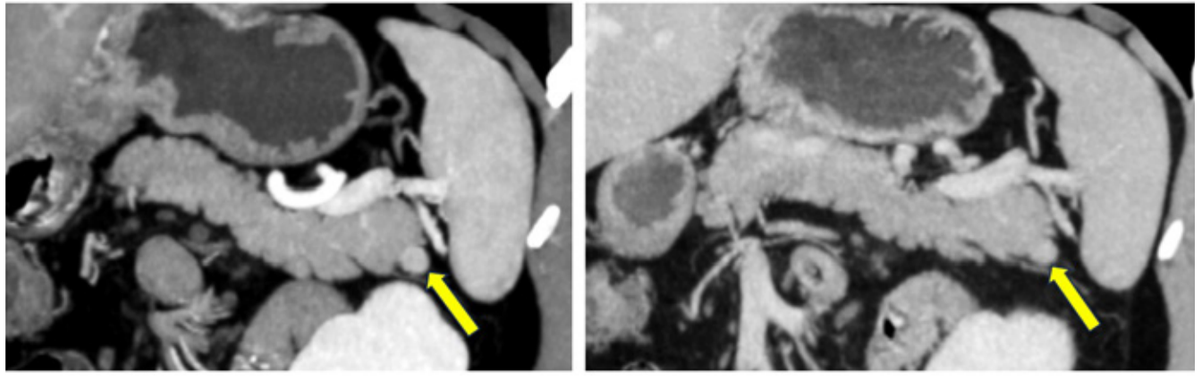
/ 副脾组织（脾小体）

异位副脾组织（脾小体）是正常脾组织的结节，可能出现在腹部的许多部位，包括腹膜表面、韧带和网膜等结构。常见部位是脾门或胰尾附近。

在超声、CT 或 MRI 横断位成像中，异位脾组织显示出与主要脾组织相同的组织模式和动态强化模式。必要时可采用 **99-Tc 硫胶体闪烁显像技术**确认病变的脾脏来源属性。

<!> 注意

尽管异位脾组织通常无需治疗，但其易被误认为其他来源的占位性病变（包括肿瘤性病变）。此外，副脾结节根据其解剖位置，可能引起扭转或梗死等急性并发症，临床表现为急性腹痛。



Abdominal multiphasic CT (coronal multiplanar reconstruction) showing a nodule of accessory spleen (splenumculus) in the tail of the pancreas. In all phases of contrast enhancement, the enhancement pattern of the lesionin the pancreatic tail is the same as the spleen.

Image courtesy: Oskar Bozek, MD, Department of Radiodiagnostics and Invasive Radiology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Poland.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

腹部多期 CT（冠状位多平面重建）显示胰尾处副脾结节。在增强扫描的所有期相中，胰尾部病灶的强化模式与脾脏相同。

图片来源：Oskar Bozek 医学博士（卡托维兹医学院放射诊断与介入放射学系，波兰西里西亚医科大学）。

Acute Pancreatitis

Pancreas and Spleen Imaging

胰腺和脾脏影像学

CHAPTER OUTLINE:

章节大纲：

急性胰腺炎

Acute Pancreatitis

Acute pancreatitis is a common cause of admission for acute abdominal pain, the most common aetiologies for pancreatitis being migration of gallstones and alcohol use. Other aetiologies may include iatrogenic instrumentation of the ampulla of Vater, neoplastic obstruction of the main pancreatic duct, or ductal injury with extravasation of pancreatic juice in the context or blunt abdominal trauma.

<!> ATTENTION

Acute pancreatitis in adults can be classified according to the **revised Atlanta classification**. From a clinical point of view the severity of acute pancreatitis may be graded as mild (no local or systemic complications); moderately severe (local or systemic complications but without organ failure) and severe (including persistent organ failure).

Regarding local complications it is important to distinguish the more self-limited, **interstitial oedematous form of acute pancreatitis** from the **necrotising form**, which occurs in ≤10% but has a much higher morbidity and mortality. Patients with necrotising pancreatitis are often in a critical clinical state and require intensive care. This may cause some limitations to the use diagnostic imaging modalities from a logistic point of view (patient transfer, monitoring, collaboration, etc).

Local complications of severe acute pancreatitis include the formation of **large or infected fluid collections** which may compress adjacent abdominal organs or become superinfected, with the risk of sepsis and extensive retroperitoneal fat necrosis. **Vascular complications** include **thrombosis** of major peripancreatic vessels and formation of **arterial pseudoaneurysms** with the risk of severe acute intra-abdominal haemorrhage.

CHAPTER OUTLINE:

急性胰腺炎

章节大纲：

急性胰腺炎是急性腹痛入院的常见原因，胰腺炎最常见的病因是胆结石迁移和饮酒。其他病因可能包括医源性壶腹部器械操作、肿瘤阻塞主胰管、胰管损伤伴有胰液外渗或腹部钝性损伤。

<!> 注意

成人急性胰腺炎可根据修订版亚特兰大分类。从临床角度来看，急性胰腺炎的严重程度可分为轻度（不伴有局部或全身并发症）；中重度（伴有局部或全身并发症，但无器官功能衰竭）和重度（伴有持续性器官衰竭）。

关于局部并发症，重要的是区分更多的自限性、间质水肿型急性胰腺炎与坏死型，坏死型发生率 ≤ 10%，但其发病率和死亡率更高。坏死性胰腺炎患者往往处于危急的临床状态，需要重症监护。这可能导致从逻辑角度（患者转移、监测、协作等）使用诊断影像学检查方法存在一些局限性。

重症急性胰腺炎的局部并发症包括形成大量或感染性积液，可能压迫邻近的腹部脏器或继发感染，有败血症和广泛腹膜后脂肪坏死的风险。血管并发症包括胰周主要血管血栓形成和动脉假性动脉瘤形成，伴有严重急性腹腔内出血风险。

/ Imaging in Acute Pancreatitis

The diagnosis of acute pancreatitis at emergency admission is usually based on **clinical symptoms and laboratory findings**. Since cholelithiasis is the most common cause of acute pancreatitis, **US is indispensable** and should be performed in all patients with suspected acute pancreatitis. However, contrast-enhanced **CT is the imaging method of choice for further characterisation** of acute pancreatitis and detection of local complications. If the diagnosis can be established clinically, patients with mild pancreatitis may not require CT imaging at the time of admission. However, acute pancreatitis is an evolving, dynamic condition which may change in severity over time. In moderately severe and severe acute pancreatitis **follow–up CT imaging** is, therefore, often required to assess the course of the disease and detect developing complications.

<!> ATTENTION

According to the **revised Atlanta classification**, imaging has a key role in distinguishing between acute interstitial oedematous pancreatitis in which contrast enhancement of the gland on CT is intact and where key diagnostic findings may include diffuse or focal swelling of the gland, infiltration of the **peripancreatic fat and acute peripancreatic fluid collections** or pseudocysts (of homogeneous liquid content) from acute necrotising pancreatitis in which variable portions of the parenchyma lack contrast enhancement on CT and where key diagnostic findings may include solitary or multiple intra- or peripancreatic necrotic collections or walled- of necrotic areas with heterogeneous liquid/non-liquid content. The non-liquid content of these lesion is more conspicuous on US and MRI than on CT.

MRI may be used as an alternative to CT if iv. injection of iodinated contrast material is contraindicated. **MRCP is the method of choice for non-invasive delineation of ductal anomalies**. Unlike CT, however, MRI is not always possible in severely ill patients who cannot cooperate and who are equipped with electronic and ferromagnetic accessory devices that are incompatible with use in the magnetic field.

CHAPTER OUTLINE:

章节大纲：

/ 急性胰腺炎的影像学检查

急诊入院的急性胰腺炎诊断通常基于**临床症状和实验室检查结果**。由于胆石症是急性胰腺炎的最常见病因，因此**超声检查不可或缺**，所有疑似急性胰腺炎患者均应进行超声检查。然而，CT 增强检查**是进一步明确**急性胰腺炎特征和检测局部并发症的首选影像学检查方法。如果临床上可确诊，则轻症胰腺炎患者在入院时可能无需 CT 检查。然而，急性胰腺炎是一种动态进展的疾病，其严重程度可能随时间的推移而变化。因此，在中度重症和重症急性胰腺炎中，通常需要进行**CT 随访复查**，以评估病程并检测出现的并发症。

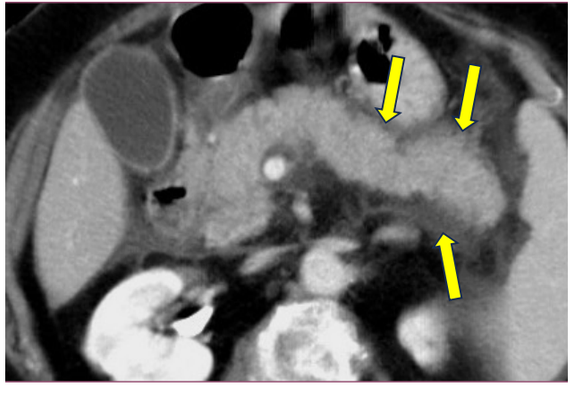
<!> 注意

根据修订版亚特兰大分类，影像学在鉴别急性间质水肿性胰腺炎方面发挥关键作用，在急性间质水肿性胰腺炎CT 增强扫描中胰腺腺体是完整的，关键的诊断发现可能包括腺体弥漫性或局灶性肿胀、**胰周脂肪浸润和急性胰周液体积聚**或急性坏死性胰腺炎导致的假性囊肿（均质液体内容物），部分胰腺实质在 CT 增强中无强化，关键诊断结果可能包括单发或多发性胰内或胰周坏死物积聚，这些区域的液体/非液体成分是不均匀的。这些病变的非液体成分在超声和 MRI 影像上比 CT 更明显。

如果对静脉注射碘对比剂过敏，则可将 MRI 用作 CT 的替代方法。**MRCP 是无创性显示导管异常的首选方法**。但与 CT 不同的是，对于那些病情严重、无法配合且身上配备磁场不兼容的电子和铁磁辅助设备的重症患者，不一定可行 MRI 检查。

>|< COMPARE

/ Acute Oedematous vs. Acute Necrotising Pancreatitis



CT (portal phase) showing oedematous acute pancreatitis. Glandular swelling, moderate infiltration of peripancreatic fat (arrows) no major peripancreatic fluid collections, homogeneous enhancement of gland.

CT (pancreatic phase) showing necrotising acute pancreatitis. Inhomogeneous, incomplete enhancement of the gland with non-enhancing areas (arrows). Intra- and peri-pancreatic fluid collections (*) due to haemorrhage and exudate.

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

章节大纲：

>|< 比较

/ 急性水肿性胰腺炎与急性坏死性胰腺炎

CT（门静脉期）显示水肿性急性胰腺炎。腺体肿胀，胰腺周围脂肪中度浸润（箭头所示），胰腺周围无大量积液，腺体均匀增强。

CT（胰腺期）显示坏死性急性胰腺炎。腺体不均匀、不完全增强，伴非强化区域（箭头所示）。出血和渗出导致的胰腺内和胰腺周围积液（*）。

/ Local Complications of Acute Pancreatitis

<!> ATTENTION

Fluid collections in interstitial oedematous pancreatitis can be distinguished according to the revised Atlanta classification as

- **non-encapsulated** peripancreatic fluid collections (in the first 4 weeks)
- **encapsulated** peripancreatic or remote fluid collections or well-defined pseudocysts (after 4 weeks)

Fluid collections in necrotising pancreatitis are defined as

- **acute necrotic collections** (occurring in the first 4 weeks) which are not encapsulated and contain heterogeneous non-liquefied material, as opposed to
- **walled-off necrosis** (developing after 4 weeks) in which collections are

All of these collections may cause clinical symptoms, either due to compression of the adjacent common bile duct (jaundice) or gastrointestinal tract (vomiting) or due to infection (sepsis).

The distinction between infected and noninfected collections can often be made by **image-guided percutaneous fine needle aspiration**. Although infected pancreatic fluid collections can be drained externally by percutaneous catheters under CT or US guidance, minimally invasive treatment of established pseudocysts is preferably done by means of EUS-guided internal drainage into the gastrointestinal tract.

Vascular complications of acute pancreatitis include thrombosis of major peripancreatic arteries or veins and formation of arterial pseudoaneurysms, as well as acute haemorrhage. Potential or active sources of arterial bleeding are best treated with angiographic embolisation.

CHAPTER OUTLINE:

章节大纲：

/ 急性胰腺炎的局部并发症

所有这些积液都可能引起临床症状，原因包括邻近胆总管受压（黄疸）、胃肠道受压（呕吐）或感染（脓毒症）。

通常可以通过**影像学引导的经皮细针穿刺抽吸活检**来区分受感染和未受感染的积液。尽管感染性胰腺积液可在 CT 或 US 引导下通过经皮导管进行外部引流，但确诊假性囊肿的微创治疗首选 EUS 引导下胃肠道内引流。

急性胰腺炎的**血管并发症**包括主要胰周动脉或静脉血栓形成、动脉假性动脉瘤形成以及急性出血。潜在或活动性动脉出血源最好采用血管造影栓塞术治疗。

<!> 注意

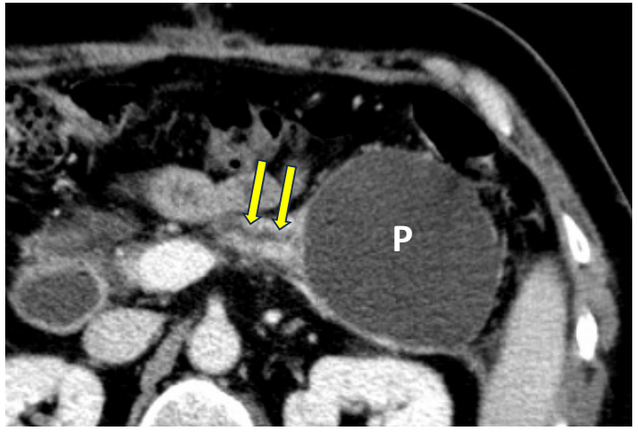
间质水肿性胰腺炎的液体积聚可根据修订版亚特兰大分类划分为

- **无包膜**胰周积液（前 4 周）
- **包裹性**胰周或远端积液或边界清楚的假性囊肿（4 周后）

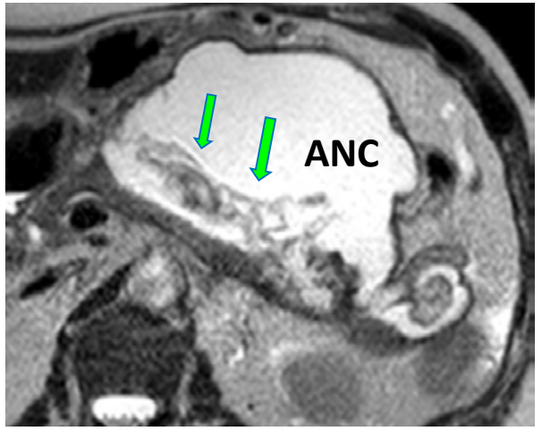
坏死性胰腺炎的积液定义为

- **急性坏死物积聚**（发生在前 4 周），没有形成包裹并含有不均匀的非液化物质，与
- **包裹性坏死**（4 周后形成）不同，在包裹性坏死中聚集物被包裹并含有不均匀的非液化物质

/ Pancreatic and Peripancreatic Collections after Acute Oedematous and Acute Necrotising Pancreatitis



Pancreatic pseudocyst (> 4 weeks). CT (portal phase) showing a large rounded encapsulated collection 5 weeks after acute oedematous pancreatitis, corresponding to a pseudocyst (P) in the pancreatic tail. Pancreatic duct (arrows).



Acute necrotic collection (< 4 weeks). MRI (transverse T2-weighted image) showing a large irregular-shaped acute necrotic pancreatic collection (ANC) containing heterogeneous debris due to haemorrhage or exudate (arrows) 3 weeks after the onset of necrotising pancreatitis.

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

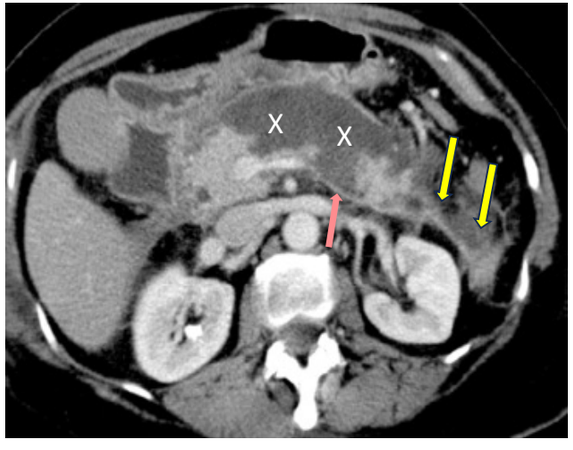
/ 急性水肿性胰腺炎和急性坏死性胰腺炎后胰腺和胰周积液

章节大纲：

胰腺假性囊肿（> 4 周）。CT（门静脉期）显示急性水肿性胰腺炎后 5 周出现较大的圆形包裹性积液，对应胰尾假性囊肿 (P)。胰管（箭头所示）。

急性坏死物积聚（< 4 周）。在坏死性胰腺炎发病 3 周后，MRI（T2WI 横断位）显示一个巨大的不规则形状的急性坏死物积聚 (ANC)，其中含有由于出血或渗出液（箭头）引起的异质性碎片。

/ Pancreatic and Peripancreatic Collections After Acute Necrotising Pancreatitis



Acute necrotic collection (< 4weeks). CT (portal phase) shows a large devascularised portion of the pancreatic body and formation of an acute necrotic collection (X), thrombosis of the splenic vein (pink arrow) and fat stranding of the anterior pararenal space (yellow arrows), 2 weeks after the onset of acute necrotising pancreatitis

Walled-off necrotic collections (> 4weeks). CT (portal phase) shows acute walled-off pancreatic and peripancreatic necrotic collections (asterisks) 6 weeks after the onset of acute necrotising pancreatitis. The collections have a slightly enhancing defined wall of granulomatous tissue (arrows).

CHAPTER OUTLINE:

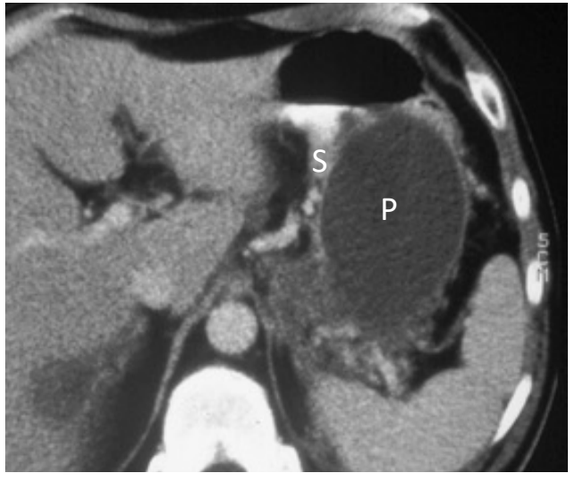
/ 急性坏死性胰腺炎后胰腺和胰周积液

章节大纲：

急性坏死物积聚（< 4 周）。急性坏死性胰腺炎发作 2 周后，CT（门静脉期）显示胰腺体部有一大片无血管区域，并形成急性坏死物积聚（X），脾静脉血栓形成（粉色箭头），肾旁前间隙脂肪条纹（黄色箭头）

包裹性坏死物积聚（> 4 周）。CT（门静脉期）显示急性坏死性胰腺炎发作 6 周后有急性胰腺和胰周包裹性坏死物积聚（星号所示）。这些积聚物具有轻度强化的肉芽肿组织壁（箭头所示）。

/ Further Complications of Acute Pancreatitis



Pancreatic pseudocyst compressing the stomach. CT (portal phase) showing a large rounded encapsulated collection 5 weeks after acute oedematous pancreatitis, corresponding to a pseudocyst (P) in the lesser sac, compressing the stomach (S)

Thrombosis of splenic artery. Dynamic contrast-enhanced CT (arterial phase) shows complete occlusion of the splenic artery with beginning collaterals (arrows) complicating acute pancreatitis.

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ 急性胰腺炎的其他并发症

/ **胰腺**和**脾脏**影像学

章节大纲：

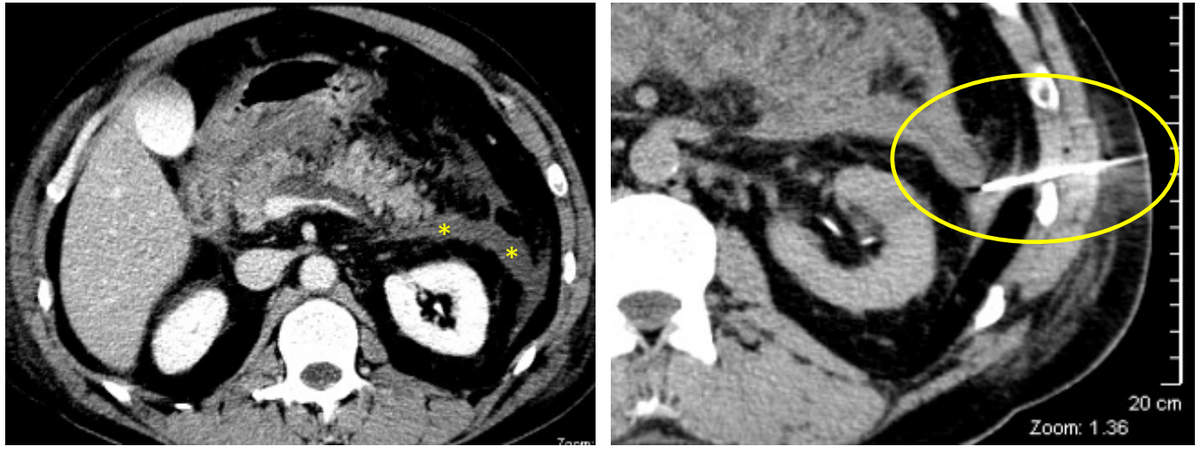
胰腺假性囊肿压迫胃。CT（门静脉期）显示急性水肿性胰腺炎 5 周后出现较大的圆形包裹性积液，对应于小网膜囊中的假性囊肿 (P)，压迫胃 (S)

脾动脉血栓形成。动态增强 CT（动脉期）显示脾动脉完全闭塞，起始侧支（箭头所示）并发急性胰腺炎。

/ Image-Guided Fluid Aspiration in Acute Pancreatitis

<!> ATTENTION

Bacterial superinfection occurs commonly in necrotising pancreatitis and carries a high risk of abdominal sepsis. CT-guided fine-needle aspiration allows for the diagnosis of infection and specification of germs.



CT-guided fluid aspiration. Left image: CT (portal phase) showing free fluid (asterisks) in the presence of clinical signs of infection. Right image: CT-guided needle placement within the fluid collection (yellow ellipse) for the diagnosis of infection and specification of germs.

/ 急性胰腺炎的影像引导下液体抽吸术

<!> 注意

细菌二重感染常见于坏死性胰腺炎，有腹部脓毒症的高风险。CT 引导的细针穿刺可以诊断感染并确定病原体。

CT 引导下液体抽吸。左图：CT（门静脉期）显示存在感染临床体征的游离液体（星号所示）。右图：CT 引导下将针头插入积液中（黄色椭圆形），用于诊断感染和明确致病菌。

/ Percutaneous Drainage of Complicated Pancreatic Fluid Collections

CT-guided percutaneous drainage with an indwelling pigtail catheter can be indicated as a temporary alternative to internal drainage during the first weeks in:

- / large or increasing collections (>5cm diameter)
- / symptomatic collections causing pain, gastric or duodenal compression
- / infected collections

Pigtail catheters
猪尾导管

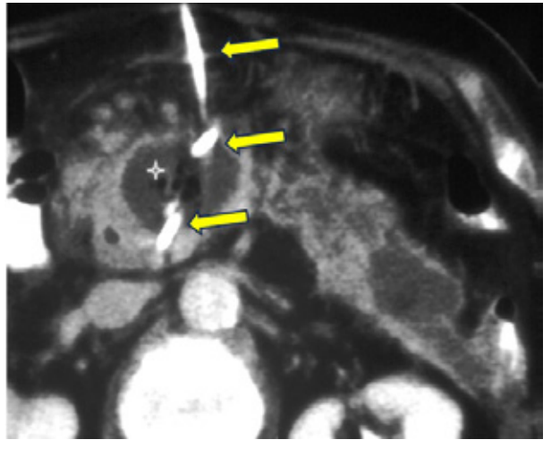


Image on the left illustrates the **CT set-up for an interventional procedure** with the interventional radiologist targeting the area to punction under CT guidance. Image on the right illustrates the **correct position of the pigtail catheter** (arrows) in the infected pancreatic collection (+).

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

/ 复杂性胰腺积液的经皮穿刺引流

章节大纲：

对于以下患者，CT 引导下留置猪尾导管经皮引流可作为最初几周内内引流的临时替代方法：

- / 大量或不断增多的积液（直径 > 5 cm）
- / 引起疼痛、胃或十二指肠受压的症状性积液
- / 感染积液

左图显示了**介入手术的 CT 设置**，介入放射科医生在 CT 引导下对该区域进行穿刺。右图显示了**猪尾导管**（箭头所示）在感染性胰腺积液 (+) 中的正确位置。

Chronic Pancreatitis

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

慢性胰腺炎

Chronic Pancreatitis

Chronic pancreatitis is the result of a **recurrent inflammatory process leading to fibrosis, calcification, pseudocyst formation and ductal changes and eventually exocrine functional insufficiency** of the pancreas. The aetiology of chronic pancreatitis is not fully understood and includes idiopathic but also toxic-metabolic causes (e.g., chronic alcohol consumption), and congenital predispositions such as pancreas divisum or pancreas annulare, as well as autoimmune diseases.

<!> ATTENTION

On cross-sectional imaging parenchymal changes include **lack of perfusion** due to fibrotic changes in chronically inflamed areas, **atrophy, calcifications and fluid collections**. Although these changes can be visualised on both CT and MRI, calcifications are better visualised with CT. The morphologic changes of the pancreatic parenchyma in the context of chronic pancreatitis may sometimes be very difficult to distinguish from pancreatic adenocarcinoma, and even a negative image guided biopsy cannot reliably rule out malignancy.

Ductal changes can be graded according to the **Cambridge classification** as equivocal, mild, moderate or severe, based on the extent of dilatation and stenosis, calculi and pseudocysts. Irregular calibre due to stenoses and dilated segments may appear as a "string of beads". Although the Cambridge classification was initially developed for ERCP, ductal changes may also be delineated noninvasively by means of MRCP.

Dynamic evaluation with MRCP after secretin stimulation may be used in selected cases to allows semi-quantitavie estimation of the exocrine secretory function and enhances anatomic detail.

>▪< FURTHER KNOWLEDGE

Para-duodenal or "groove"-pancreatitis is an uncommon focal form of chronic pancreatitis in the space between the duodenum and pancreas. Cross-sectional imaging shows cystic thickening of the duodenal wall with or without duodenal stenosis. The fibrous tissue within the pancreatico-duodenal groove may show late enhancement after contrast administration. The inflammatory mass should not be confused with a neoplastic lesion.

CHAPTER OUTLINE:

慢性胰腺炎

慢性胰腺炎是复发性炎症过程导致的胰腺纤维化、钙化、假性囊肿形成和导管改变，并最终导致胰腺外分泌功能不全的结果。慢性胰腺炎的病因尚不完全清楚，包括特发性但也包括毒性-代谢性原因（如长期饮酒）、先天性易感性（如分裂胰腺或环状胰腺）以及自身免疫性疾病。

<!> 注意

横断位成像实质变化包括灌注缺乏（由于慢性炎症区域的纤维化改变）、**萎缩、钙化和积液**。虽然 CT 和 MRI 均可显示这些改变，但 CT 能更好地显示钙化。慢性胰腺炎患者的胰腺实质形态学改变有时可能很难与胰腺癌区分，即使影像引导的活检结果为阴性，也不能完全排除恶性肿瘤。

根据扩张和狭窄程度、结石和假性囊肿，可将胆管变化按剑桥分类法分为不明确、轻度、中度或重度。狭窄和扩张节段导致的不规则口径可能表现为"串珠样"。虽然剑桥分类最初是为 ERCP 制定的，但 MRCP 也可无创地显示胰管改变。

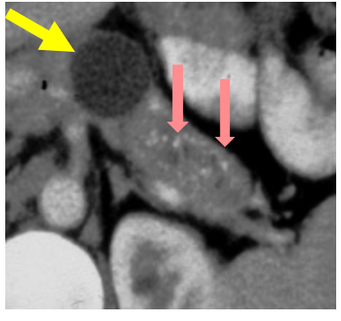
促胰液素刺激后采用 MRCP 进行动态评估，可用于特定病例，以便半定量估计外分泌功能，并增强解剖细节。

>▪< 进阶知识

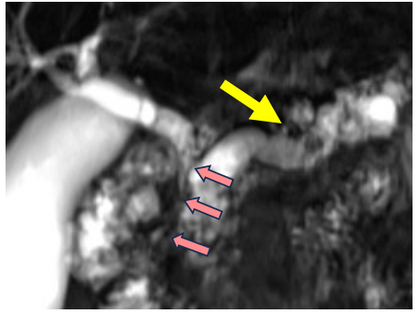
十二指肠旁或"沟槽状"胰腺炎是一种少见的出现在十二指肠和胰腺间隙的局灶性慢性胰腺炎。横断位成像检查显示十二指肠壁囊性增厚，伴或不伴十二指肠狭窄。注射对比剂后，胰十二指肠沟内的纤维组织可表现为晚期强化。炎性肿块不应与肿瘤性病变相混淆。

章节大纲：

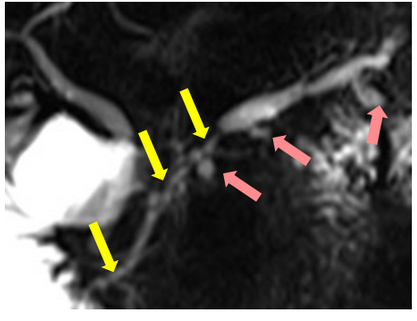
/ Chronic Pancreatitis: Imaging Features



CT (pancreatic phase) shows **pseudocyst of pancreatic body** (yellow arrow) and multiple parenchymal **calcifications** (pink arrows).



MRCP shows dilated main pancreatic duct with calculi (yellow arrow) as well as compression of distal common bile duct (pink arrows) .



MRCP shows stenosis of main pancreatic duct, which has a "string of beads" appearance (yellow arrows) and shows dilatation of its distal portion. Note also dilatation of second order branches (pink arrows).

CHAPTER OUTLINE:

/ 慢性胰腺炎：影像学特征

章节大纲：

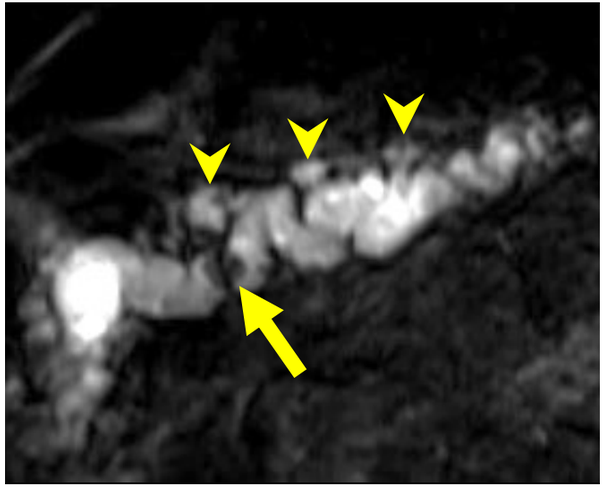
CT（胰腺期）显示**胰体假性囊肿**（黄色箭头）和多发性实质**钙化**（粉色箭头）。

MRCP 显示主胰管扩张伴结石（黄色箭头）以及远端胆总管受压（粉色箭头）。

MRCP 显示主胰管狭窄（呈"串珠样"外观，黄色箭头），远端胰管扩张。还应注意二级分支扩张（粉色箭头）。

Contrast-enhanced CT (pancreatic phase) shows calcified calculi (arrows) within the dilated main pancreatic duct.

CT image courtesy: Oskar Bozek, MD, Department of Radiodiagnostics and Invasive Radiology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Poland.



MRCP in a different patient shows a **dilated main pancreatic duct and dilatations of second order branches** (arrowheads), as well as **ductal calculi**, which present as filling defects (arrow).

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

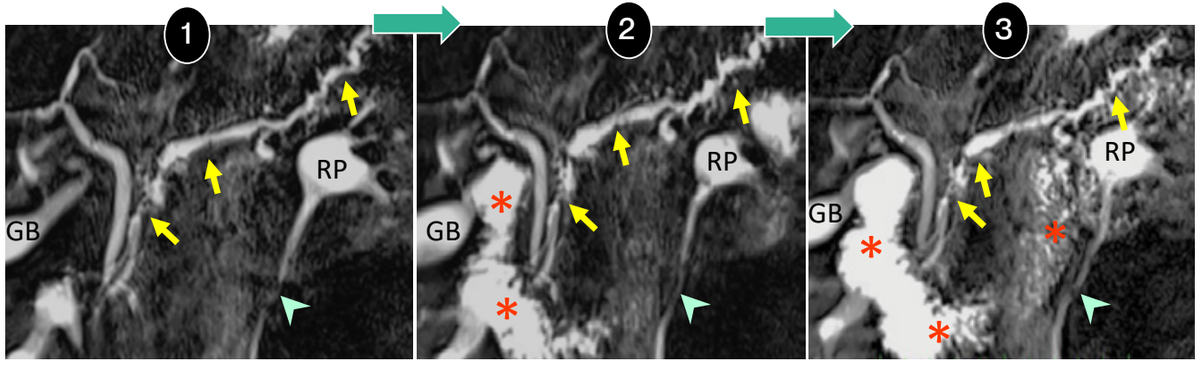
章节大纲：

增强 CT（胰腺期）显示扩张的主胰管内有钙化结石（箭头所示）。

CT 图片来源：Oskar Bozek 医学博士（卡托维兹医学院放射诊断与介入放射学系，波兰西里西亚医科大学）。

另一患者的 MRCP 显示**主胰管扩张和二级分支扩张**（箭头所示），以及**导管结石**，表现为充盈缺损（箭头所示）。

/ Chronic Pancreatitis: Dynamic MRCP with Secretin Stimulation



Selected frames (1-3) of a dynamic MRCP (coronal view) with secretin stimulation show stenosis and inflammatory irregularities of main pancreatic duct and secondary ducts (arrows) in chronic pancreatitis. Note increasing secretion of pancreatic juice after iv. injection of secretin with improved visualisation of ductal detail and progressive filling of the duodenum. Duodenum marked by asterisks. GB = gallbladder. RP = left renal pelvis. Left ureter (arrowhead).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺** 和**脾脏** 影像学

章节大纲：

/ 慢性胰腺炎：分泌素刺激的动态 MRCP

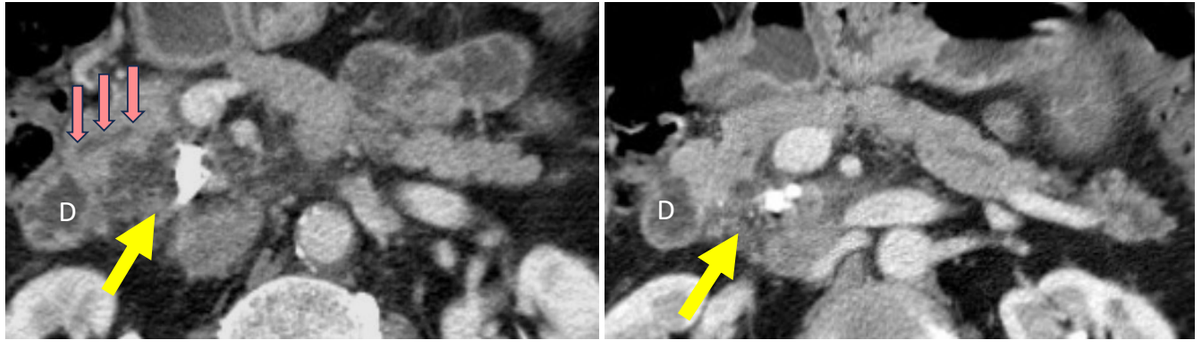
带促胰液素刺激的动态 MRCP（冠状位视图）的选定帧 (1-3) 显示慢性胰腺炎中主胰管和分支胰管的狭窄和炎性不规则（箭头所示）。注意静脉注射促胰液素后胰液分泌增加，导管细节的可视化改善，十二指肠逐渐充盈。十二指肠用星号标记。GB = 胆囊。RP = 左肾盂。左侧输尿管（箭头所示）。

/ Focal Chronic Pancreatitis of the Uncinate Process in Pancreas Divisum

<!> ATTENTION

Although patients with pancreas divisum are usually asymptomatic, about **25% - 35%** of these patients experience **recurrent pancreatitis**, which may lead to the development of chronic pancreatitis.

Pancreas divisum can explain why chronic pancreatitis changes can be **limited** to the lower part of the pancreatic head and uncinate process.



Multiphasic contrast-enhanced CT (pancreatic phase image on the left and portal phase image on the right) shows reduced enhancement and calcifications of the uncinate process (yellow arrow) compared with the rest of the pancreas which is drained by Santorini's duct (pink arrows) into the duodenum (D).

CHAPTER OUTLINE:

章节大纲：

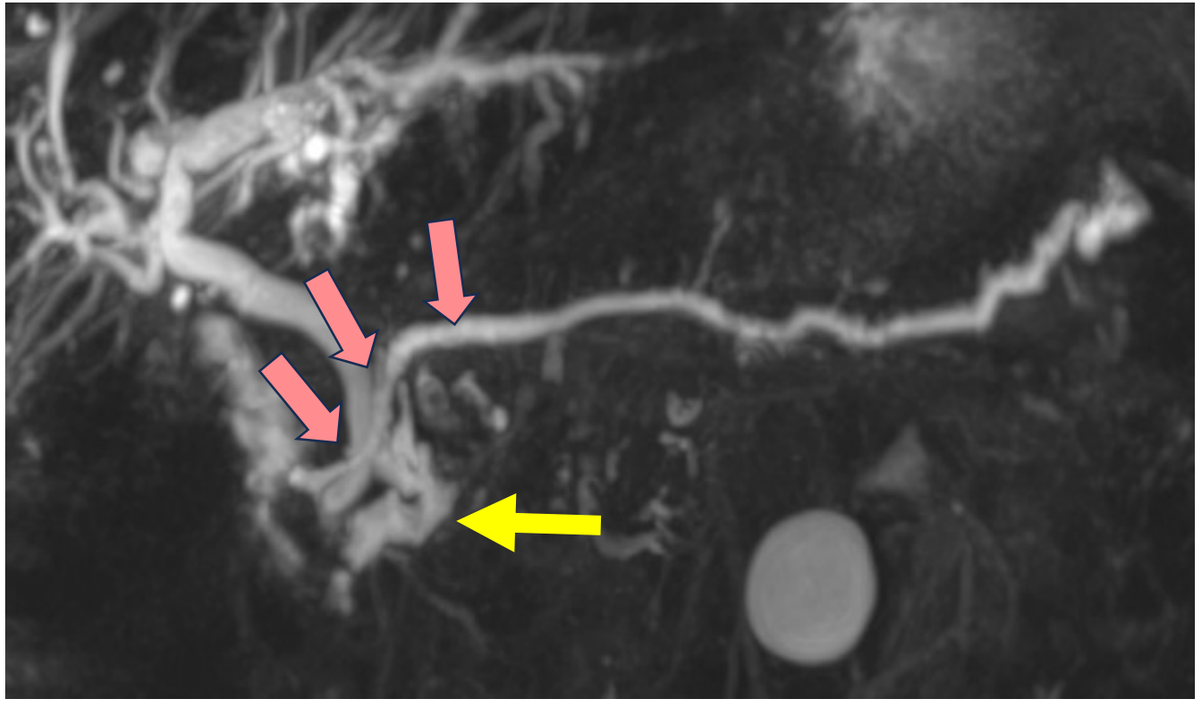
/ 胰腺分裂伴钩突局灶性慢性胰腺炎

<!> 注意

虽然胰腺分裂患者通常无症状，但其中约 **25%～35%** 的患者会出现**复发性胰腺炎**，这可能会导致慢性胰腺炎的发生。

胰腺分裂可以解释为什么慢性胰腺炎的变化可能**仅限于**胰头下部和钩突。

多期动态增强 CT（左侧为胰腺期，右侧为门静脉期）显示，与通过副胰管引流至十二指肠 (D) 的胰腺其余部位（粉色箭头）相比，钩突的增强和钙化减少（黄色箭头）。



MRCP showing normal duct of Santorini and main pancreatic duct (pink arrows). Dilated duct of Wirsung due to **chronic pancreatitis in the uncinate process** (yellow arrow).

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

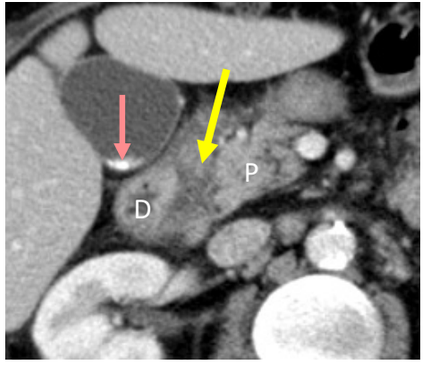
章节大纲：

MRCP 显示副胰管和主胰管正常（粉色箭头）。慢性沟槽状胰腺炎**导致的主胰管扩张**（黄色箭头）。

/ Paraduodenal ("Groove-") Pancreatitis: Imaging Features

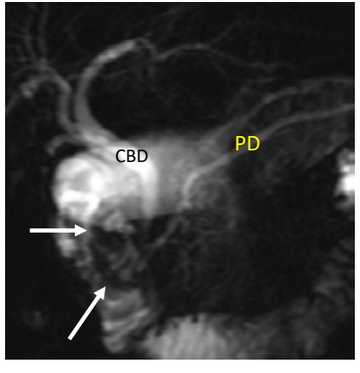
Groove pancreatitis is a form of **chronic inflammation** involving the **anatomic space between the duodenal wall and the pancreatic head**.

Although it can have cystic components, it may also appear as a mass and therefore, be difficult to distinguish from a malignant tumour.



Contrast-enhanced CT (axial pancreatic phase image) shows a hypodense zone (yellow arrow) between the duodenum (D) and the pancreatic head (P). Note the presence of gallbladder stones (pink arrow).

MRI (T2-weighted, transverse image) shows cystic thickening of the duodenal wall and cyst-like changes within the paraduodenal groove (arrow).



MRCP shows a mass protruding into the duodenal lumen due to thickening of the duodenal wall (arrows). Common bile duct (CBD); Pancreatic Duct (PD).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

章节大纲：

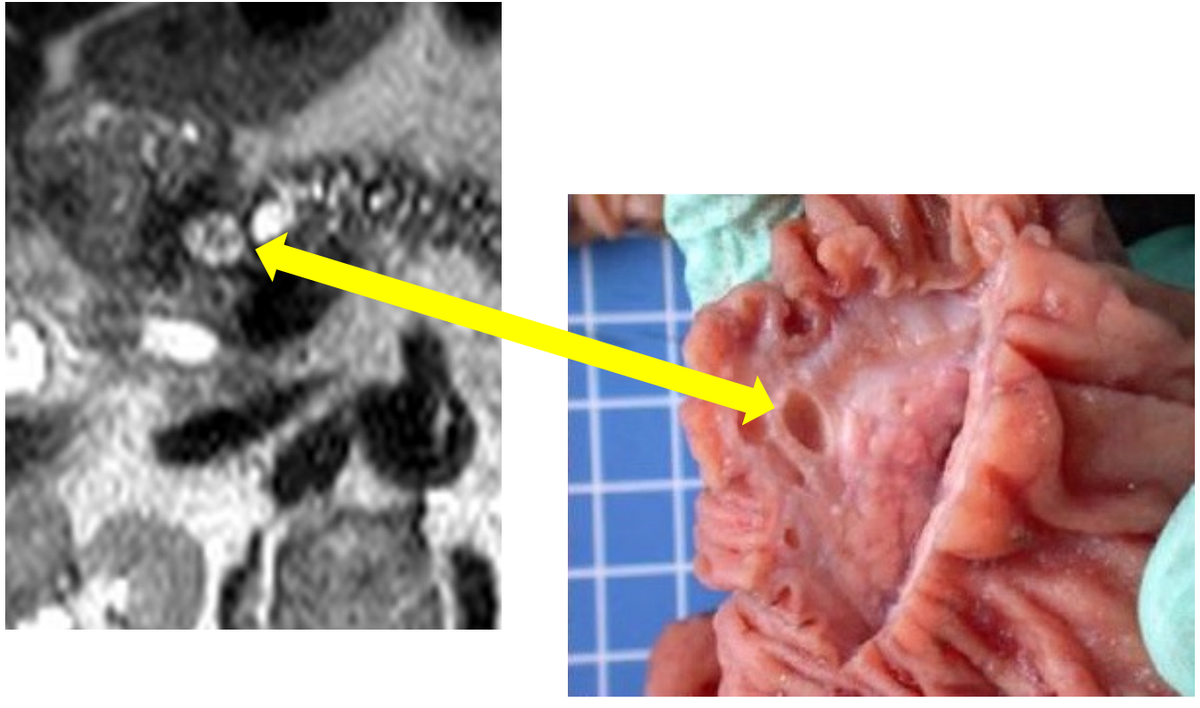
/ 十二指肠旁（"沟槽状"）胰腺炎：影像学特征

沟槽状胰腺炎是一种**慢性炎症**，累及**十二指肠壁和胰头之间的解剖空间**。虽然其可能有囊性成分，但也可能表现为肿块，因此很难与恶性肿瘤区分开来。

增强 CT（轴位胰腺期）显示十二指肠 (D) 和胰头 (P) 之间存在低密度区（黄色箭头）。注意有无胆囊结石（粉色箭头）。

MRI（T2WI 横断位）显示十二指肠壁囊性增厚，十二指肠旁沟内的囊样改变（箭头所示）。

MRCP 显示由于十二指肠壁增厚，肿块凸入到十二指肠肠腔内（箭头所示）。胆总管 (CBD)；胰管 (PD)。



MRI (T2-weighted, transverse image) shows cystic thickening of the duodenal wall (arrow).

Resected specimen confirmed cystic and fibrotic changes due to chronic inflammation within the pancreatico-duodenal groove.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

MRI（T2WI 横断位）显示十二指肠壁囊性增厚（箭头所示）。

切除标本证实胰十二指肠沟慢性炎症引起的囊性、纤维性改变。

Pancreatic Neoplasms

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

胰腺肿瘤

/ Pancreatic Neoplasms

<!> ATTENTION

A wide variety of pancreatic neoplasms exists that can be classified:

- / according to their functional origin as exocrine and endocrine
- / according to their location as intra- or extraductal
- / according to their tissular components as solid or cystic
- / according to their behaviour as benign or malignant

Ductal adenocarcinoma, a solid, tumour originating from the exocrine pancreatic tissue is by far the most common tumour and is always malignant, often with a serious prognosis at the time of the diagnosis. It is important, however, to distinguish pancreatic ductal **adenocarcinoma from adenocarcinoma of the ampulla of Vater** which usually has much more favourable prognosis if completely resected, thus warranting a more aggressive therapeutic approach even in elderly patients.

Pancreatic neuroendocrine neoplasms (PanNENs) are much less common solid tumours originating from the pancreatic islets. They can be functionally active or inactive and can be either benign or malignant.

Cystic tumours of the pancreas have no systemic functional activity. Although serous multicystic tumours are benign, mucinous cystadenoma and intraductal mucinous neoplasms (IPMN) can undergo malignant transformation.

/ 胰腺肿瘤

导管腺癌是一种起源于胰腺外分泌组织最常见的实体肿瘤，常常为恶性，在确诊时通常预后较差。然而，区分**胰腺导管腺癌和壶腹腺癌**非常重要，后者在完全切除后通常预后更好，因此即使在老年患者中也需要采取更积极的治疗方法。

胰腺神经内分泌肿瘤 (PanNEN) >是一种罕见的起源于胰岛细胞的实体肿瘤。其可表现为功能性或无功能性，可以是良性或恶性。

胰腺**囊性肿瘤**无全身性功能活性。虽然浆液性多囊性肿瘤是良性的，但黏液性囊腺瘤和导管内乳头状黏液性肿瘤 (IPMN) 可发生恶变。

<!> 注意

胰腺肿瘤种类繁多，可分为：

- / **根据其功能起源分为外分泌和内分泌**
- / **根据其位置分为导管内或导管外**
- / **根据其组织成分为实性或囊性**
- / **根据其行为分为良性或恶性**

/ Pancreatic Ductal Adenocarcinoma

Typical findings at CT or MRI consist of a solid parenchymal mass with usually **less enhancement** compared with the surrounding pancreatic tissue. However, contrast behaviour may also sometimes result in an isodense or hyperdense mass. Because a common location is in the pancreatic head, the tumours may compress the common bile duct, leading to painless jaundice. Simultaneous compression of the common bile duct and the main pancreatic duct may be seen on diagnostic imaging studies and has been termed as the "**double duct sign**".

Imaging has an important role for the staging of pancreatic ductal adenocarcinoma, which is done according to the **"Tumour" "Node" "Metastasis" (TNM)** classification of the Union for International Cancer Control (UICC) / American Joint Cancer Committee (AJCC). Criteria for primary tumour (T) staging are based on tumour size, extension beyond the organ, and involvement of the adjacent major arteries. Criteria for nodal (N) staging are based on the number of regional lymph nodes that are involved by malignancy. Imaging signs of advanced disease include infiltration of the peripancreatic fat, bile ducts, duodenum, or major pancreatic vessels, enlarged locoregional lymph nodes, and metastases in remote lymph nodes, liver, or other organs. Detection of metastases in remote lymph nodes, liver or other organs (M-staging) can be facilitated by PET/CT.

Pancreatic adenocarcinomas are **often unresectable for cure** at the time of imaging diagnosis. Depending on the clinical situation, **minimally invasive palliative treatment** including endoscopic or percutaneous biliary stenting may be favoured in advanced cases over attempts at major curative resection, which carries a high morbidity.

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺导管腺癌

/ 胰腺和脾脏影像学

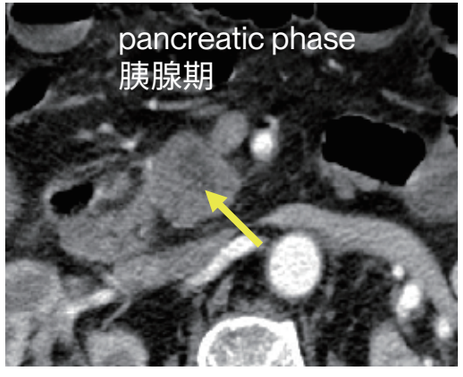
章节大纲：

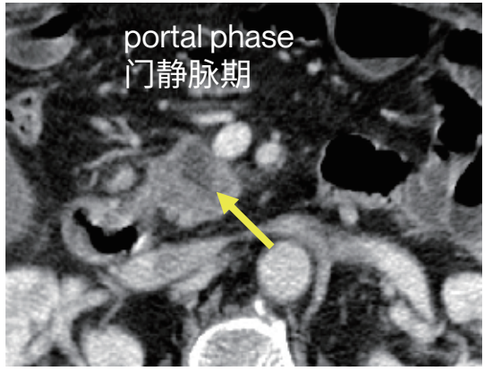
CT 或 MRI 的典型表现是实性肿块，与周围胰腺组织相比**呈弱强化**。然而，对比行为有时也可能导致等密度或高密度肿块。由于肿瘤常位于胰头，肿瘤可能压迫胆总管，导致无痛性黄疸。诊断性影像学检查可见胆总管和主胰管同时受压，称为"**双管征**"。

影像学检查对胰腺导管腺癌的分期有重要作用，根据国际抗癌联盟 (UICC)/美国联合癌症委员会 (AJCC) 的"**肿瘤**""**淋巴结**""**转移**"(TNM) 分类进行分期。原发性肿瘤 (T) 分期标准基于肿瘤大小、器官外扩散和邻近主要动脉的受累情况。淋巴结 (N) 分期标准基于恶性肿瘤累及的区域淋巴结数量。晚期疾病的影像学征象包括：胰周脂肪、胆管、十二指肠或主要胰腺血管浸润，局部区域淋巴结肿大，以及远处淋巴结、肝脏或其他器官转移。PET/CT 有助于检测远处淋巴结、肝脏或其他器官的转移（M 分期）。

影像学诊断时，胰腺腺癌**通常无法切除治愈**。根据临床情况的不同，对于晚期患者，与具有高发病率的大的根治性切除术的尝试相比，可能更倾向于使用包括内镜或经皮胆道支架置入术在内的**微创姑息治疗**。

/ Pancreatic Ductal Adenocarcinoma: Imaging Features

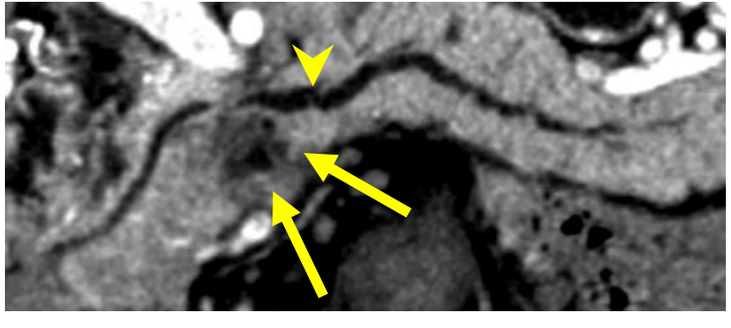




Multiphasic contrast-enhanced CT showing a solid mass in the pancreatic head (arrows), enhancing less than the surrounding pancreatic tissue. The tumour is limited to the pancreatic head.

<!> ATTENTION

Pancreatic ductal adenocarcinoma typically enhances less than the surrounding pancreatic tissue!



MRI (T1-weighted with Gd-enhancement) showing a solid hypointense mass in the pancreatic body (arrows). Note beginning dilatation of main duct (arrowhead)

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

/ 胰腺导管腺癌：影像学特征

章节大纲：

多期增强 CT 显示胰头有实性肿块（箭头所示），强化程度低于周围胰腺组织。肿瘤局限于胰头。

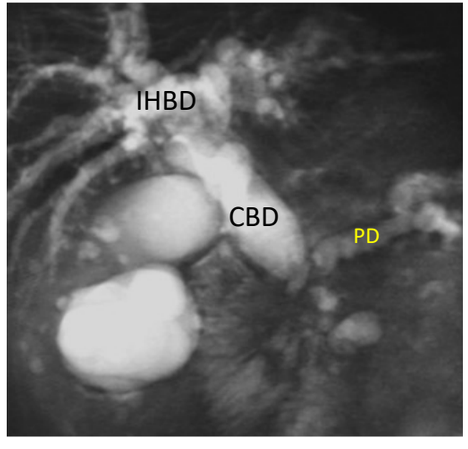
<!> 注意

胰腺导管腺癌的强化程度通常低于周围胰腺组织！

MRI（T1WI 增强）显示胰腺体部实性低信号肿块（箭头所示）。注意：主胰管开始扩张（三角箭头）

Contrast-enhanced CT (curved reconstruction) shows an isodense solid mass involving the pancreatic head and body (asterisk) and dilatation of the distal main pancreatic duct (arrowhead).

>=< FURTHER KNOWLEDGE



MRCP shows dilated common bile duct (CBD) and main pancreatic duct (PD) In a patient with painless jaundice (= "double duct sign"). Note also dilatation of intrahepatic bile ducts (IHBD)

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

增强 CT（曲面重建）显示累及胰头和胰体的等密度实性肿块（星号所示）伴有远端主胰管扩张（箭头所示）。

>=< 进阶知识

MRCP 显示无痛性黄疸患者的胆总管 (CBD) 和主胰管 (PD) 扩张（即“双管征”）。此外，还应注意肝内胆管扩张 (IHBD)

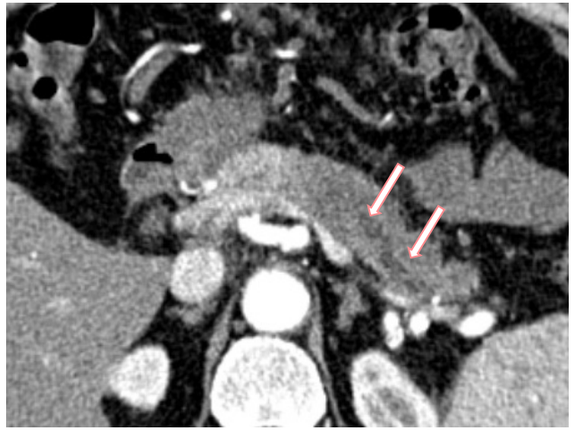
<!> ATTENTION

Pancreatic ductal adenocarcinoma often shows **increased glucose metabolism** at PET/CT.

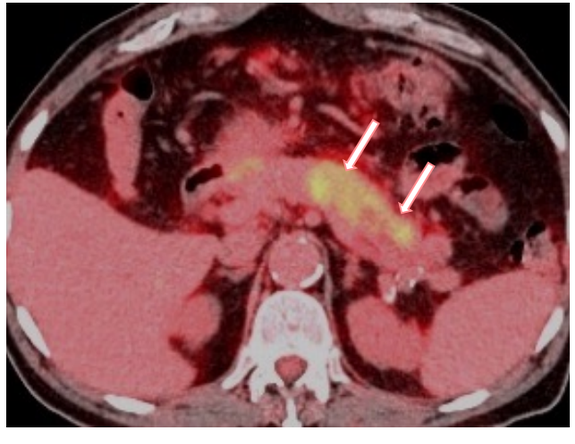
PET/CT is mostly used for the **detection of distant metastases (M-staging)** rather than for locoregional staging. PET/CT has a limited value for the distinction between tumour and inflammation.

<∞> REFERENCE

> See also e-Book chapter on Nuclear Medicine



Contrast-enhanced CT (pancreatic phase) shows a hypodense lesion of the left portion of the pancreatic body and dilatation of the distal pancreatic duct (arrows) in a patient with pancreatic adenocarcinoma.



Same patient as in the image on the left. 18-FDG PET/CT shows increased FDG uptake of the left portion of the pancreatic body (arrows).

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

章节大纲：

<!> 注意

胰腺导管腺癌通常在 PET/CT 时显示**葡萄糖代谢增加**。

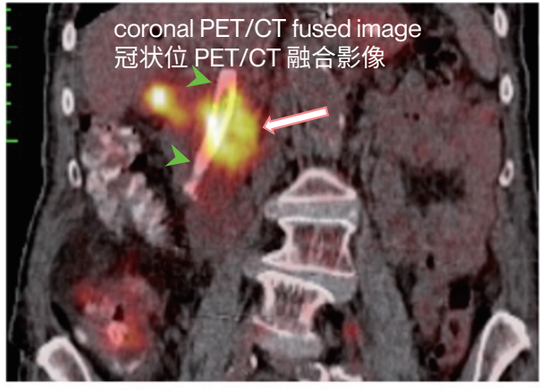
PET/CT 多用于**远处转移的检测（M 分期）**，而非用于局部分期。PET/CT 在区分肿瘤和炎症方面的价值有限。

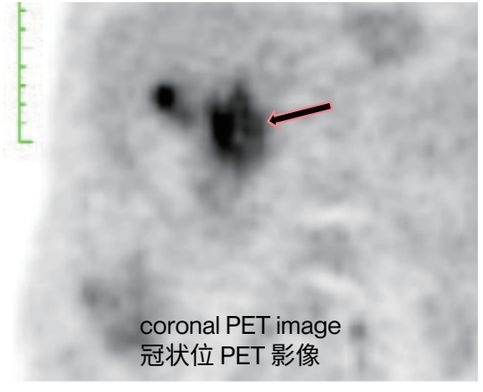
<∞> 参考文献

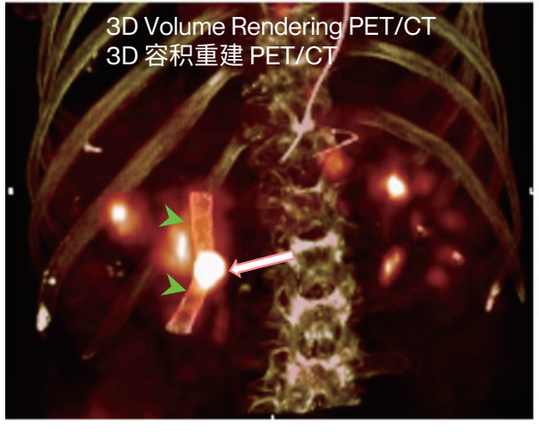
> 另请参阅《核医学》电子书章节

增强 CT（胰腺期）显示胰腺癌患者胰腺体部左侧低密度病变伴有远端胰管扩张（箭头所示）。

与左图中的患者一样。18-FDG PET/CT 显示胰体左侧 FDG 摄取增加（箭头所示）。







18-FDG PET/CT of advanced pancreatic tumour after palliative placement of biliary metallic endoprosthesis (arrowheads) for obstructive jaundice. Increased glucose metabolism of the tumour (arrows). Note position of the tumour around the biliary endoprosthesis.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

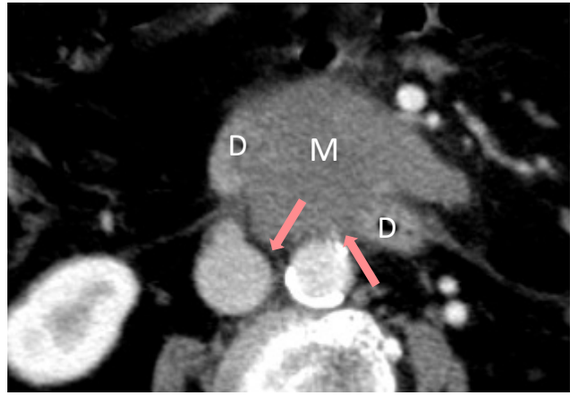
章节大纲：

晚期胰腺肿瘤患者，在放置胆道金属支架（三角箭头）以缓解梗阻性黄疸后，再进行 18-FDG PET/CT 检查。肿瘤葡萄糖代谢增加（箭头所示）。注意胆管内假体周围肿瘤的位置。

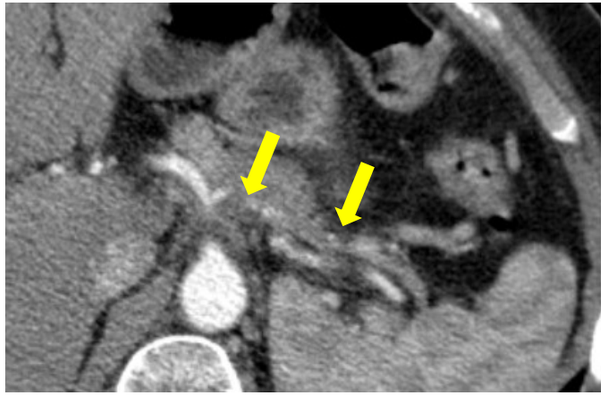
/ Staging of Pancreatic Ductal Adenocarcinoma

<!> ATTENTION

By showing infiltration of the peripancreatic tissues and organs and of nearby large vessels, cross-sectional imaging provides important information regarding **advanced tumour manifestations indicating non-resectability for cure**.



Abdominal CT (pancreatic phase). Large non-enhancing solid mass of the pancreatic head and uncinate process (M), infiltrating the retroperitoneal fatty tissue (arrows) indicating advanced disease (T3). D = duodenum.



Abdominal CT (arterial phase). The tumor infiltrates the celiac axis and the splenic artery (arrows) indicating advanced disease (T4) and unresectability for cure.

CHAPTER OUTLINE:

/ 胰腺导管腺癌分期

章节大纲：

<!> 注意

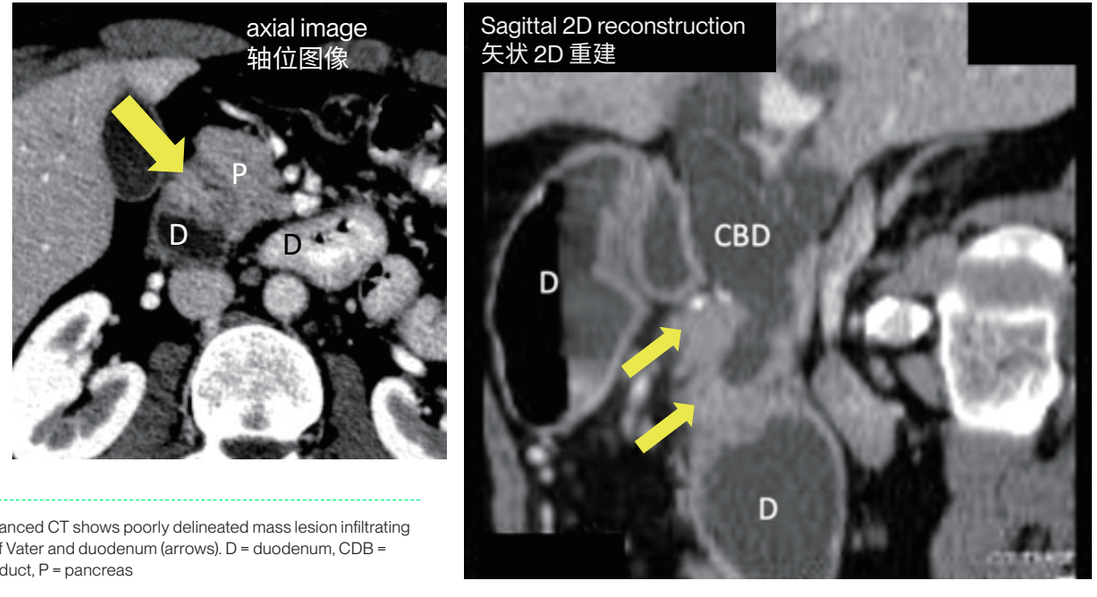
通过显示胰周组织和器官以及附近大血管的浸润，横断位成像提供了关于晚期肿瘤表现的重要信息，表明当前不可根治性切除。

腹部 CT（胰腺期）。胰头和钩突较大不强化实性肿块 (M)，浸润腹膜后脂肪组织（箭头所示），提示晚期疾病 (T3)。D = 十二指肠。

腹部 CT（动脉期）。肿瘤浸润腹腔干和脾动脉（箭头所示），提示疾病处于晚期 (T4) 且无法治愈。

/ Ampullary Adenocarcinoma

Ampullary adenocarcinomas often present at imaging with a **double duct sign**. Large tumours may protrude into the 2nd part of the duodenum; however, smaller lesions may be entirely occult. **Endoscopic biopsy is the method of choice** to distinguish between ampullary carcinoma and pancreatic ductal adenocarcinoma.



Contrast-enhanced CT shows poorly delineated mass lesion infiltrating the ampulla of Vater and duodenum (arrows). D = duodenum, CDB = common bile duct, P = pancreas

CHAPTER OUTLINE:

/ 壶腹部腺癌

壶腹部腺癌在影像学上常表现为双管征。大肿瘤可凸入十二指肠降部；然而小的病变可能完全隐匿。**内镜活检是区分壶腹癌和胰腺导管腺癌的首选方法。**

章节大纲：

增强 CT 显示边界不清的肿块病变浸润壶腹和十二指肠（箭头所示）。D = 十二指肠，CDB = 胆总管，P = 胰腺

Pancreatic Neuroendocrine Neoplasms (panNENs)

Among solid epithelial pancreatic tumours, **pancreatic neuroendocrine neoplasms (panNENs)** are much less common than ductal adenocarcinoma. The **WHO classification** distinguishes between well- differentiated variants of neuroendocrine tumours (panNETs), poorly differentiated variants or neuroendocrine carcinomas (panNECs), and mixed neuroendocrine/non-neuroendocrine neoplasms (MiNENs). Well differentiated panNETs may be functionally active, producing clinical symptoms according to their cellular origin and peptide production, e.g.,

- Insulinoma > hypoglycemia
- Glucagonoma > glucose intolerance
- Gastrinoma > Zollinger-Ellison syndrome
- Vasoactive intestinal peptide tumours (VIPoma) > watery diarrhoea

Because of their symptoms, these tumours are often diagnosed in an **earlier stage** than functionally inactive tumours. Although the majority of panNETs is sporadic, around 10% occur in the context of an endocrine syndrome such as **multiple endocrine neoplasia (MEN-1), neurofibromatosis or tuberous sclerosis**.

<!> ATTENTION

On cross-sectional dynamic imaging panNETs typically appear as **solid, hypervascular tumours**. However, it must be kept in mind that they can also be of **cystic** appearance and that they can be **multiple**. Multiphasic contrast-enhanced CT is considered the **first choice for imaging** although multiphasic MRI is very well suited to detect even very small panNENs. Scintigraphy and 68-Ga DOTATATE–PET may be used to localise small functional panNETs.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

胰腺神经内分泌肿瘤 (panNEN)

在实体上皮胰腺肿瘤中在实体上皮源性胰腺肿瘤中，**胰腺神经内分泌肿瘤 (panNEN) 的发生率**远低于胰腺导管腺癌。**WHO 分类**对胰腺神经内分泌肿瘤 (panNETs) 的高分化亚型、低分化亚型或神经内分泌癌 (panNECs) 以及混合性神经内分泌/非神经内分泌肿瘤 (MiNENs) 进行了区分。高分化胰腺神经内分泌肿瘤 (panNETs) 可能具有功能活性，根据其细胞起源和肽类分泌情况而引发相应临床症状，例如：

- 胰岛素瘤 > 低血糖
- 胰高血糖素瘤 > 葡萄糖不耐受
- 胃泌素瘤 > Zollinger-Ellison 综合征
- 血管活性肠肽瘤 (VIPoma) > 水样腹泻

由于其症状，这些肿瘤通常比无功能肿瘤在**更早期**确诊。尽管大多数 panNETs 为散发性，但约 10% 的病例发生于内分泌综合征背景下，如**多发性内分泌腺瘤病（MEN-1型）、神经纤维瘤病或结节性硬化症**。

<!> 注意

在横断位动态成像中，panNETs 通常表现为血管丰富的实体肿瘤。但必须记住，他们也可能呈囊性外观，且可能为多发性。多期增强 CT 被认为是首选的影像学检查方式，但多时相 MRI 非常适合检测微小的 panNENs。闪烁显像和 68-Ga DOTATATE–PET 可用于定位小型功能性 panNETs。

/ PanNET: Insulinoma

<!> ATTENTION

Most (but not all) insulinomas are **hypervascular**!

Multiphasic CT (pancreatic phase) shows a rounded, solid strongly enhancing mass in the pancreatic head (arrow). **Portal phase** shows decreased enhancement of the mass (arrow), so-called "washout phenomenon".

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

章节大纲：

/ 高分化胰腺神经内分泌肿瘤：胰岛素瘤

<!> 注意

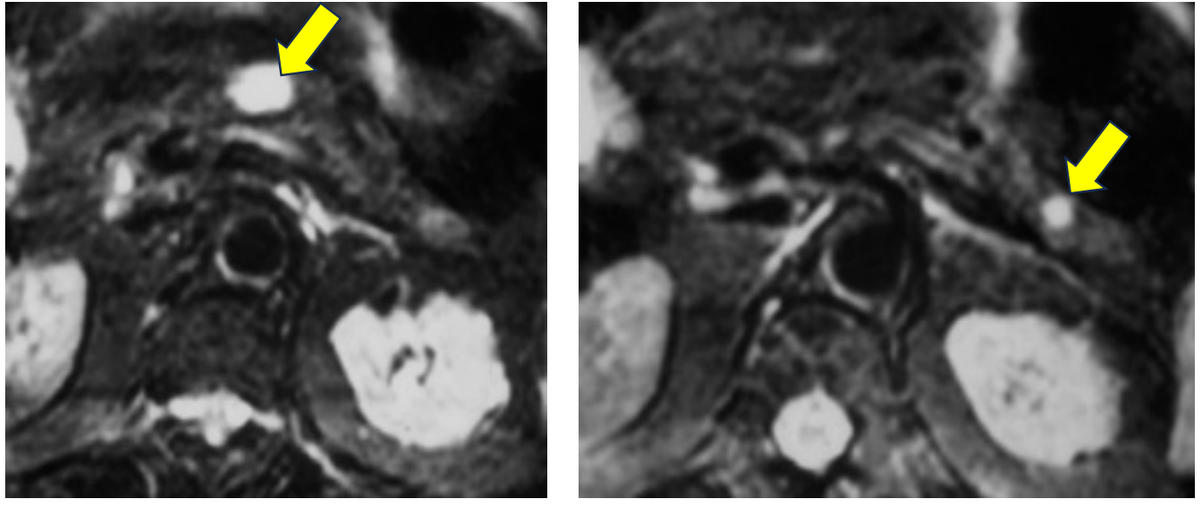
大多数（但非全部）胰岛素瘤都为**富血供肿瘤**！

多期增强 CT（胰腺期）显示胰头中有一圆形实性强化肿块（箭头所示）。**门静脉期**显示肿块强化减弱（箭头所示），即所谓的"廓清现象"。

/ Multifocal Insulinoma of the Pancreatic Body and Tail

<!> ATTENTION

Insulinomas can be **multifocal**!
Insulinomas can be **cystic**!



MRI (axial T2-weighted images with fat saturation) shows multiple rounded, hyperintense lesions in the, body and tail of the pancreas (arrows)

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

章节大纲：

/ 胰体尾多灶性胰岛素瘤

<!> 注意

胰岛素瘤可为多灶性！
胰岛素瘤可呈囊性！

MRI（轴位 T2WI 脂肪抑制序列）显示胰腺体部和尾部有多个圆形高信号病灶（箭头所示）

/ Cystic Neoplasms of the Pancreas

True **cystic pancreatic neoplasms** are much less common than pancreatic ductal adenocarcinoma and include a variety of different entities.

Examples for **benign** lesions are serous microcystic adenomas. Although mucinous cystic neoplasm and the intraductal papillary mucinous neoplasm (IPMN) are also of benign origin, they are **potentially** malignant as they may undergo transformation into mucinous cystadenocarcinoma.

Although some cystic pancreatic neoplasms, e.g., serous microcystic adenomas or ductal IPMN have characteristic imaging features, others may be difficult to characterise regarding their aetiology. Follow-up and/or image-guided aspiration biopsy may thus be needed because treatment depends on precise lesion characterisation.

<!> ATTENTION

Because high resolution MRCP is increasingly being used for biliary conditions, ductal cystic lesions are a common unexpected finding and must be distinguished from potentially malignant lesions. Follow-up of ductal cysts >1cm is, therefore, often recommended although guidelines regarding follow-up may differ.

CHAPTER OUTLINE:

/ 胰腺囊性肿瘤

章节大纲：

真性**胰腺囊性肿瘤**比胰腺导管腺癌少见得多，包括多种不同的类型。

良性病变的示例有浆液性微囊腺瘤。尽管黏液性囊性肿瘤和导管内乳头状黏液性肿瘤 (IPMN) 也是良性起源，因存在恶变为黏液性囊腺癌的风险，故具有**潜在**恶性。

尽管一些囊性胰腺肿瘤（例如微囊性浆液性囊腺瘤或 IPMN）具有特征性的影像学特征，但其他肿瘤的病因可能难以确定。因此，可能需要随访和/或影像引导下的穿刺活检，因为治疗方案取决于病变的精准定性。

<!> 注意

由于高分辨率 MRCP 越来越多地用于胆道疾病，导管囊性病变属于影像检查中意外发现的常见解剖变异，必须与潜在的恶性病变区分开。因此，通常推荐对 > 1 cm 的导管囊肿进行随访，但随访指南可能不同。

/ Serous Microcystic Adenoma

Serous microcystic adenomas are benign tumours which have a characteristic **sponge-like or 'honeycomb' structure** with multiple fibrous septa caused by small cysts. The size of individual cysts is usually <10mm in diameter.

Serous adenomas contain a glycogen-rich, non-viscous fluid without mucinous components which can be analysed by means of image-guided fine-needle aspiration.

<!> ATTENTION

Typical cross-sectional imaging features include moderately enhancing septa within a microcystic structure, commonly including calcifications in the central area. Despite their often-considerable size these tumours **do not** tend to displace or infiltrate the adjacent anatomical structures. e.g., bile ducts or vessels.

/ 微囊性浆液性囊腺瘤

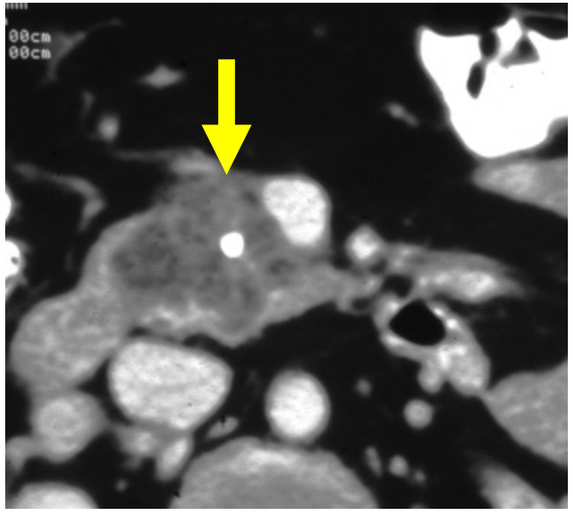
微囊性浆液性囊腺瘤是良性肿瘤，具有特征性的**海绵状或“蜂窝”结构**，并伴有小囊肿引起的多个纤维间隔。单个囊肿的直径通常< 10 mm。

浆液性囊腺瘤含有富含糖原的非黏性液体，可通过影像引导的细针抽吸进行分析。

<!> 注意

典型的横断位影像学特征包括微囊性结构内中度增强的间隔，通常包括中央区域钙化。尽管这些肿瘤通常比较大，但不会使邻近解剖结构（如胆管或血管）移位或发生浸润。

/ Serous Microcystic Adenoma: CT Features



Contrast-enhanced CT (portal phase) showing the typical pattern of serous microcystic adenoma of the pancreatic head with a central calcification (arrow).

Contrast-enhanced CT (portal phase) showing. large serous microcystic adenoma of the pancreatic corpus and tail. Note multiple septal calcifications (arrows).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺** 和**脾脏** 影像学

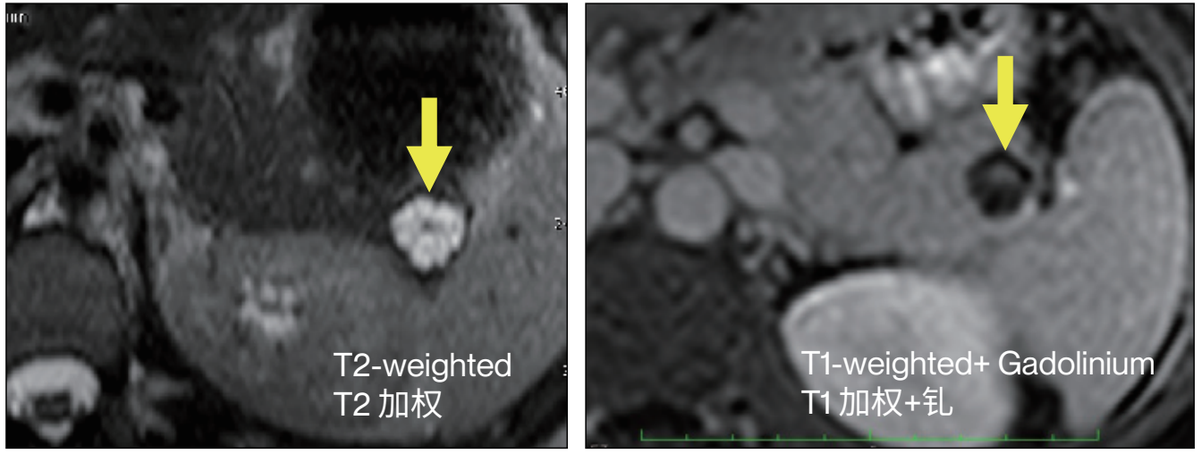
/ 微囊性浆液性囊腺瘤：CT 特征

章节大纲：

增强 CT（门静脉期）显示典型的胰头微囊性浆液性囊腺瘤伴有中心钙化（箭头所示）。

增强 CT（门静脉期）显示胰体尾的较大微囊性浆液性囊腺瘤。注意多发间隔钙化（箭头所示）。

/ Serous Microcystic Adenoma: MRI Features



MRI T2-weighted image (left) showing the typical pattern of a microcystic septated lesion in the pancreatic tail (arrow).**T1-weighted image after injection of a Gd-based contrast material** (right) shows a mainly hypovascular lesion with some central enhancement. These MRI features are typical of microcystic adenoma.

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

/ 微囊性浆液性囊腺瘤：MRI 特征

章节大纲：

MRI (T2WI)（左图）显示了胰尾典型的微囊分隔病变（箭头所示）。**T1WI 增强检查**（右图）显示了以低血管为主的病变，伴有一些中心增强。这些 MRI 特征是微囊性囊腺瘤的典型特征。

/ Mucinous Cystic Neoplasms

Pancreatic mucinous cystadenoma is a benign condition which occurs mainly in women and is characterised by **mucin-producing epithelial cells and an ovarian-type stroma**. However, it may undergo malignant transformation into carcinoma in situ or invasive mucinous cystadenocarcinoma. Therefore, surgical removal is usually indicated. The prognosis after resection is favourable.

Percutaneous or endoscopically-guided fine-needle aspiration can be used to confirm the nature of these lesions by examining aspirated fluid for carcino-embryonic antigen (CEA), viscosity, mucin content, and cytology.

<!> ATTENTION

On cross-sectional imaging, mucinous cysts have typically **no communication** with the pancreatic ductal system; they are often larger than 2 cm and have an enhancing wall.

A thick irregular wall and intracystic polypoid masses are signs of **malignant** transformation.

CHAPTER OUTLINE:

章节大纲：

/ 黏液性囊性肿瘤

胰腺黏液性囊腺瘤是一种良性疾病，多见于女性患者，以分泌黏液的上皮细胞和卵巢型基质为特征，但有可能恶变为原位癌或浸润性黏液性囊腺癌。因此，通常建议手术切除。术后预后良好。

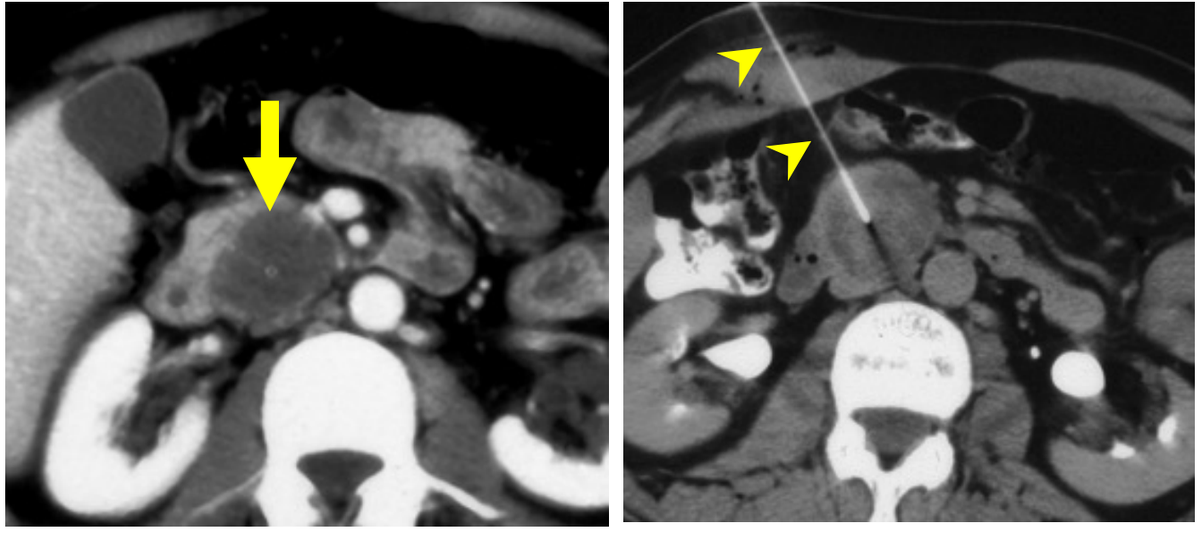
经皮或内镜引导下的细针穿刺可通过检测抽吸液的癌胚抗原(Carcino-Embryonic Antigen, CEA)、黏度、黏蛋白含量和细胞学指标来确认这些病变的性质。

<!> 注意

横断位成像检查显示，黏液囊肿通常与胰管系统不连通；囊肿通常大于2 cm，囊壁强化。

厚而不规则的囊壁和囊内息肉样肿块是恶性转化的征象。

/ Mucinous Cystadenoma: CT Imaging Features



CT (pancreatic phase) showing a large slightly inhomogeneous cystic mass without clear internal structure (arrow, left image). No specific clinical signs of pancreatitis. Result of **CT-guided fine-needle aspiration** confirmed the diagnosis of mucinous cystadenoma. Arrowheads point at aspiration needle placed under CT guidance (right image).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

章节大纲：

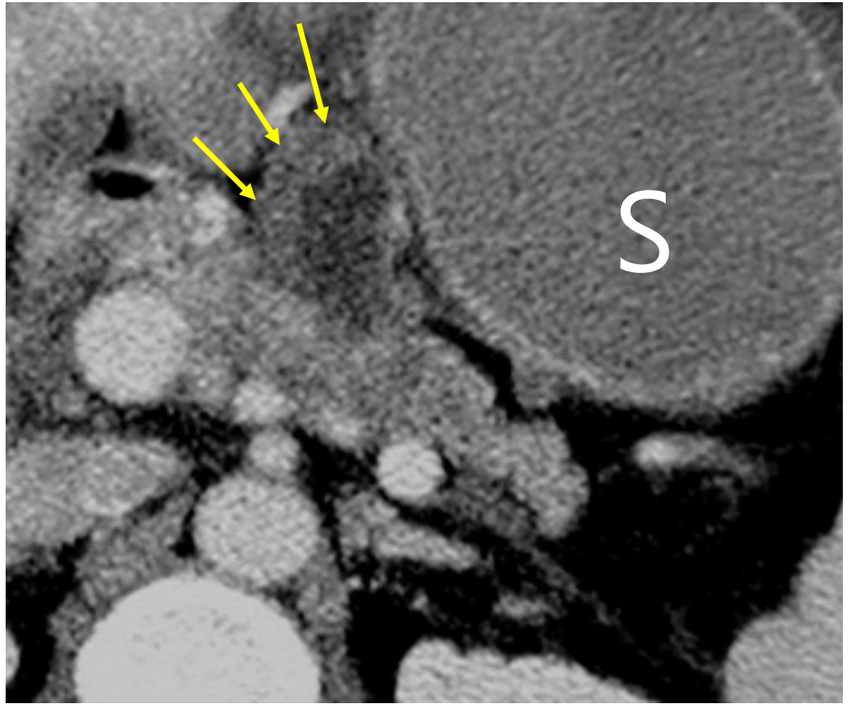
/ 黏液性囊腺瘤：CT 影像学特征

CT（胰腺期）显示较大的轻度不均匀的囊性肿块，无清晰的内部结构（箭头所示，左图）。无胰腺炎的特定临床体征。**CT 引导下细针穿刺抽吸活检结果确诊为黏液性囊腺瘤。**箭头所指位置为 CT 引导下的穿刺针（右图）。

/ Mucinous Cystadenocarcinoma

<!> ATTENTION

Malignant transformation of a mucinous cystadenoma of the pancreas. Note irregular wall thickening!



CT (portal phase) showing cystic lesion of the pancreas with inhomogeneous wall thickening (arrows) indicating malignancy. S = stomach

CHAPTER OUTLINE:

/ 黏液性囊腺癌

章节大纲：

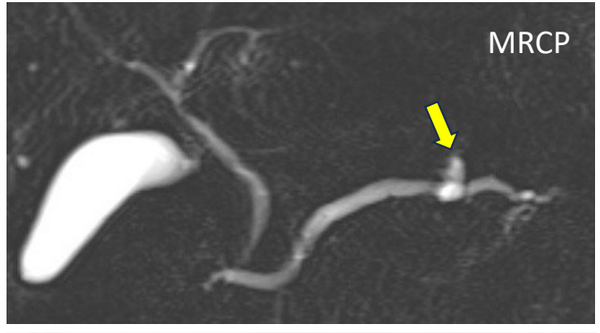
<!> 注意

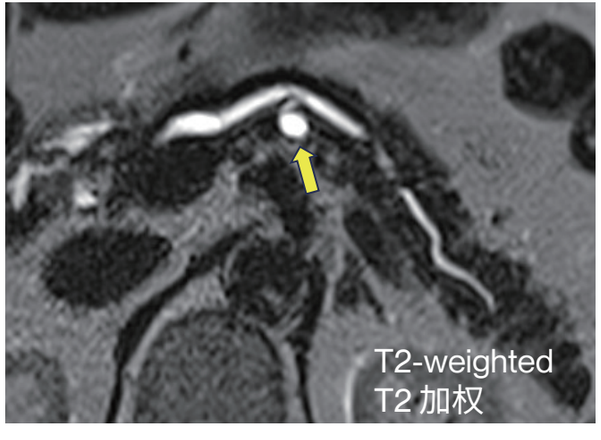
胰腺黏液囊腺瘤恶性转化。注意囊壁的不规则增厚！

CT（**门静脉期**）显示胰腺囊性病变伴不均匀壁增厚（箭头所示），提示恶性肿瘤。S = 胃

/ Benign Pancreatic Ductal Cyst (Branch Duct Type)

MRI shows a non-enhancing small cystic lesion of 2nd order branch in contact with main duct.





CHAPTER OUTLINE:

/ 良性胰管囊肿（分支型）

MRI 显示与主胰管接触的二级分支无强化的小囊性病变。

章节大纲：

/ Intraductal Papillary Mucinous Neoplasia (IPMN)

Intraductal papillary mucinous neoplasias (IPMN) are caused by papillary proliferation of intraductal dysplastic mucinous cells, leading to ductal dilatation. Based on their macroscopic appearance, they can be divided into **main duct type, branch duct type and mixed-type lesions**. Histologically, IPMN may undergo **transition** from cystadenoma to borderline malignant cystic neoplasms and to intraductal papillary mucinous adenocarcinoma with or without invasion of the surrounding tissues.

On cross-sectional imaging studies with CT, MRI, US or EUS, IPMN may appear as single or multiple cystic lesions. Typically, **there is communication** with the pancreatic ductal system. IPMN may also appear as diffuse or segmental ectasia of the main pancreatic duct or side branches.

Depending on the degree of papillary proliferation, the lesions may have an inhomogeneous internal enhancement and and enhancing wall. Advanced malignancies may show irregularities in the structure of their wall and even invasion of the adjacent tissue.

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 导管内乳头状黏液性肿瘤 (IPMN)

/ 胰腺和脾脏影像学

章节大纲：

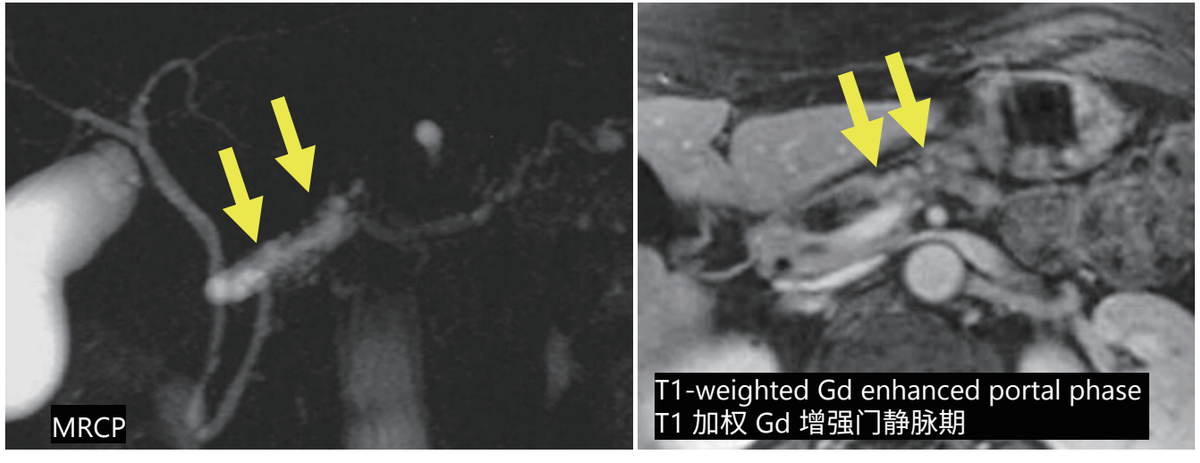
导管内乳头状黏液性肿瘤 (Intraductal Papillary Mucinous Neoplasia, IPMN) 是由导管内发育不良的黏液细胞乳头状增生引起导管扩张所致。根据其大体外观可分为**主胰管型、分支胰管型和混合型**。在组织学上，IPMN 可能从良性囊性肿瘤**转化**为交界性恶性囊性肿瘤和导管内乳头状黏液腺癌，伴或不伴周围组织浸润。

在 CT、MRI、US 或 EUS 横断位成像检查中，IPMN 可能表现为单发或多发囊性病变。通常，与胰腺导管系统**存在连通**。IPMN 也可表现为主胰管或分支胰管的弥漫性或节段性扩张。

根据乳头状增生的程度，病变可能有不均匀的内部和壁结节的强化。晚期恶性肿瘤可能表现为瘤壁结构不规则，甚至侵犯邻近组织。

/ IPMN, Segmental Main Duct Type

In main duct type IPMN (main duct dilatation >5mm), there is segmental pancreatic duct ectasia. Solid enhancing mural ductal nodules are suspicious for malignant transformation.



MRI shows segmental ectasia of main pancreatic duct on MRCP and irregular intraductal enhancement after injection of a Gadolinium-based contrast material (arrows).

CHAPTER OUTLINE:

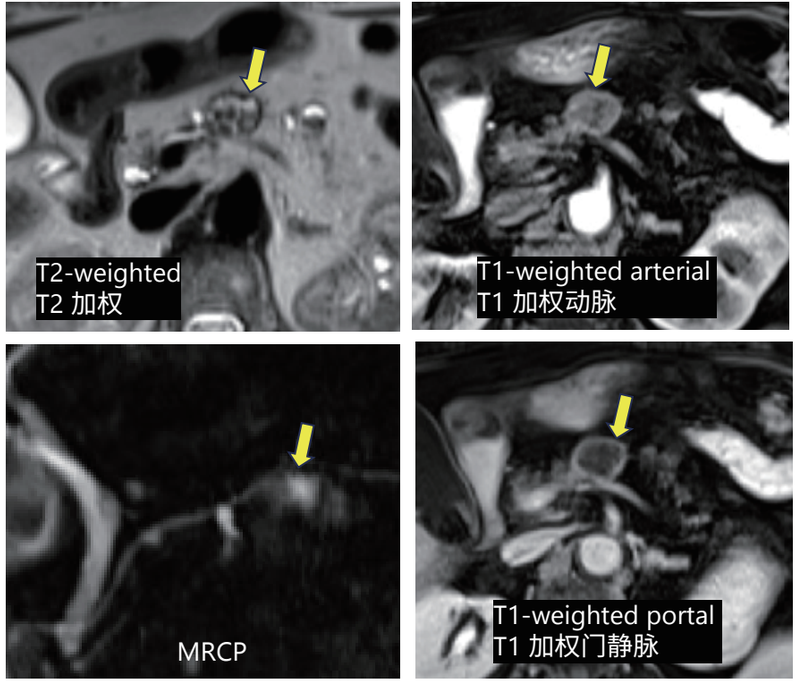
/ IPMN（主胰管局限型）

主胰管型 IPMN（主胰管扩张 > 5 mm）存在节段性胰管扩张。有实性强化的壁结节应怀疑恶变。

章节大纲：

MRI 显示主胰管在 MRCP 上呈节段性扩张，注射钆对比剂后胰管内不规则增强（箭头所示）。

/ Cystic Pancreatic Neoplasm with Internal Papillary Proliferation: MRI Features



MRI (different sequences) shows a small rounded, cyst-like mass adjacent to the main pancreatic duct but without proof of ductal communication. (arrow).
Note papillary-shaped, inhomogeneous enhancing content, with partly solid enhancing wall (arrow).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

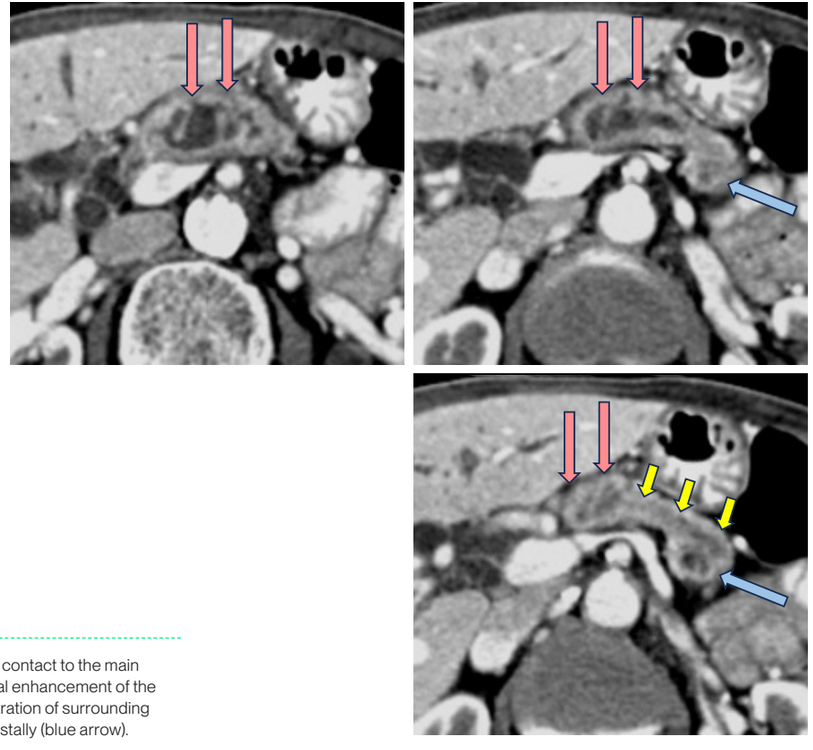
/ **胰腺** 和**脾脏** 影像学

/ 囊性胰腺肿瘤伴乳头状内增生：MRI 特征

章节大纲：

MRI（不同序列）显示主胰管附近有一个圆形小囊肿样肿块，但无胰管连通的证据（箭头所示）。
注意乳头状、不均匀强化内容物，部分实性强化壁（箭头所示）。

/ Malignant IPMN, Main Duct Type



CT (portal phase) showing a lesion (pink arrows) with contact to the main pancreatic duct (yellow arrows). Note irregular internal enhancement of the lesion, thickening of the wall, as well as beginning infiltration of surrounding fatty tissue. Note that there is a second lesion more distally (blue arrow).

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

章节大纲：

/ 恶性 IPMN（主胰管型）

CT（门静脉期）显示病变（粉色箭头）与主胰管相通（黄色箭头）。注意病变内部不规则强化、壁增厚以及周围脂肪组织开始浸润。请注意，更远端有第二个病变（蓝色箭头）。

/ Cystic Lesions of the Pancreas: Analysis of Aspirated Material

	AMYLASE	CEA*	VISCOSITY	MUCIN	CYTOLOGY
Serous cystadenoma	+/-	-	-	-	glycogen-rich
Mucinous cystadenoma	+/-	+++	++	++	mucinous
Intraductal Papillary Mucinous Neoplasms (IPMN)	++	++	++	+	mucinous
Pseudocyst	+++	-	-	-	(inflammatory)

* Carcino-Embryonic Antigen

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺** 和**脾脏** 影像学

章节大纲：

/ 胰腺囊性病变：抽吸物分析

	淀粉酶	癌胚抗原*	黏度	粘蛋白	细胞学检查
浆液性囊腺瘤	+/-	-	-	-	富含糖原
黏液性囊腺瘤	+/-	+++	++	++	黏液性
导管内乳头状黏液性肿瘤 (IPMN)	++	++	++	+	黏液性
假性囊肿	+++	-	-	-	（炎性）

*癌胚抗原

Splenic Pathologies

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

脾脏疾病

Splenic Pathologies

A variety of pathologic conditions can affect the spleen. Very often the spleen is the site of **secondary manifestations of systemic disorders** rather than the site of origin. **Splenomegaly** is a common feature in haematopoietic diseases (e.g., thrombocytosis, extramedullary haematopoiesis) but splenomegaly also occurs in the context of portal hypertension. Diffuse splenic infiltrative processes can also be the consequence of infectious, granulomatous and metabolic disorders or secondary manifestations of malignancy (e.g., lymphoma, leukaemia, metastatic melanoma).

Primary focal splenic lesions are infrequent and often present without symptoms. A pattern approach to the diagnosis of splenic lesions includes the distinction between single and multiple lesions, between cystic and solid lesions and between hypervascular and hypovascular lesions. Primary cystic lesions of the spleen are often benign (e.g., epithelial, hydatid cysts or lymphangioma). However, solid lesions can be benign (e.g., hamartoma, haemangioma, extramedullary haematopoiesis) or malignant (e.g., lymphoma, metastasis, sarcoma). Because the imaging features may overlap, distinguishing between benign and malignant lesions on the basis of imaging alone can be very challenging.

From a differential diagnostic point of view, it is important to mention **splenunculus (accessory spleen)** because it can be mistaken for a neoplastic mass.

Finally, **traumatic splenic injuries** are common in the context of severe blunt abdominal trauma, and imaging plays a crucial role in conservative management.

CHAPTER OUTLINE:

脾脏疾病

章节大纲：

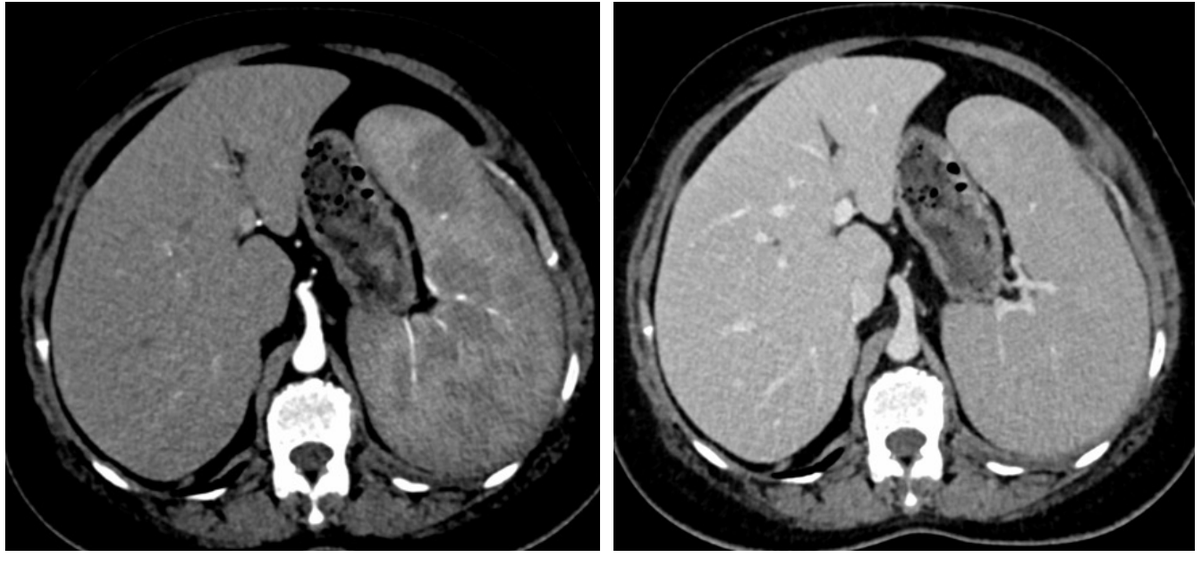
多种病理状况可累及脾脏。脾脏常是**全身性疾病继发表现**的部位，而非原发病灶。**脾肿大**是造血系统疾病的常见特征（例如血小板增多、髓外造血），亦可见于门静脉高压症。弥漫性脾浸润亦可继发于感染、肉芽肿或代谢性疾病，或为恶性肿瘤（如淋巴瘤、白血病、转移性黑色素瘤）的继发表现。

原发性局灶性脾病变并不常见，通常无症状。诊断脾脏病变的模式包括区分单发和多发病变、区分囊性和实性病变，以及区分血供丰富和血供不足的病变。脾脏原发性囊性病变通常为良性（例如，上皮性、包虫性囊肿或淋巴管瘤）。但是，实体病变可能是良性的（例如错构瘤、血管瘤、髓外造血）或恶性的（例如淋巴瘤、转移、肉瘤）。由于影像学特征可能重叠，仅凭影像学表现常难以鉴别良恶性病变。

从鉴别诊断的角度来看，需提及**脾（副脾）**因其易被误诊为肿瘤。

最后，**外伤性脾损伤**在腹部严重钝性损伤中很常见，影像学检查在保守治疗中起着至关重要的作用。

/ Splenomegaly



Multiphasic contrast enhanced CT (arterial phase on the left, portal venous phase on the right) show splenomegaly in a patient with acute myeloid leukaemia. Compare with images on page 9 showing a normal sized-spleen.

CHAPTER OUTLINE:

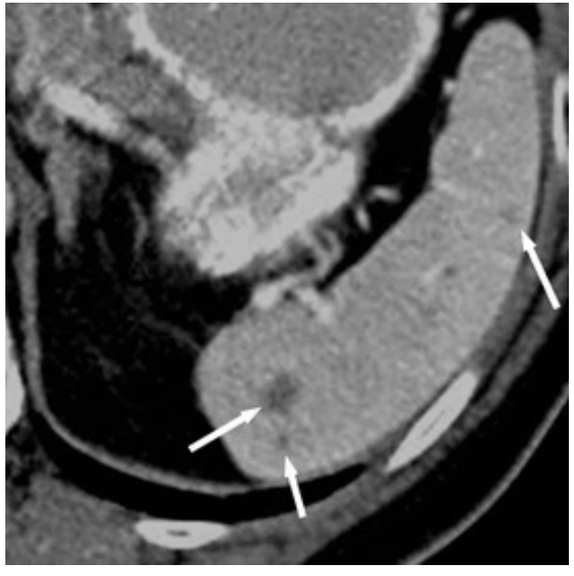
/ 脾肿大

章节大纲：

多期增强 CT（左侧动脉期，右侧门静脉期）显示急性髓系白血病患者的脾肿大。与第 9 页正常脾脏大小的图片进行比较。

/ Focal Benign Splenic Lesions

Lymphangioma: CT (portal venous phase) showing a hypodense cystic mass lesion of the spleen with thin septa (arrow).



Sarcoidosis: CT (portal venous phase) showing multiple solid hypodense mass lesions of the spleen (arrows).

Images from: Karlo CA, Stolzmann P, Do RK, Alkadhi H. Computed tomography of the spleen: how to interpret the hypodense lesion. Insights Imaging (2013) 4:65–76

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

/ 脾脏局灶性良性病变

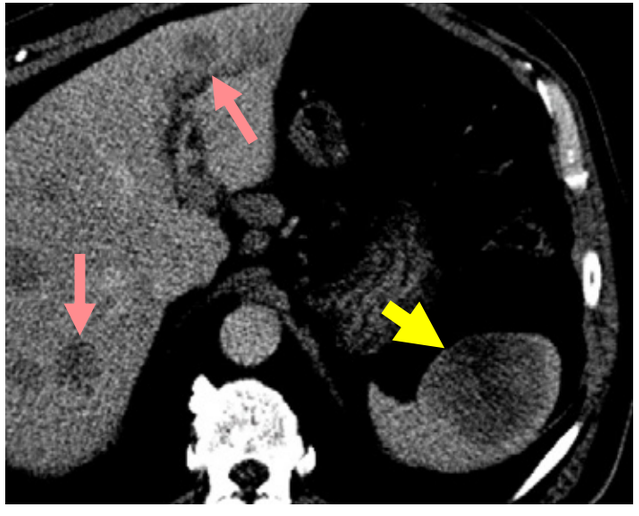
章节大纲：

淋巴管瘤：CT（门静脉期）显示脾内一处低密度囊性肿块，内见薄分隔（箭头所示）。

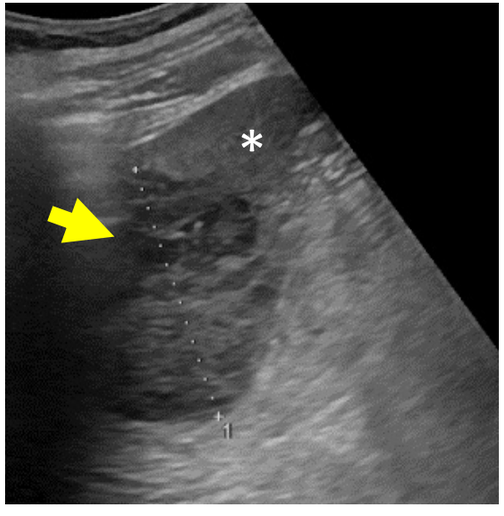
结节病：CT（门静脉期）显示脾脏多发性实性低密度肿块病变（箭头所示）。

图片来源：Karlo CA, Stolzmann P, Do RK, Alkadhi H. Computed tomography of the spleen: how to interpret the hypodense lesion. Insights Imaging (2013) 4:65–76

/ Focal Malignant Splenic Lesions



CT (portal venous phase) showing a hypodense solid mass lesion of the spleen (yellow arrow) in the context of **sytemic malignant lymphoma.** Note two additional nodules in the liver (pink arrows).



US showing the spleenic tumour (arrow). The tumour is solid and hypoechoic compared to normal splenic parenchyma (asterisk). Histologic diagnosis was **spleen lymphoma.**

Images courtesy: Oskar Bozek, MD, Department of Radiodiagnostics and Invasive Radiology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Poland.

/ 局灶性恶性脾脏病变

CT（门静脉期）显示**恶性淋巴瘤**背景下脾脏低密度实质性肿块病变（黄色箭头）。注：肝脏中另有两个结节（粉色箭头）。

US 显示脾脏肿瘤（箭头所示）。与正常脾实质相比，肿瘤为实性且低回声（星号所示）。组织学诊断为**脾淋巴瘤。**

图片来源：Oskar Bozek 医学博士（卡托维兹医学院放射诊断与介入放射学系，波兰西里西亚医科大学）。

Blunt Trauma

Pancreas and Spleen Imaging

胰腺和脾脏影像学

CHAPTER OUTLINE:

章节大纲：

钝性损伤

/ Blunt Trauma: Pancreatic Injuries

Blunt pancreatic injuries usually occur in the context of severe deceleration through direct impact or a shearing mechanism against the spine and are much less common than blunt splenic injuries. According to the **organ injury scale of the American Association for Surgery of Trauma (AAST)** the severity of blunt pancreatic injuries ranges from contusion or laceration without ductal injury or tissue loss to complete transection including ductal rupture distally (= left of the SMV) complete proximal transection with ductal rupture proximally (= to the right of the SMV) and to massive disruption of the pancreatic head. Leakage of pancreatic juice may lead to posttraumatic acute pancreatitis.

<!> ATTENTION

CT is usually the first-line examination and well-suited for follow-up. However, the severity of blunt pancreatic injuries is often difficult to assess at the time of initial examination because morphologic changes in the form of acute posttraumatic pancreatitis develop only after hours or even days after trauma.

Follow-up imaging in the posttraumatic phase plays an important role conservative treatment monitoring. Potential complications are due to acute pancreatitis following ductal injuries and include pseudocysts, arterial pseudoaneurysms, haemorrhage, and infection.

MRCP is the **method of choice** for non-invasive assessment of posttraumatic **ductal Injuries**.

CHAPTER OUTLINE:

/ 钝性损伤：胰腺损伤

章节大纲：

胰腺钝性损伤通常发生于直接撞击或剪切机制导致脊柱严重减速的情况下，比脾脏钝挫伤少见得多。根据**美国创伤外科协会 (AAST) 器官损伤量表**，胰腺钝性损伤的严重程度从挫伤或裂伤（无胰管损伤或组织丢失）到完全横断（包括胰管远端破裂 [即 SMV 左侧]）、完全近端横断伴胰管近端破裂（即 SMV 右侧）和胰头严重破坏不等。胰液渗漏可能导致创伤后急性胰腺炎。

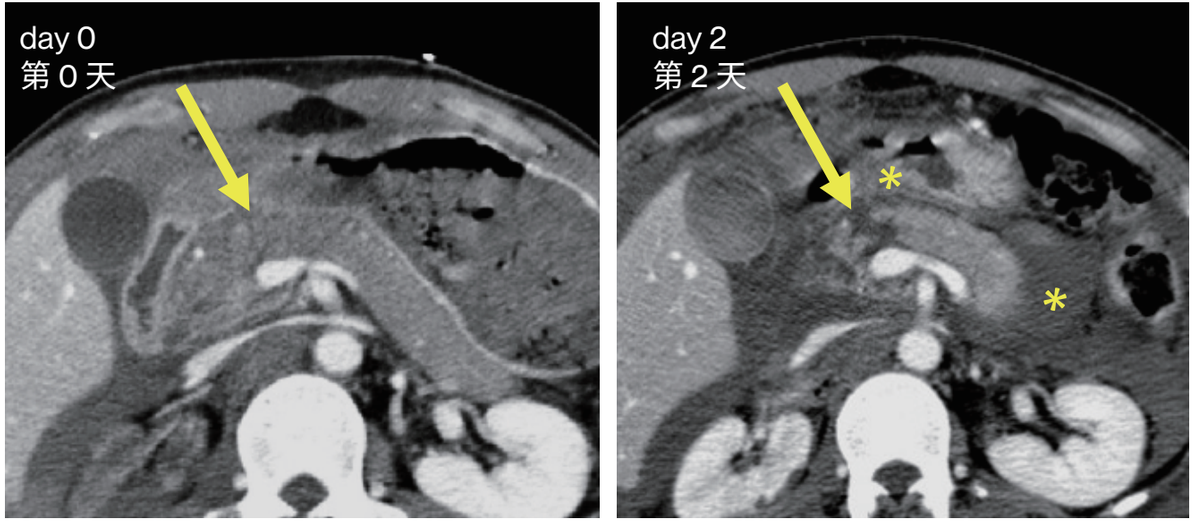
<!> 注意

CT 通常是一线检查，非常适合随访。但在初次检查时往往难以评估胰腺钝挫伤的严重程度，因为仅在创伤后数小时甚至数日后才会发生急性创伤后胰腺炎的形态学改变。

创伤后随访影像学检查在保守治疗监测中起着重要作用。导管损伤后的急性胰腺炎可能引起并发症，包括假性囊肿、动脉假性动脉瘤、出血和感染。

MRCP 是创伤后**胰管损伤**非有创评估的首选**方法**。

/ Blunt Pancreatic Injuries: Proximal Transection



Importance of follow-up scanning in suspected pancreatic injury. CT obtained immediately after blunt abdominal trauma (day 0, left) shows diffuse swelling in the region of the pancreatic neck (arrow). CT after 48 hr (right) shows a devascularised portion of the pancreatic neck (arrow) indicating transection, as well as a peripancreatic fluid collection (asterisks), indicating the development of posttraumatic pancreatitis.

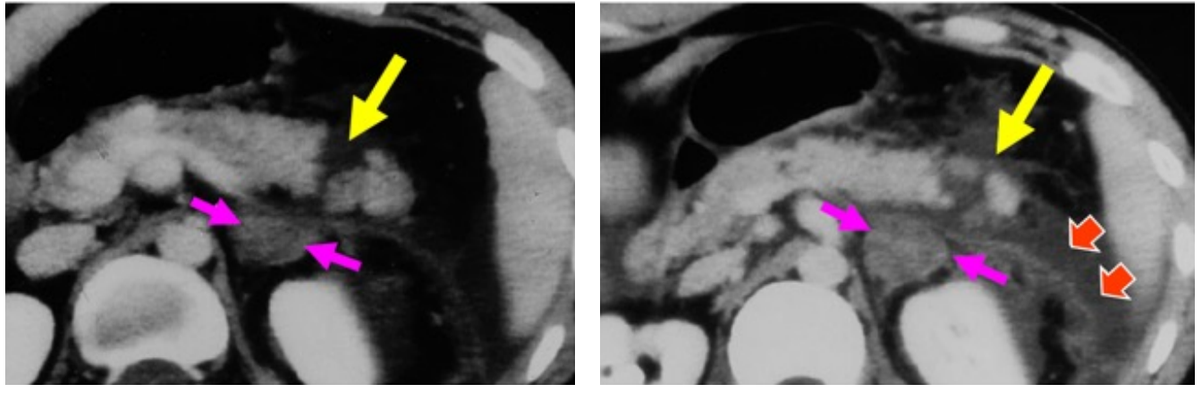
CHAPTER OUTLINE:

/ 胰腺钝性损伤：近端横断位

章节大纲：

疑似胰腺损伤时随访扫描的重要性。腹部钝性损伤后立即采集的 CT（第 0 天，左图）显示胰腺颈部区域弥漫性肿胀（箭头所示）。48 小时后的 CT（右图）显示胰颈血供阻断的部分（箭头所示），表明横断，以及胰周积液（星号所示），表明发生了创伤后胰腺炎。

/ Blunt Pancreatic Injuries: Distal Transection



CT obtained immediately after blunt abdominal trauma (day 0, left) shows distal transection of the pancreas (yellow arrow). **CT after 48 hr** (right) shows the transection (yellow arrow) but also a fluid collection in the retroperitoneum (red arrows) due to developing posttraumatic pancreatitis. Note swelling of left adrenal gland due to contusion (small pink arrows)

<∞> REFERENCE

Becker CD, Mentha G, Schmidlin F, Terrier F. Blunt abdominal trauma in adults: role of CT in the diagnosis and management of visceral injuries Part 2: Gastrointestinal tract and retroperitoneal organs. Eur. Radiol. 8, 772- 780 (1998

CHAPTER OUTLINE:

/ 胰腺钝性损伤：远端横断位

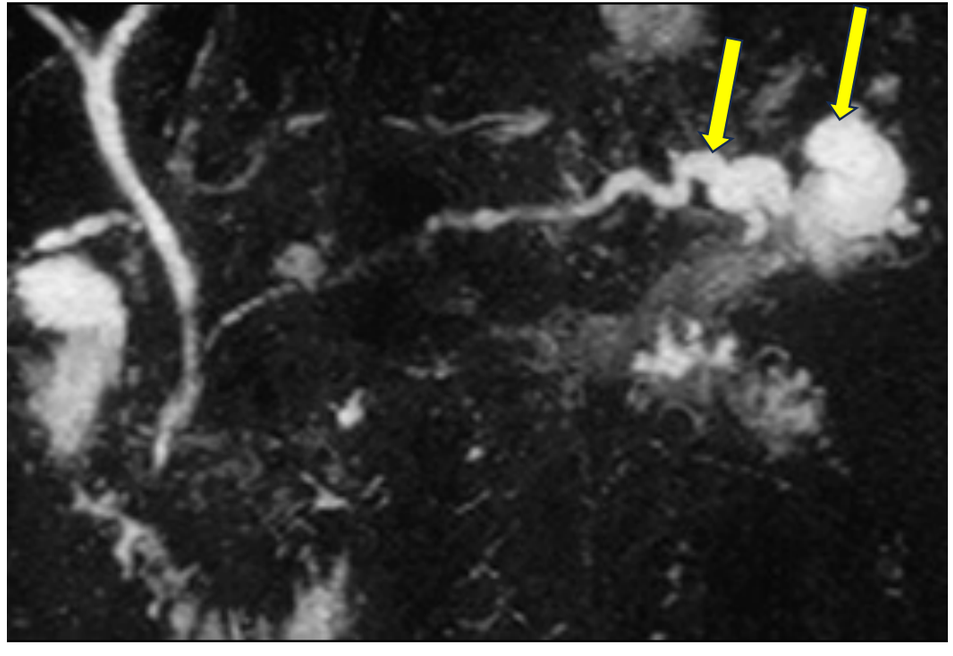
章节大纲：

腹部钝挫伤后立即进行的 CT（第 0 天，左图）显示胰腺远端横断（黄色箭头）。**48 小时后的 CT**（右图）显示横断（黄色箭头），但也显示由于发展为创伤后胰腺炎而在腹膜后积聚的液体（红色箭头）。注意挫伤引起的左肾上腺肿胀（粉色小箭头）

<∞> 参考文献

Becker CD, Mentha G, Schmidlin F, Terrier F. Blunt abdominal trauma in adults: role of CT in the diagnosis and management of visceral injuries Part 2: Gastrointestinal tract and retroperitoneal organs. Eur. Radiol. 8, 772- 780 (1998

/ Blunt Pancreatic Injuries: Proximal Transection



MRCP shows ductectasia and ductal leakage in the pancreatic tail (arrows) in a patient with posttraumatic acute pancreatitis.

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

/ 胰腺钝性损伤：近端横断位

章节大纲：

MRCP 显示一例创伤后急性胰腺炎患者的胰尾导管扩张和导管渗漏（箭头所示）。

/ Blunt Trauma: Splenic Injuries

The spleen is the most common site of organ injuries in severe blunt abdominal trauma. Focussed assessment with sonography in trauma (FAST) is the first-line imaging technique well suited to detect haemoperitoneum that may warrant surgery in haemodynamically unstable patients and may also detect major splenic injuries at the time of admission. Contrast enhanced CT offers a more complete overview of traumatic injuries and is the method of choice for the detection and grading of visceral injuries. However, it is usually not indicated in haemodynamically unstable patients except in a dedicated trauma care environment.

In haemodynamically stable patients, blunt splenic trauma is managed with conservative expectation whenever possible, the success rate being high in adults and even higher in children.

<!> ATTENTION

CT findings of blunt splenic injuries are classified using the **organ injury scale** of the World Society of Emergency Surgery and the **American Association for Surgery of Trauma (AAST)**. Grading is mainly based on the size and extent of subcapsular haematoma and parenchymal laceration and signs of vascular injury (devascularisation). CT also plays an important role for the follow–up during conservative treatment of splenic injuries as it may detect delayed complications of splenic injuries such as expanding subcapsular haematoma, formation of pseudoaneurysms or continuous haemorrhage.

Intraarterial embolisation is a minimally invasive interventional radiologic method to provide haemostasis in delayed bleeding or to treat posttraumatic pseudoaneurysms.

<∞> REFERENCE

> See also e-Book chapter on Interventional Radiology

CHAPTER OUTLINE:

/ 钝性损伤：脾脏损伤

章节大纲：

在腹部严重钝性损伤病例中，脾脏是最常见的损伤部位。超声是创伤重点评估 (FAST) 首选影像手段，非常适合检测血流动力学不稳定患者可能需要手术的腹腔积血，也可以在入院时检测主要的脾损伤。对比增强 CT 可更全面地显示创伤情况，是发现内脏损伤和分级的首选方法。然而，除非在专门的创伤护理环境中，否则通常不会在血流动力学不稳定的患者中使用。

对于血流动力学稳定的患者，脾脏钝性损伤应尽可能采用保守治疗，成功率在成年人中很高，在儿童中甚至更高。

<!> 注意

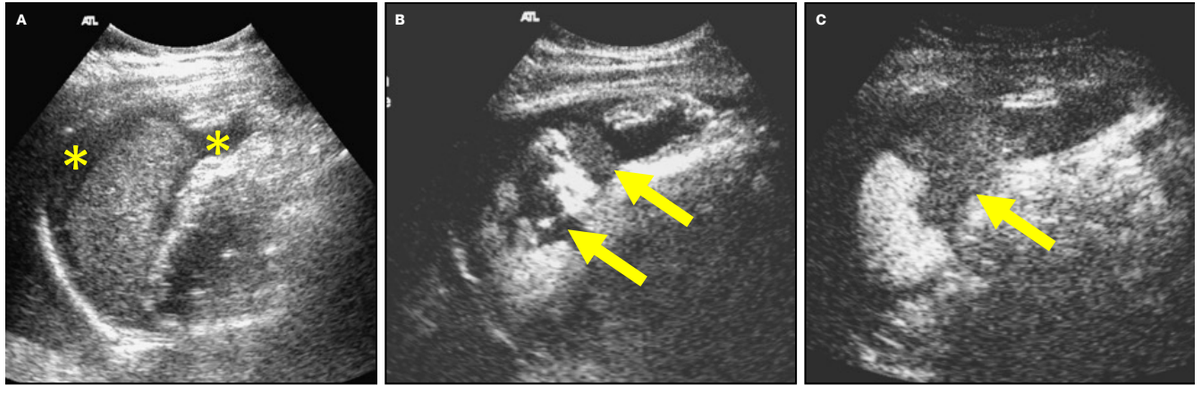
采用世界急诊外科学会和美国创伤外科协会 (AAST) 联合制定的器官损伤分级量表对脾脏钝性损伤的 CT 结果进行分类。分级主要基于包膜下血肿和实质撕裂的大小和范围以及血管损伤（血供阻断）体征。CT 在脾损伤保守治疗期间的随访中也起着重要作用，因其可以检测脾损伤的迟发性并发症，例如包膜下血肿扩大、假性动脉瘤形成或持续出血。

动脉栓塞术是一种微创介入放射技术，用于迟发性出血或创伤后假性动脉瘤的止血治疗。

<∞> 参考文献

> 另请参阅《介入放射学》电子书章节

/ Blunt Splenic Injuries



US after blunt abdominal trauma. US without iv. contrast material (A) shows haemoperitoneum (asterisk), but no parenhymal lesion. B (early phase contrast-enhanced US) and C (late phase contrast-enhanced CT) show hypoperfused areas (arrows) suggesting splenic laceration with devascularised areas.

Images courtesy of Alexandra Platon, MD, Geneva University Hospitals, Geneva, Switzerland.

CHAPTER OUTLINE:

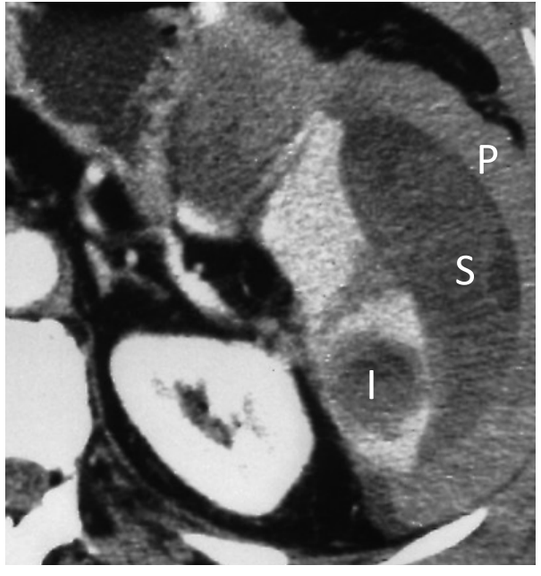
/ 脾脏钝性损伤

章节大纲：

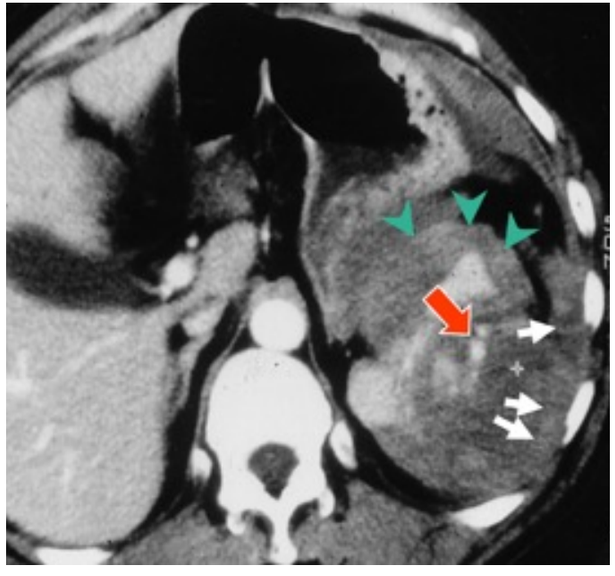
脾脏钝性损伤后的超声检查。未使用静脉对比剂的超声检查 (A) 显示腹腔积血（星号所示），但无实质病变。B（早期对比增强 US）和 C（晚期对比增强 CT）显示低灌注区域（箭头所示），提示脾裂伤伴血供阻断区域。

图片由 Alexandra Platon 医学博士（日内瓦大学医院，瑞士日内瓦）提供。

/ Posttraumatic Splenic Haematoma and Active Bleeding



CT showing posttraumatic subcapsular (S), intraparenchymal (I) and perisplenic (P) haematoma. This patient was successfully treated conservatively.



CT showing a shattered spleen requiring immediate splenectomy. Contrast-enhanced CT shows major devascularisation of splenic parenchyma with extravasation of contrast material (red arrow). Note subcapsular haematoma (green arrowheads) and free perisplenic blood (white arrows).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺** 和**脾脏** 影像学

/ 创伤后脾血肿和活动性出血

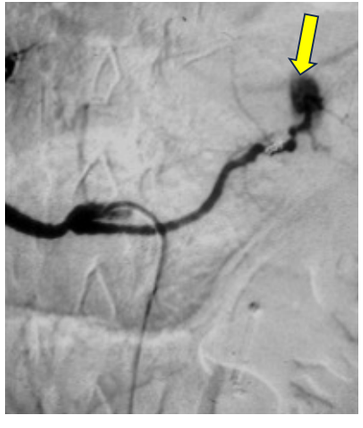
章节大纲：

CT 显示创伤后包膜下 (S)、实质内 (I) 和脾周 (P) 血肿。成功对患者进行了保守治疗。

CT 显示脾破碎，需要立即进行脾切除术。对比增强 CT 显示脾实质严重血供阻断伴对比剂外渗（红色箭头）。注意包膜下血肿（绿色箭头）和脾周游离血液（白色箭头）。

/ Blunt Splenic Injuries: Selective Arteriogram Before Minimally Invasive Treatment of Ruptured Posttraumatic Pseudoaneurysm

CT shows pseudonaeurym (arrow)



DSA of celiac axis shows pseudonaeurym (arrow).

Selective DSA of peripheral splenic artery branch showing pseudonaeurym (yellow arrow) and extravastion indicating active haemorrhage (arrow).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ **胰腺**和**脾脏**影像学

章节大纲：

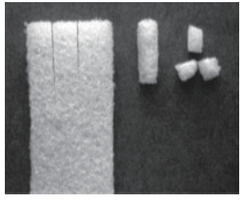
/ 脾脏钝性损伤：创伤后假性动脉瘤破裂微创治疗前行选择性动脉造影

CT 显示假动脉瘤（箭头所示）

腹腔动脉 DSA 显示假动脉瘤（箭头所示）。

脾外周动脉分支选择性 DSA 显示假动脉瘤（黄色箭头）和提示活动性出血的外渗（箭头所示）。

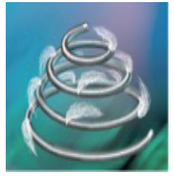
/ Interventional Radiologic Treatment



Absorbable gelatine sponge
可吸收的明胶海绵

Microparticles
微粒

Microcatheter
微导管



Metallic coils
金属线圈

The interventional radiologist performing an embolisation procedure for acute haemorrhage. The left image shows the technical environment of the interventional radiology suite. The four images on the right illustrate the endovascular devices that are typically used for endoarterial occlusion of bleeding sources by means of a co-axial microcatheter, namely, absorbable gelatine sponge, polyvinyl alcohol microparticles or metallic coils.

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

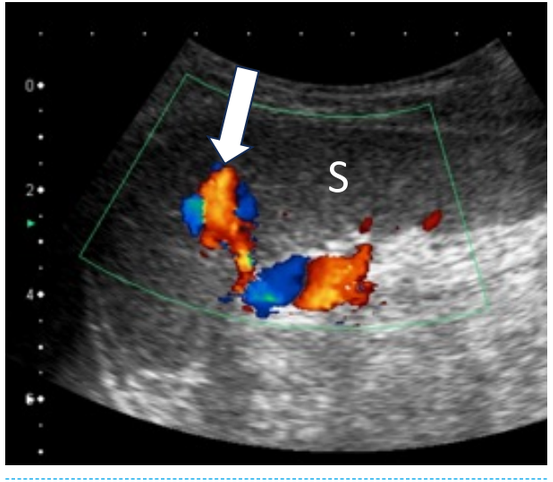
章节大纲：

/ 介入治疗

介入放射科医生对急性出血进行栓塞治疗。左图显示了介入放射套件的技术环境。右侧的四张图显示了通常通过同轴微导管用于出血源的动脉内闭塞的血管内装置，即可吸收明胶海绵、聚乙烯醇微粒或金属线圈。

/ Posttraumatic Splenic Vascular Complications and Interventional Radiologic Treatment

Depending on morphology and location, post-traumatic aneurysm of the spleen artery and its branches can be treated by **micro-coils** inserted for packing or excluded from arterial flow by using an **expandable endovascular covered stent graft**.



Colour Doppler- US shows posttaumatic intraparenchymal pseudoaneurysm of the spleen (arrow) S = spleen.

CT (arterial phase, MIP reconstruction) shows posttraumatic pseudoaneurysm of the main splenic artery (arrow).

/ **Pancreas** and **Spleen** Imaging

CHAPTER OUTLINE:

/ 创伤后脾血管并发症和介入放射治疗

/ **胰腺**和**脾脏**影像学

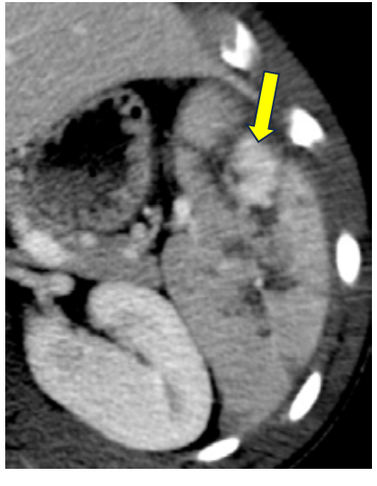
根据形态和位置，脾动脉及其分支的创伤后动脉瘤可以通过插入微线圈进行填充或使用**可扩张血管内覆膜支架移植物**从动脉血流中排除来治疗。

章节大纲：

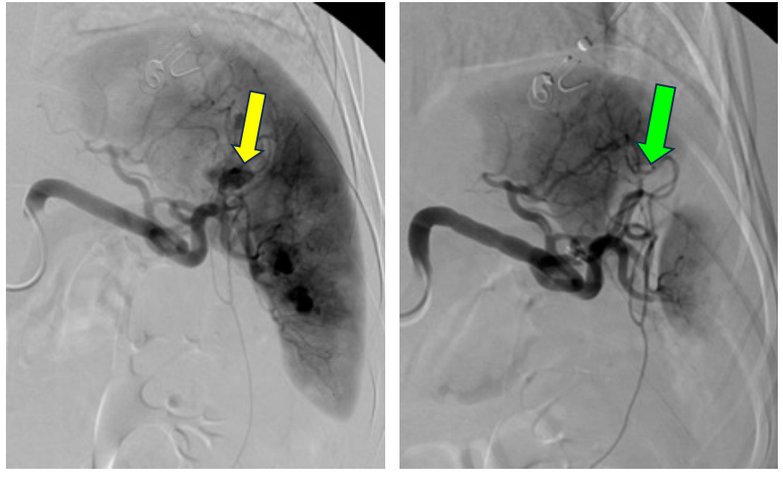
彩色多普勒超声显示脾脏瘤变后实质内假性动脉瘤（箭头所示）S = 脾脏。

CT（动脉期，MIP 重建）显示脾大动脉的创伤后假性动脉瘤（箭头所示）。

/ Blunt Splenic Injuries: Transarterial Embolisation of Pseudoaneurysm Complicating Conservative Treatment



Contrast-enhanced CT (arterial phase). Postraumatic multiple intraparenchymal fractures and intraparenchymal haemorrhage (arrow).



DSA before intravascular embolisation (left image) and after successful embolisation (right image). Before embolisation, note intrasplenic contrast extravasation (yellow arrow). After transarterial embolisation with sterile compressed absorbable sponge particles (Gelfoam), there is no contrast material extravasation (green arrow).

/ Pancreas and Spleen Imaging

CHAPTER OUTLINE:

/ 胰腺和脾脏影像学

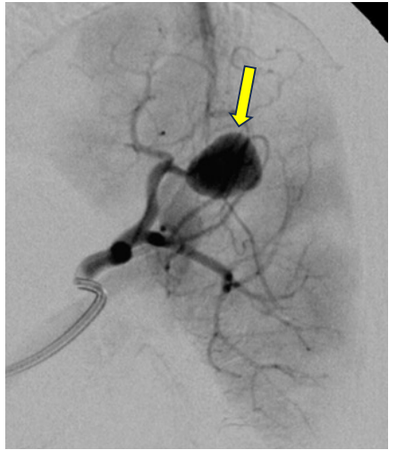
章节大纲：

/ 脾脏钝性损伤：经动脉栓塞术治疗假性动脉瘤并发保守治疗

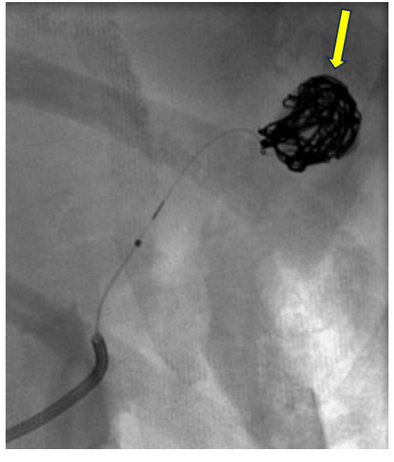
增强 CT（动脉期）。外伤性多发性脑实质骨折和脑实质内出血（箭头所示）。

血管内栓塞前（左图）和成功栓塞后（右图）的 DSA。栓塞前，注意脾内对比剂外渗（黄色箭头）。使用无菌压缩可吸收海绵颗粒 (Gelfoam) 进行经动脉栓塞后，无对比剂外渗（绿色箭头）。

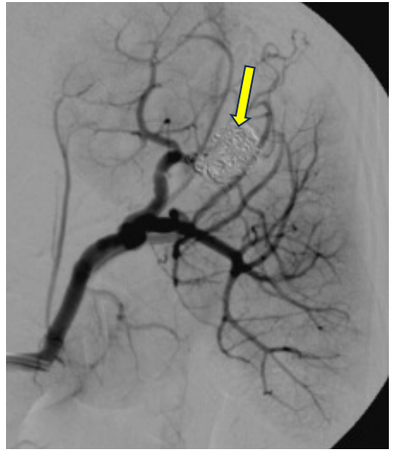
Interventional Radiologic Treatment of Posttraumatic Intrasplenic Pseudoaneurysm



Splenic artery DSA showing large intrasplenic pseudoaneurysm (arrow).



Metallic micro-coils inserted for packing of pseudoaneurysm (arrow).



DSA: control after endovascular treatment showing coiled area (arrow).

CHAPTER OUTLINE:

外伤后脾内假性动脉瘤的介入放射治疗

章节大纲：

脾动脉 DSA 显示脾内巨大假性动脉瘤（箭头所示）。

插入金属微弹簧圈填塞假性动脉瘤（箭头所示）。

DSA：血管内治疗后显示卷曲区域的对照（箭头所示）。

/ Take-Home Messages

- Because US is the method of choice to detect gallbladder stones, it is the first-line imaging method in acute pancreatitis. However, the pancreas is cannot always be assessed entirely by means of transcutaneous US.
- Both multiphasic dynamic cross-sectional imaging with CT and MRI offer detailed and consistent demonstration of parenchymal pancreatic and splenic abnormalities.
- CT and MRI play a key role in the severity grading of acute pancreatitis, to distinguish the oedematous from the necrotising form and to detect complications during treatment.
- Image-guided fluid aspiration and drainage are useful techniques in the management of large, growing or infected fluid collections in the early phase after acute necrotising pancreatitis .
- Imaging findings in chronic pancreatitis include both parenchymal and ductal changes. Although calcifications are easier to detect with CT, MRCP is more suitable to delineate and grade ductal changes such as strictures, cysts, and stones and to detect variants of the main pancreatic duct such as pancreas divisum that may predispose to pancreatitis.
- Imaging with CT and MRI and image-guided biopsy have an important role in the characterisation and staging of solid and cystic benign and malignant pancreatic neoplasms.
- Ductal adenocarcinoma is the most common malignant pancreatic tumour, and CT and MRI are useful to distinguish potentially resectable tumours from those which are a priori unresectable for cure, thus indicating palliative treatment.

CHAPTER OUTLINE:

/ 核心要点

章节大纲：

- 超声是胆囊结石的首选检查，因此也列为急性胰腺炎的一线影像检查手段。但经皮超声不一定能完全评估胰腺。
- CT 和 MRI 的多期动态横断位成像均可详细且一致地显示胰腺和脾实质异常。
- CT 和 MRI 可区分水肿型和坏死型胰腺炎，并进行严重程度分级，同时可检测治疗期间的并发症。
- 在急性坏死性胰腺炎爆发后的早期，影像引导下液体抽吸术和引流术是处理大量、生长中或感染性积液的有效手段。
- 慢性胰腺炎的影像学表现包括实质和胰管改变。虽然钙化灶采用 CT 更易发现，但 MRCP 更适合用于描述和分级胰管改变，如狭窄、囊肿和结石，也更适合用于检测主胰管变异，如可能诱发胰腺炎的胰腺分裂。
- CT、MRI 和影像学引导下活检在实性和囊性良性和恶性胰腺肿瘤的特征描述和分期中具有重要作用。
- 导管腺癌是最常见的恶性胰腺肿瘤，CT 和 MRI 有助于区分潜在可切除肿瘤和无法根治的肿瘤，从而提示姑息治疗。

- Endocrine neoplasms of the pancreas (panNENs) include differentiated, benign tumours (functional or non-functional panNETs), undifferentiated malignant tumours (panNECs) or mixed neuroendocrine/non-neuroendocrine neoplasms (MiNENs). On cross-sectional contrast-enhanced images panNETs typically appear as hypervascular lesions within the pancreatic parenchyma, and it must be kept in mind that they may be multiple.
- Although serous, multicystic pancreatic adenomas are benign, mucinous cystadenomas and intraductal pancreatic mucinous neoplasms may undergo adenomatous proliferation, eventually transforming into carcinoma.
- The spleen is the most commonly injured abdominal organ due to blunt trauma. Initial imaging assessment is done with FAST. In haemodynamically stable patients undergoing conservative treatment CT is the method of choice for the detection and grading of the extent of splenic and pancreatic injuries and for early follow- up during non-surgical management.
- Transarterial embolisation is a well-established technique for minimally invasive and effective haemostasis in posttraumatic haemorrhage and for the treatment of pseudoaneurysms complicating inflammation and trauma of the pancreas and spleen.

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

- 胰腺神经内分泌肿瘤 (panNEN) 包括分化型良性肿瘤（功能性或非功能性 panNET）、未分化恶性肿瘤 (panNEC) 或混合性神经内分泌/非神经内分泌肿瘤 (MiNEN)。在对比增强横断位影像学检查结果上，panNET 通常表现为胰腺实质内富血供病变，必须牢记其可能为多发性。
- 虽然浆液性多囊性胰腺腺瘤是良性的，但黏液性囊腺瘤和胰腺导管内黏液性肿瘤可能会发生腺瘤样增生，最终恶变为癌。
- 脾脏是最常见的腹部钝性损伤器官。初始影像学评估通过 FAST 完成。在接受保守治疗的血流动力学稳定的患者中，CT 是检测脾脏和胰腺损伤程度并进行分级以及在非手术治疗期间进行早期随访的首选方法。
- 经动脉栓塞术是一种成熟的技术，用于创伤后出血的微创和有效止血，以及治疗胰腺和脾脏炎症和创伤并发的假性动脉瘤。

References

- Banks PA, Bollen TL, Dervenis C et al Classification of acute pancreatitis—2012:revision of the Atlanta classification and definitions by international consensus. Gut 2013;62:102–111. doi:10.1136/gutjnl-2012-302779
- Shyu JY, Sainani NI, Sahni, VA, Necrotizing Pancreatitis: Diagnosis, Imaging, and Intervention RadioGraphics 2014; 34:1218–1239
- Balci C. MRI assessment of chronic pancreatitis. Diagn Interv Radiol2011;17:249-54.
- Kamat R, Gupta P, Rana S. Imaging in chronic pancreatitis:State of the art review. Indian J Radiol Imaging 2019;29:201-10.
- Low G, Panu A , Millo N, Leen E (2011) Multimodality Imaging of Neoplastic and Non- Neoplastic Solid Lesions of the Pancreas. RadioGaphics 2011; 31:993-1015
- Lee DW, Kim MK, Kim HG. Diagnosis of Pancreatic Neuroendocrine Tumors. Clin Endosc. 2017 Nov;50(6):537-545. doi: 10.5946/ce.2017.131. Epub 2017 Nov 30. PMID: 29207856; PMCID: PMC5719919.
- Khanna L, Prasad SR, Sunnapwar A. Pancreatic Neuroendocrine Neoplasms: 2020 Update on Pathologic and Imaging Findings and Classification. RadioGraphics 2020; 40:1240–1262https://doi.org/10.1148/rg.2020200025
- Miller FH, Lopes Vendrami C, Recht, HS. Pancreatic Cystic Lesions and Malignancy: Assessment, Guidelines, and the Field Defect RadioGraphics 2022; 42:87–105
- Machado NO, Al Qadhi H, Al Wahibi K. Intraductal Papillary Mucinous Neoplasm of Pancreas. N Am J Med Sci. 2015 May;7(5):160-75. doi:
- Kim N, Auerbach A, Manning MA. (2022) Algorithmic Approach to the Splenic Lesion Based on Radiologic-Pathologic Correlation. RadioGraphics 42, No. 3. https://doi.org/10.1148/rg.210071
- Karlo CA, Stolzmann P, Do RK, Alkadhi H. Computed tomography of the spleen: how to interpret the hypodense lesion. Insights Imaging (2013) 4:65–76
- Lee H, Kim JW, Hong JH et al. Cross-sectional Imaging of Splenic lesions. RadioGraphics 2018; 38:435–436 https://doi.org/10.1148/rg.2018170119
- Becker CD, Mentha G, Terrier F (1998) Blunt abdominal trauma in adults: role of CT in the diagnosis and management of visceral injuries. Part 1: liver and spleen. Eur Radiol 8(4):553–562
- Becker CD, Mentha G, Schmidlin F, Terrier F. Blunt abdominal trauma in adults: role of CT in the diagnosis and management of visceral injuries Part 2: Gastrointestinal tract and retroperitoneal organs. Eur. Radiol. 8, 772- 780 (1998)
- Gamanagatti S, Rangarajan K, Kumar A, Jineesh. Blunt abdominal trauma: imaging and intervention. Curr Probl Diagn Radiol. 2015 Jul-Aug;44(4):321- 36. doi: 10.1067/j.cpradiol.2015.02.005. Epub 2015 Feb 12. PMID: 25801463.
- Podda M, De Simone B, Ceresoli M, et al. Follow-up strategies for patients with splenic trauma managed non-operatively: the 2022 World Society of Emergency Surgery consensus document. World Journal of Emergency Surgery (2022) 17:52 https://doi.org/10.1186/s13017-022-00457-5
- Modern Radiology e-Book, Interventional Radiology. doi: 10.26044/esr-undergraduate-ebook-27

Pancreas and Spleen Imaging

CHAPTER OUTLINE:

胰腺和脾脏影像学

章节大纲：

参考文献

- Banks PA, Bollen TL, Dervenis C et al Classification of acute pancreatitis—2012:revision of the Atlanta classification and definitions by international consensus. Gut 2013;62:102–111. doi:10.1136/gutjnl-2012-302779
- Shyu JY, Sainani NI, Sahni, VA, Necrotizing Pancreatitis: Diagnosis, Imaging, and Intervention RadioGraphics 2014; 34:1218–1239
- Balci C. MRI assessment of chronic pancreatitis. Diagn Interv Radiol2011;17:249-54.
- Kamat R, Gupta P, Rana S. Imaging in chronic pancreatitis:State of the art review. Indian J Radiol Imaging 2019;29:201-10.
- Low G, Panu A , Millo N, Leen E (2011) Multimodality Imaging of Neoplastic and Non- Neoplastic Solid Lesions of the Pancreas. RadioGaphics 2011; 31:993-1015
- Lee DW, Kim MK, Kim HG. Diagnosis of Pancreatic Neuroendocrine Tumors. Clin Endosc. 2017 Nov;50(6):537-545. doi: 10.5946/ce.2017.131. Epub 2017 Nov 30. PMID: 29207856; PMCID: PMC5719919.
- Khanna L, Prasad SR, Sunnapwar A. Pancreatic Neuroendocrine Neoplasms: 2020 Update on Pathologic and Imaging Findings and Classification. RadioGraphics 2020; 40:1240–1262https://doi.org/10.1148/rg.2020200025
- Miller FH, Lopes Vendrami C, Recht, HS. Pancreatic Cystic Lesions and Malignancy: Assessment, Guidelines, and the Field Defect RadioGraphics 2022; 42:87–105
- Machado NO, Al Qadhi H, Al Wahibi K. Intraductal Papillary Mucinous Neoplasm of Pancreas. N Am J Med Sci. 2015 May;7(5):160-75. doi:
- Kim N, Auerbach A, Manning MA. (2022) Algorithmic Approach to the Splenic Lesion Based on Radiologic-Pathologic Correlation. RadioGraphics 42, No. 3. https://doi.org/10.1148/rg.210071
- Karlo CA, Stolzmann P, Do RK, Alkadhi H. Computed tomography of the spleen: how to interpret the hypodense lesion. Insights Imaging (2013) 4:65–76
- Lee H, Kim JW, Hong JH et al. Cross-sectional Imaging of Splenic lesions. RadioGraphics 2018; 38:435–436 https://doi.org/10.1148/rg.2018170119
- Becker CD, Mentha G, Terrier F (1998) Blunt abdominal trauma in adults: role of CT in the diagnosis and management of visceral injuries. Part 1: liver and spleen. Eur Radiol 8(4):553–562
- Becker CD, Mentha G, Schmidlin F, Terrier F. Blunt abdominal trauma in adults: role of CT in the diagnosis and management of visceral injuries Part 2: Gastrointestinal tract and retroperitoneal organs. Eur. Radiol. 8, 772- 780 (1998)
- Gamanagatti S, Rangarajan K, Kumar A, Jineesh. Blunt abdominal trauma: imaging and intervention. Curr Probl Diagn Radiol. 2015 Jul-Aug;44(4):321- 36. doi: 10.1067/j.cpradiol.2015.02.005. Epub 2015 Feb 12. PMID: 25801463.
- Podda M, De Simone B, Ceresoli M, et al. Follow-up strategies for patients with splenic trauma managed non-operatively: the 2022 World Society of Emergency Surgery consensus document. World Journal of Emergency Surgery (2022) 17:52 https://doi.org/10.1186/s13017-022-00457-5
- Modern Radiology e-Book, Interventional Radiology. doi: 10.26044/esr-undergraduate-ebook-27

Test Your Knowledge

Pancreas and Spleen Imaging

胰腺和脾脏影像学

CHAPTER OUTLINE:

知识测试

Test Your Knowledge

<?> QUESTION

1 Which of the following statements are correct?

- ☐ Multiphasic contrast – enhanced imaging of the pancreas can be done with both CT and MRI
- ☐ The diagnosis of pancreatic ductal abnormalities with MRCP is based on the injection of Gadolinium- based contrast material
- ☐ Non-surgical management of blunt splenic and pancreatic injuries is often facilitated by follow–up imaging with CT
- ☐ Image-guided biopsy, fluid aspiration and drainage are minimally invasive interventional radiologic techniques in the context of acute pancreatitis

CHAPTER OUTLINE:

知识测试

章节大纲：

<?> 问题

1 下列说法正确的是：

- ☐ 多期对比 CT 和 MRI 均可对胰腺进行增强成像
- ☐ MRCP 对胰管异常的诊断基于钆对比剂的注射
- ☐ 脾脏和胰腺钝性损伤的非手术治疗通常需要 CT 随访成像
- ☐ 影像引导下活检、液体抽吸和引流是治疗急性胰腺炎的微创介入放射技术

/ Test Your Knowledge

<?> ANSWER

1 Which of the following statements are correct?

- ■ Multiphasic contrast – enhanced imaging of the pancreas can be done with both CT and MRI
- ☐ The diagnosis of pancreatic ductal abnormalities with MRCP is based on the injection of Gadolinium- based contrast material
- ■ Non-surgical management of blunt splenic and pancreatic injuries is often facilitated by follow–up imaging with CT
- ■ Image-guided biopsy, fluid aspiration and drainage are minimally invasive interventional radiologic techniques in the context of acute pancreatitis

CHAPTER OUTLINE:

章节大纲：

/ 知识测试

<?> 回答

1 下列说法正确的是：

- ■ 多期对比 CT 和 MRI 均可对胰腺进行增强成像
- ☐ MRCP 对胰管异常的诊断基于钆对比剂的注射
- ■ 脾脏和胰腺钝性损伤的非手术治疗通常需要 CT 随访成像
- ■ 影像引导下活检、液体抽吸和引流是治疗急性胰腺炎的微创介入放射技术

Test Your Knowledge

<?> QUESTION

2 Which of the following statements are correct regarding **pancreas divisum**?

- ☐ The pancreatic body is separated from the pancreatic tail
- ☐ The duct of Wirsung does not communicate with the duct of Santorini
- ☐ Predisposes to cystic neoplasms
- ☐ Predisposes to pancreatitis

CHAPTER OUTLINE:

知识测试

<?> 问题

2 关于**胰腺分裂**，说法正确的是？

- ☐ 胰体与胰尾分离
- ☐ 主胰管与副胰管不连通
- ☐ 易患囊性肿瘤
- ☐ 易患胰腺炎

章节大纲：

Test Your Knowledge

<?> ANSWER

2 Which of the following statements are correct regarding **pancreas divisum**?

- ☐ The pancreatic body is separated from the pancreatic tail
- ■ The duct of Wirsung does not communicate with the duct of Santorini
- ☐ Predisposes to cystic neoplasms
- ■ Predisposes to pancreatitis

知识测试

<?> 回答

2 关于**胰腺分裂**，说法正确的是？

- ☐ 胰体与胰尾分离
- ■ 主胰管与副胰管不连通
- ☐ 易患囊性肿瘤
- ■ 易患胰腺炎

Test Your Knowledge

<?> QUESTION

3 Which of the following statements are correct regarding pancreatic neoplasms?

- ☐ The so-called “double duct sign” occurs in carcinoma of the pancreatic head.
- ☐ Adenocarcinoma of the ampulla of Vater usually has a better prognosis after resection than ductal adenocarcinoma of the pancreas
- ☐ Pancreatic neuro-endocrine tumours (panNETs) usually have a characteristic hypovascular appearance on CT and MRI
- ☐ On multiphasic contrast-enhanced CT and MRI, ductal adenocarcinoma of the pancreas usually appears strongly hypervascular in the pancreatic phase followed by a rapid “washout” in the portal phase

CHAPTER OUTLINE:

知识测试

章节大纲：

<?> 问题

3 关于胰腺肿瘤，下列说法正确的是？

- ☐ 所谓的“双管征”发生于胰头癌。
- ☐ 壶腹腺癌通常在切除术后的预后优于胰腺导管腺癌
- ☐ 胰腺神经内分泌肿瘤 (panNET) 在 CT 和 MRI 上通常具有特征性的低血供表现
- ☐ 在多期对比增强 CT 和 MRI 上，胰腺导管腺癌通常在胰腺期表现为血管高度丰富，随后在门静脉期快速“退出”

/ Test Your Knowledge

<?> ANSWER

3 Which of the following statements are correct regarding pancreatic neoplasms?

- ■ The so-called “double duct sign” occurs in carcinoma of the pancreatic head
- ■ Adenocarcinoma of the ampulla of Vater usually has a better prognosis after resection than ductal adenocarcinoma of the pancreas
- ☐ Pancreatic neuro-endocrine tumours (panNETs) usually have a characteristic hypovascular appearance on CT and MRI
- ☐ On multiphasic contrast-enhanced CT and MRI, ductal adenocarcinoma of the pancreas usually appears strongly hypervascular in the pancreatic phase followed by a rapid “washout” in the portal phase

CHAPTER OUTLINE:

章节大纲：

/ 知识测试

<?> 回答

3 关于胰腺肿瘤，下列说法正确的是？

- ■ 所谓的“双管征”发生于胰头癌
- ■ 壶腹腺癌通常在切除术后的预后优于胰腺导管腺癌
- ☐ 胰腺神经内分泌肿瘤 (panNET) 在 CT 和 MRI 上通常具有特征性的低血供表现
- ☐ 在多期对比增强 CT 和 MRI 上，胰腺导管腺癌通常在胰腺期表现为血管高度丰富，随后在门静脉期快速“退出”

Test Your Knowledge

<?> QUESTION

4 Which of the following statements are correct?

- ☐ In pancreatic disease, endoscopic- retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS) are usually performed as complementary methods after noninvasive imaging with CT or MRI
- ☐ Cystic abnormalities of the pancreas may occur due to chronic pancreatitis or to neoplastic disease
- ☐ On MRCP, intraductal pancreatic mucinous neoplasms (IPMNs) may appear as segmental ductectasia
- ☐ On CT, parenchymal pancreatic calcifications are typical signs of acute pancreatitis

CHAPTER OUTLINE:

知识测试

章节大纲：

<?> 问题

4 下列说法正确的是：

- ☐ 在胰腺疾病中，经内镜逆行胰胆管造影 (ERCP) 和内镜超声 (EUS) 通常在 CT 或 MRI 无创成像后作为补充方法使用
- ☐ 慢性胰腺炎或肿瘤性疾病可能导致胰腺囊性异常
- ☐ 在 MRCP 上，胰腺导管内黏液性肿瘤 (Intraductal Pancreatic Mucinous Neoplasm, IPMN) 可能表现为节段性导管扩张
- ☐ CT 显示胰腺实质钙化是急性胰腺炎的典型体征

/ Test Your Knowledge

<?> ANSWER

4 Which of the following statements are correct?

- ■ In pancreatic disease, endoscopic- retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS) are usually performed as complementary methods after noninvasive imaging with CT or MRI
- ■ Cystic abnormalities of the pancreas may occur due to chronic pancreatitis or to neoplastic disease
- ■ On MRCP, intraductal pancreatic mucinous neoplasms (IPMNs) may appear as segmental ductectasia
- ☐ On CT, parenchymal pancreatic calcifications are typical signs of acute pancreatitis

CHAPTER OUTLINE:

章节大纲：

/ 知识测试

<?> 回答

4 下列说法正确的是：

- ■ 在胰腺疾病中，经内镜逆行胰胆管造影 (ERCP) 和内镜超声 (EUS) 通常在 CT 或 MRI 无创成像后作为补充方法使用
- ■ 慢性胰腺炎或肿瘤性疾病可能导致胰腺囊性异常
- ■ 在 MRCP 上，胰腺导管内黏液性肿瘤 (Intraductal Pancreatic Mucinous Neoplasm, IPMN) 可能表现为节段性导管扩张
- ☐ CT 显示胰腺实质钙化是急性胰腺炎的典型体征

Test Your Knowledge

<?> QUESTION

5 Which of the following statements are correct in the context of CT in chronic pancreatitis?

- ☐ Multiple parenchymal calcifications are common findings
- ☐ Intraductal pancreatic calculi are often calcified
- ☐ The pancreatic duct often appears irregular with stenosis, dilatation and outpouchings
- ☐ Chronic pancreatitis of the pancreatic head may lead to stenosis of the distal common bile duct

CHAPTER OUTLINE:

知识测试

章节大纲：

<?> 问题

5 关于慢性胰腺炎的 CT 检查，下列说法正确的是：

- ☐ 多实质钙化是常见表现
- ☐ 胰管内结石常发生钙化
- ☐ 胰管通常看起来不规则，伴有狭窄、扩张和囊状/憩室样突出
- ☐ 胰头慢性胰腺炎可能导致远端胆总管狭窄

Test Your Knowledge

<?> ANSWER

5 Which of the following statements are correct in the context of CT in chronic pancreatitis?

- Multiple parenchymal calcifications are common findings
- Intraductal pancreatic calculi are often calcified
- The pancreatic duct often appears irregular with stenosis, dilatation and outpouchings
- Chronic pancreatitis of the pancreatic head may lead to stenosis of the distal common bile duct

CHAPTER OUTLINE:

知识测试

章节大纲：

<?> 回答

5 关于慢性胰腺炎的 CT 检查，下列说法正确的是：

- 多实质钙化是常见表现
- 胰管内结石常发生钙化
- 胰管通常看起来不规则，伴有狭窄、扩张和囊状/憩室样突出
- 胰头慢性胰腺炎可能导致远端胆总管狭窄

Test Your Knowledge

<?> QUESTION

6 Which of the following statements are correct?

- ☐ Endocrine neoplasms of the pancreas (panNENs) can be benign or malignant
- ☐ Insulinoma can be multiple
- ☐ Ductal adenocarcinoma of the pancreas has an endocrine activity
- ☐ Endocrine tumours of the pancreas may be functionally active or inactive

知识测试

<?> 问题

6 下列说法正确的是：

- ☐ 胰腺神经内分泌肿瘤 (panNEN) 可能是良性的，也可能是恶性的
- ☐ 胰岛素瘤可呈多发性
- ☐ 胰腺导管腺癌具有内分泌活性
- ☐ 胰腺内分泌肿瘤可能功能活跃，也可能不活跃

Test Your Knowledge

<?> ANSWER

6 Which of the following statements are correct?

- ■ Endocrine neoplasms of the pancreas (panNENs) can be benign or malignant
- ■ Insulinoma can be multiple
- ☐ Ductal adenocarcinoma of the pancreas has an endocrine activity
- ■ Endocrine tumours of the pancreas may be functionally active or inactive

知识测试

<?> 回答

6 下列说法正确的是：

- ■ 胰腺神经内分泌肿瘤 (panNEN) 可能是良性的，也可能是恶性的
- ■ 胰岛素瘤可呈多发性
- ☐ 胰腺导管腺癌具有内分泌活性
- ■ 胰腺内分泌肿瘤可能功能活跃，也可能不活跃

Test Your Knowledge

<?> QUESTION

7 Which of the following statements are correct?

- ☐ Serous multicystic adenomas of the pancreas must be resected because they undergo malignant transformation
- ☐ Intraductal pancreatic mucinous neoplasms (IPMN) have no malignant potential
- ☐ IPMN can appear as segmental ductectasia or as cystic lesions with ductal contact
- ☐ Pancreatic cystic lesions can be further characterised by means of image-guided fine-needle aspiration

CHAPTER OUTLINE:

知识测试

<?> 问题

7 下列哪些说法正确?

- ☐ 胰腺浆液性多囊性腺瘤发生恶性转化，必须切除
- ☐ 胰腺导管内黏液性肿瘤 (IPMN) 不存在恶性的可能性
- ☐ IPMN 表现为节段性导管扩张或与导管接触的囊性病变
- ☐ 影像学引导下的细针抽吸活检可进一步明确胰腺囊性病变的特征

章节大纲:

Test Your Knowledge

<?> ANSWER

7 Which of the following statements are correct?

- ☐ Serous multicystic adenomas of the pancreas must be resected because they undergo malignant transformation
- ☐ Intraductal pancreatic mucinous neoplasms (IPMN) have no malignant potential
- ■ IPMN can appear as segmental ductectasia or as cystic lesions with ductal contact
- ■ Pancreatic cystic lesions can be further characterised by means of image-guided fine-needle aspiration

CHAPTER OUTLINE:

知识测试

<?> 回答

7 下列哪些说法正确?

- ☐ 胰腺浆液性多囊性腺瘤发生恶性转化，必须切除
- ☐ 胰腺导管内黏液性肿瘤 (IPMN) 不存在恶性的可能性
- ■ IPMN 表现为节段性导管扩张或与导管接触的囊性病变
- ■ 影像学引导下的细针抽吸活检可进一步明确胰腺囊性病变的特征

章节大纲：

Test Your Knowledge

<?> QUESTION

8 Which of the following statements are correct regarding pancreatic pseudocysts in acute necrotising pancreatitis?

- ☐ They may grow and compress the adjacent gastrointestinal structures or bile ducts
- ☐ They may become superinfected
- ☐ They may undergo malignant transformation
- ☐ They may be treated by image-guided percutaneous drainage

CHAPTER OUTLINE:

知识测试

章节大纲：

<?> 问题

8 关于急性坏死性胰腺炎的胰腺假性囊肿，下列说法正确的是？

- ☐ 可能会生长并压迫相邻的胃肠道结构或胆管
- ☐ 可继发感染
- ☐ 可能发生恶性转化
- ☐ 可采用影像学引导下经皮引流治疗

Test Your Knowledge

<?> ANSWER

8 Which of the following statements are correct regarding pancreatic pseudocysts in acute necrotising pancreatitis?

- ■ They may grow and compress the adjacent gastrointestinal structures or bile ducts
- ■ They may become superinfected
- ☐ They may undergo malignant transformation
- ■ They may be treated by image-guided percutaneous drainage

CHAPTER OUTLINE:

知识测试

<?> 回答

8 关于急性坏死性胰腺炎的胰腺假性囊肿，下列说法正确的是？

- ■ 可能会生长并压迫相邻的胃肠道结构或胆管
- ■ 可继发感染
- ☐ 可能发生恶性转化
- ■ 可采用影像学引导下经皮引流治疗

章节大纲：

Test Your Knowledge

<?> QUESTION

9 Which of the following statements are correct regarding blunt abdominal trauma?

- ☐ Splenic injuries after blunt trauma are managed conservatively whenever possible
- ☐ CT is often used for follow- up of blunt splenic injuries in order to detect complications during conservative treatment
- ☐ Blunt splenic injuries may include subcapsular haematoma, intraparenchymal haematoma, laceration, and active bleeding
- ☐ CT is the initial imaging technique of choice in haemodynamically unstable patients with blunt abdominal trauma

CHAPTER OUTLINE:

知识测试

章节大纲：

<?> 问题

9 以下关于腹部钝性损伤说法正确的是？

- ☐ 脾脏钝性损伤应尽量保守治疗
- ☐ CT 常用于脾脏钝性损伤的随访，以检测保守治疗期间的并发症
- ☐ 脾脏钝性损伤可能包括包膜下血肿、实质内血肿、裂伤和活动性出血
- ☐ CT 是血流动力学不稳定的腹部钝性损伤患者的首选初始影像学检查技术

/ Test Your Knowledge

<?> ANSWER

9 Which of the following statements are correct regarding blunt abdominal trauma?

- ■ Splenic injuries after blunt trauma are managed conservatively whenever possible
- ■ CT is often used for follow- up of blunt splenic injuries in order to detect complications during conservative treatment
- ■ Blunt splenic injuries may include subcapsular haematoma, intraparenchymal haematoma, laceration, and active bleeding
- ☐ CT is the initial imaging technique of choice in haemodynamically unstable patients with blunt abdominal trauma

CHAPTER OUTLINE:

章节大纲：

/ 知识测试

<?> 回答

9 以下关于腹部钝性损伤说法正确的是？

- ■ 脾脏钝性损伤应尽量保守治疗
- ■ CT 常用于脾脏钝性损伤的随访，以检测保守治疗期间的并发症
- ■ 脾脏钝性损伤可能包括包膜下血肿、实质内血肿、裂伤和活动性出血
- ☐ CT 是血流动力学不稳定的腹部钝性损伤患者的首选初始影像学检查技术

Test Your Knowledge

<?> QUESTION

10 Which of the following statements are correct?

- ☐ Pseudoaneurysms of the pancreatic or splenic arteries may occur after blunt trauma or in the context of severe acute pancreatitis
- ☐ Pseudoaneurysms are best detected with scintigraphy or ERCP
- ☐ Intraarterial catheter embolisation is a minimally invasive interventional radiologic treatment of pseudoaneurysms of the splenic and pancreatic arteries
- ☐ Intraarterial catheter embolisation may be done to avoid splenectomy for acute arterial haemorrhage after blunt splenic trauma

CHAPTER OUTLINE:

知识测试

章节大纲：

<?> 问题

10 以下说法正确的是？

- ☐ 胰腺或脾动脉假性动脉瘤可见于钝性损伤后或重症急性胰腺炎患者
- ☐ 假性动脉瘤最好采用闪烁显像技术或 ERCP 进行检测
- ☐ 动脉内导管栓塞术是脾动脉和胰动脉假性动脉瘤的一种微创介入放射治疗
- ☐ 脾脏钝性损伤后急性动脉出血可行动脉内导管栓塞术以避免脾切除

/ Test Your Knowledge

<?> ANSWER

10 Which of the following statements are correct?

- ■ Pseudoaneurysms of the pancreatic or splenic arteries may occur after blunt trauma or in the context of severe acute pancreatitis
- ☐ Pseudoaneurysms are best detected with scintigraphy or ERCP
- ■ Intraarterial catheter embolisation is a minimally invasive interventional radiologic treatment of pseudoaneurysms of the splenic and pancreatic arteries
- ■ Intraarterial catheter embolisation may be done to avoid splenectomy for acute arterial haemorrhage after blunt splenic trauma

CHAPTER OUTLINE:

章节大纲：

/ 知识测试

<?> 回答

10 以下说法正确的是？

- ■ 胰腺或脾动脉假性动脉瘤可见于钝性损伤后或重症急性胰腺炎患者
- ☐ 假性动脉瘤最好采用闪烁显像技术或 ERCP 进行检测
- ■ 动脉内导管栓塞术是脾动脉和胰动脉假性动脉瘤的一种微创介入放射治疗
- ■ 脾脏钝性损伤后急性动脉出血可行动脉内导管栓塞术以避免脾切除

EUROPEAN SOCIETY OF RADIOLOGY