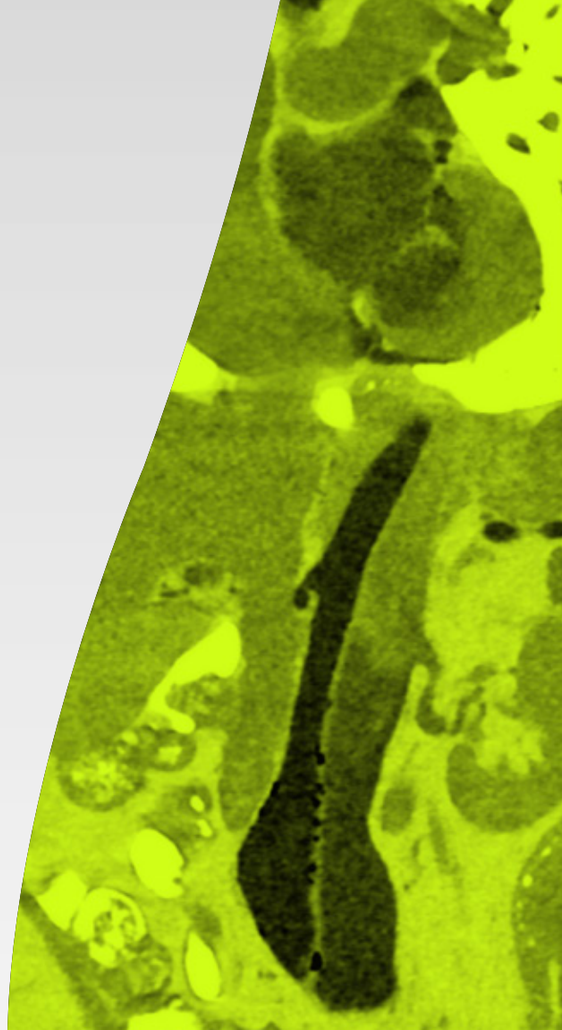
MODERN RADIOLOGY eBook

Emergency Radiology

急诊放射学



ESR 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

Emergency Radiology

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急诊放射学

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

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急诊放射学

章节大纲：

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Translation Credits

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

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Emergency Radiology

TRANSLATED BY:
Prof. Huimao Zhang, The First Hospital of Jilin University
Prof. Yang Hou, The Second Affiliated Hospital of China Medical University

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

huimao@jlu.edu.cn
houyang1973@163.com

Emergency Radiology

CHAPTER OUTLINE:

翻译致谢

本章节为《现代放射学电子书》的部分译文。

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急诊放射学

翻译：
张惠茅教授，吉林大学第一医院
侯阳教授，中国医科大学附属第二医院

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。如今，前沿智慧一键即达，为全球放射学人才的蓬勃发展注入了强劲动力。

<↑> 超链接

huimao@jlu.edu.cn
houyang1973@163.com

急诊放射学

章节大纲：

/ Signage

<▪> CORE KNOWLEDGE

<!> ATTENTION

<↑> HYPERLINKS

>▪< FURTHER KNOWLEDGE

>|< COMPARE

<∞> REFERENCES

<?> QUESTIONS

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

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/ 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

Emergency Radiology

AUTHORS

Katharina Mueller-Peltzer[1] | Dinesh Varma[2]

AFFILIATION

[1)] Department of Diagnostic and Interventional Radiology, Medical Center – University of Freiburg, Faculty of Medicine, University of Freiburg, 79106 Freiburg, Germany

[2)] Department of Radiology, Alfred Health, Adjunct Professor, Department of Surgery, Monash University, Melbourne 3004, Victoria, Australia

<↑> HYPERLINK

katharina.mueller-peltzer@uniklinik-freiburg.de

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

基于 ESR 课程的放射学教育

急诊放射学

作者

Katharina Mueller-Peltzer[1] | Dinesh Varma[2]

所属机构

[1)] 弗莱堡大学医学院附属医学中心诊断与介入放射科，德国弗莱堡市，邮编 79106

[2)] 莫纳什大学外科学系
阿尔弗雷德健康集团放射科
兼职教授
澳大利亚墨尔本，邮编 3004

<↑> 超链接

katharina.mueller-peltzer@uniklinik-freiburg.de

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- Diagnostic Imaging Techniques
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  - X-Ray
  - Computed Tomography
  - Magnetic Resonance Imaging
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  - Stroke
  - Subarachnoid Haemorrhage
  - Trauma
  - Infectious Disease
- Chest Emergencies
  - Acute Chest Pain
  - Pulmonary Embolism
  - Acute Aortic Syndrome
  - Pneumothorax
  - Pneumonia
  - Airway and Lung Trauma
  - Oesophageal Trauma
- Abdominal Emergencies
  - Acute Abdomen
  - -itis
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  - Bowel Obstruction
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章节大纲：

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- 核心要点
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Principles of Emergency Radiology

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

急诊放射学原则

/ Principles of Emergency Radiology

It takes the effort of several people of different professions to transport, examine conduct diagnostics and treat a patient in an emergency setting. The radiology staff is part of this team and engages in the communication and the decision-making process.

The exchange of information between the various disciplines involved is important to initiate the right diagnostic steps and to choose the appropriate therapy. The radiologist must select an appropriate imaging protocol while ensuring to limit the radiation exposure based on ALARA principles (As Low As Reasonably Achievable)[1].

A focused primary assessment of the scans in an emergency setting followed by the immediate communication of life-threatening imaging findings is crucial.

This chapter will explain the role of various imaging modalities in common emergencies and how to systematically approach and identify critical and important imaging findings expediently that need urgent treatment.

CHAPTER OUTLINE:

/ 急诊放射学原则

章节大纲：

在急诊环境下，运送、检查、诊断以及治疗一名患者需要数名不同专业人员的共同努力。放射科工作人员是这个团队中的一员，将参与沟通和决策过程。

不同学科之间的信息交流对于启动正确的诊断步骤和选择适当的治疗非常重要。放射科医生必须选择适当的成像方案，同时确保根据 ALARA 原则（合理可行尽量低原则）[1]限制辐射暴露。

在急诊环境下对扫描结果进行重点初步评估，然后立即告知危及生命的影像学检查结果至关重要。

本章节将解释各种影像学检查方法在常见急症中的作用，以及如何系统地处理和识别需要紧急治疗的关键和重要影像学检查结果。

Diagnostic Imaging Techniques

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

影像诊断技术

/ Diagnostic Imaging Techniques

Choosing the appropriate imaging technique is crucial in making the correct diagnosis.

The following factors need to be considered in an emergency setting:

- What are the most relevant differential diagnoses and can I rule them out using the chosen modality?
- What imaging modality is available?
- Is the patient stable enough for the examination?
- Can the patient hold still, is sedation an option?
- Is there an imaging modality with or without less radiation exposure and comparable sensitivity available?

In general, the imaging modalities used in an emergency department are ultrasound, X-ray, Computed tomography (CT) and Magnetic resonance imaging. Of course, technical equipment of the emergency department may vary depending on institution size, location and type of cases treated.

CHAPTER OUTLINE:

/ 影像诊断技术

章节大纲：

选择适当的成像技术对于做出正确诊断至关重要。

在急诊环境下需要考虑以下因素：

- 最相关的鉴别诊断有哪些？可否通过所选检查方法予以排除？
- 有哪些可用的影像学检查方法？
- 患者当前病情是否稳定至可耐受此项检查？
- 患者能保持静止吗，是否需要使用镇静措施？
- 是否存在一种辐射暴露较少或没有辐射，且具有相当敏感性的影像学检查方法？

一般而言，急诊科使用的影像学检查方法包括超声、X 线、计算机断层扫描 (CT) 和磁共振成像 (MRI)。当然，急诊科的技术设备可能因机构规模、地点和治疗病例类型而异。

/ Ultrasound

>|< COMPARE

ADVANTAGES:

+ Widely available
+ Low costs
+ Fast
+ Safe
+ Enables bedside imaging
+ Allows visualisation of blood flow
+ Helps to safely place tubes and catheters
+ No radiation exposure
+ Can reduce the use of CT[2]

DISADVANTAGES:

– Operator dependant
– Visualisation can be limited due to meteorism or obesity
– Low reproducibility[2]

<∞> REFERENCE

> see also eBook chapter Ultrasound

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 超声

>|< 比较

优点：

+ 广泛普及
+ 成本低
+ 检查快速
+ 安全
+ 可实现床旁成像
+ 血流可视化
+ 有助于安全放置管路和导管
+ 无辐射暴露
+ 可减少 CT 的使用[2]

缺点：

– 取决于操作人员
– 由于肠气过多或肥胖，可视化可能受限
– 重现性低[2]

<∞> 参考文献

> 另请参阅《超声》电子书章节

Typical indications for ultrasound in the emergency room:

Acute cholecystitis, acute appendicitis, ovarian/testicular torsion, vascular pathologies (stenosis, occlusion, aneurysm, venous thrombosis), urinary stasis, free fluid, bleeding (FAST and E-FAST[3], see below for more details), intestinal obstruction, infectious foci in lung parenchyma or abdomen.

FAST and E-FAST

- FAST = focused assessment with sonography for trauma
- E-FAST = extended FAST, additionally assessing for thoracic injuries
- FAST/E-FAST assumes that all clinically significant injuries are associated with haemorrhage in the pleural, pericardial or peritoneal space or with pneumothorax
- FAST includes four basic sonographic views to exclude free fluid:
  - pericardial, perihepatic, perisplenic, pelvic
- E- FAST additionally includes the examination of the thorax anteriorly to assess for pneumothorax and the pleural recesses for haemothorax
- FAST/E-FAST is an important component of trauma algorithms for the initial evaluation of trauma patients

CHAPTER OUTLINE:

急诊室超声检查的典型适应证：

急性胆囊炎、急性阑尾炎、卵巢/睾丸扭转、血管病变（狭窄、闭塞、动脉瘤、静脉血栓形成）、尿潴留、游离积液、出血（FAST 和 E-FAST[3]，详见下文）、肠梗阻、肺实质或腹部感染灶。

FAST 和 E-FAST

- FAST=创伤超声重点评估
- E-FAST=扩展 FAST，额外评估胸部损伤
- FAST/E-FAST 假设所有具有临床意义的损伤均与胸膜、心包或腹膜腔出血或气胸有关
- FAST 包括 4 个基本的超声切面以排除游离积液：
  - 心包、肝周、脾周、盆腔
- E-FAST 还包括检查前胸以评估气胸，以及检查胸膜隐窝以评估血胸
- FAST/E-FAST 是创伤患者初始评估创伤算法的重要组成部分

章节大纲：

/ X-Ray Imaging

>|< COMPARE

ADVANTAGES:

+ Widely available
+ Low costs
+ Fast
+ Can be used to control the positioning of tubes and catheters[4]
+ Can be used bedside

DISADVANTAGES:

– Radiation exposure
– Patient must hold still
– Limited sensitivity and specificity compared to CT[4]

<∞> REFERENCE

> see also eBook chapter X-Ray Imaging

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ X 线成像

>|< 比较

优点：

+ 广泛普及
+ 成本低
+ 检查快速
+ 可用于引导管路和导管的定位[4]
+ 可在床旁使用

缺点：

– 辐射暴露
– 患者必须保持静止
– 与 CT 相比，灵敏度和特异性有限[4]

<∞> 参考文献

> 另请参阅《X 线成像》电子书章节

/ Computed Tomography (CT)

>|< COMPARE

ADVANTAGES:

+ Allows the evaluation of multiple organ systems with 1 scan
+ Enables visualisation of pathologies in situations when ultrasound and X-ray are of limited help
+ Contrast medium allows the evaluation of pathologies of vascular structures, parenchyma and soft tissue[5]

DISADVANTAGES:

– Radiation exposure
– Patient positioning, planning, performing and reading the scan takes time
– Higher costs compared to ultrasound and X-ray
– Potential allergic reactions to contrast medium[5]

<∞> REFERENCE

> see also eBook chapter Computed Tomography

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 计算机断层扫描 (CT)

>|< 比较

优点：

+ 可通过 1 次扫描评价多个器官系统
+ 在超声和 X 线的帮助有限的情况下，实现病理可视化
+ 对比剂可评价血管结构、实质和软组织的病变[5]

缺点：

– 辐射暴露
– 患者摆位、检查规划、扫描执行及结果解读均需耗时
– 与超声和 X 线相比成本更高
– 对对比剂有潜在的过敏反应[5]

<∞> 参考文献

> 另请参阅《计算机断层扫描》电子书章节

CT imaging is widely used in emergency settings. In some cases, only one or two body regions will be scanned, in other cases, for example in polytraumatised patients, a whole-body CT scan will be performed.

<!> ATTENTION

Prior to performing a CT scan, we need to ensure that the additional information we expect from the CT scan outweighs the disadvantage of dose exposure and potential risks related to contrast medium administration.

Furthermore, we need to ensure that no other imaging modality, for example ultrasound or MRI are more appropriate compared to CT. However, in polytrauma the benefits of CT scan outweigh the risk of radiation or contrast agents[6].

Once a CT scan is determined to be the appropriate imaging modality, the following principles need to be considered:

- Discuss the likely and differential diagnoses with the referring doctors
- Consider any potential limitations regarding the scan, for example: can the patient hold their breath, can they hold still and are there any contraindications to contrast medium administration
- Apply the most appropriate CT protocol
- Limit the scan to the body region of interest

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章节大纲：

CT 成像广泛用于急诊环境下。在某些情况下，仅会对一个或两个身体部位进行扫描，而在其他情况下（例如，多发性创伤患者），则需要进行全身 CT 扫描。

<!> 注意

在进行 CT 扫描之前，我们需要确保预期从 CT 扫描中获得的额外诊断收益超过剂量暴露和对比剂相关潜在风险。

此外，我们需确保没有比 CT 更合适的其他影像学检查方法（例如超声或 MRI）。但是，在多发性创伤中，CT 扫描的获益超过辐射暴露或对比剂的风险[6]。

一旦确定 CT 扫描是合适的影像学检查方法，就需要考虑以下原则：

- 与转诊医生讨论可能的诊断和鉴别诊断
- 考虑与扫描有关的任何潜在限制，例如：患者能否屏住呼吸，能否保持不动，以及是否存在有关施用对比剂的任何禁忌证
- 采用最合适的 CT 方案
- 将扫描限制于目标身体部位

Choosing the Appropriate CT Protocol

NON-CONTRAST ENHANCED SCANS FOR:

- intracranial haemorrhage
- elevated intracranial pressure
- pulmonary infections
- fractures
- sinusitis
- hollow organ perforation
- renal colic
- spinal, pelvic and complex skeletal trauma

CONTRAST ENHANCED SCANS FOR:

- vascular pathologies (dissection, stenosis, aneurysms, bleeding, pulmonary embolism)
- abdominal infections
- soft tissue infections (for example abscess or empyema)
- penetrating or blunt trauma
- polytrauma patients
- bowel obstruction

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章节大纲：

选择适当的 CT 方案

平扫适用于：

- 颅内出血
- 颅内压升高
- 肺部感染
- 骨折
- 鼻窦炎
- 空腔脏器穿孔
- 肾绞痛
- 脊柱、骨盆和复杂骨骼创伤

增强扫描适用于：

- 血管病变（夹层、狭窄、动脉瘤、出血及肺栓塞）
- 腹部感染
- 软组织感染（例如脓肿或积脓）
- 穿透性或钝性创伤
- 多发性创伤患者
- 肠梗阻

/ Magnetic Resonance Imaging (MRI)

>|< COMPARE

ADVANTAGES:

+ Excellent visualisation of the central nervous system (brain, spinal cord)
+ Excellent visualisation of soft tissue (abdominal parenchymal organs, muscles, fat tissue)
+ Excellent visualisation of bone involvement in soft tissue infections
+ No radiation exposure[7, 8]

DISADVANTAGES:

– Limited availability in emergency departments
– Long examination duration
– Higher costs compared to ultrasound, X-ray and CT
– Potential allergic reactions to contrast medium
– Contraindicated in patients with certain medical implants or metallic foreign bodies[7, 8]

<∞> REFERENCE

> see also eBook chapter Magnetic Resonance Imaging

/ Emergency Radiology

CHAPTER OUTLINE:

/ 磁共振成像 (MRI)

/ 急诊放射学

章节大纲：

>|< 比较

优点：

+ 中枢神经系统（大脑、脊髓）的可视化呈现非常出色
+ 软组织（腹部实质脏器、肌肉、脂肪组织）的可视化呈现非常出色
+ 软组织感染中骨受累的可视化呈现非常出色
+ 无辐射暴露[7, 8]

缺点：

– 在急诊科的利用率有限
– 检查时间长
– 与超声、X 线和 CT 相比成本更高
– 对对比剂有潜在的过敏反应
– 有某些医疗植入物或金属异物的患者禁用[7, 8]

<∞> 参考文献

> 另请参阅《磁共振成像》电子书章节

Head and Neck Emergencies

Emergency Radiology

急诊放射学

CHAPTER OUTLINE:

章节大纲：

头颈部急症

/ Stroke

If a patient is admitted to the hospital due to symptoms of a stroke, imaging is used to:

- / Differentiate between ischaemic and haemorrhagic stroke, localise the pathology, look for signs of increased intracranial pressure
- / If ischaemic: look for infarct demarcation, arterial occlusion and collaterals, penumbra and core of the ischaemic area
- / If haemorrhagic: look for a potential source of bleeding
- / If a stroke is suspected CT and MRI imaging are appropriate imaging modalities

<∞> REFERENCE

> see also eBook chapter Central Nervous System

CHAPTER OUTLINE:

/ 卒中

章节大纲：

如果患者因脑卒中症状而入院，影像学检查的作用包括：

- / 区分缺血性和出血性卒中，定位病变部位，寻找颅内压增高体征
- / 若为缺血性卒中：需评估梗死边界、动脉闭塞与侧支循环、缺血区半暗带及核心区
- / 若为出血性卒中：需评估可能的出血源
- / 如果怀疑发生卒中，CT 和 MRI 成像是合适的影像学检查方法

<∞> 参考文献

> 另请参阅《中枢神经系统》电子书章节

How to approach the scan

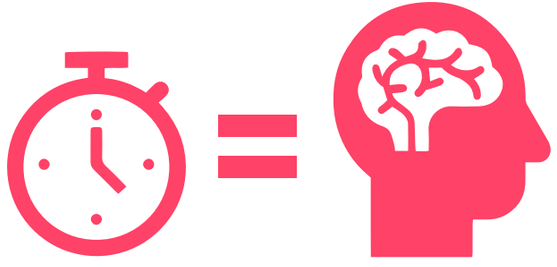
- **First step** is always to rule out cerebral haemorrhage and to clearly communicate the detection or exclusion of a haemorrhage to the treating physicians. This is important because intracranial haemorrhage is a contraindication for intravenous lysis therapy.

  If there are no other contraindications for lysis therapy (for example uncontrolled blood pressure despite intravenous application of antihypertensive medication or a major operation in the current patient history), lysis therapy will be started as quickly as possible.

- **Second step** is to look for hypoattenuating areas of brain parenchyma and for a hyperdense artery sign in CT or for signal alterations on MRI.

<!> ATTENTION

Remember: **Time is brain**



Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

如何进行扫描

章节大纲：

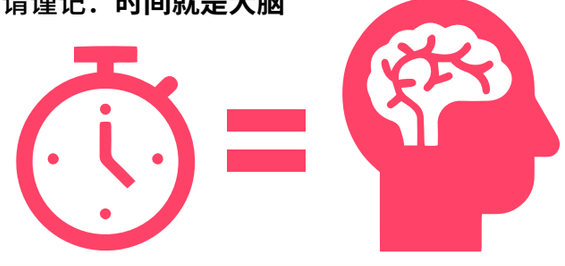
- 第一步始终是排除脑出血，并向主治医师明确通报出血的检出或排除结果。这一点很重要，因为颅内出血是静脉溶栓疗法的禁忌证。

  若患者无其他溶栓禁忌证（例如经静脉注射降压药物治疗后血压仍无法控制，或近期有重大手术史），则应尽快启动溶栓治疗。

- 第二步是在 CT 中寻找脑实质低密度区和高密度动脉征，或在 MRI 上寻找信号改变。

<!> 注意

请谨记：**时间就是大脑**



Detecting hypoattenuating areas in a brain CT can be challenging, these tips might help:

- The symptoms tell you where to look first:

  Patient can't move the left leg and arm > look on the right hemisphere

- Lean back in your chair and reduce the image magnification for a good overview

- Choose a narrow window to enhance contrast, this "stroke window" is often saved as a pre-set on the keyboard, see fig. 1 to compare brain window and stroke window[9]

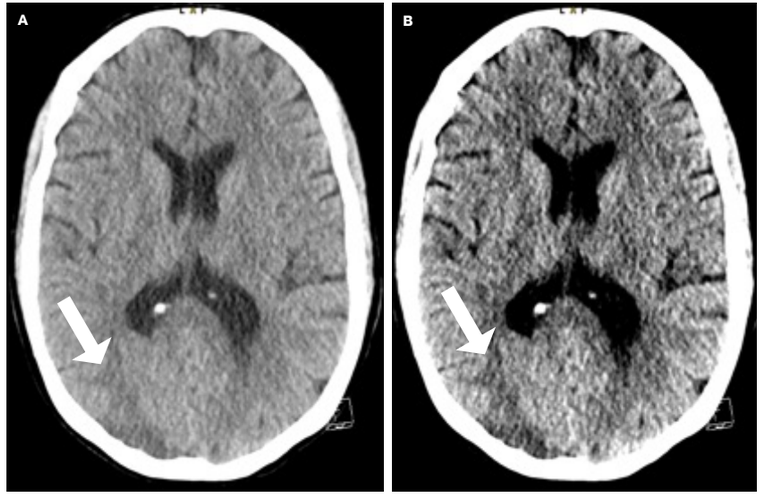


FIGURE 1

Axial image of a head CT scan of a patient with symptoms of a stroke.

A) Brain window pre-set. Right occipital infarct (**white arrow**).

B) Same patient with narrow window settings ("stroke window"). The infarct is better delineated (**white arrow**).

CHAPTER OUTLINE:

在脑部 CT 中检测低密度区域可能很困难，以下建议会有所帮助：

- 根据症状判断优先检查的部位：

  患者无法移动左腿和左臂 > 检查右侧脑半球

- 向后靠在椅子上，降低图像放大率以获得更好的整体视图

- 选择窄窗以增强对比度，此"卒中窗"通常作为预设参数保存在设备快捷键中，参见图 1 对比脑窗与卒中窗的显示差异[9]

章节大纲：

图 1

出现卒中症状患者的头部 CT 扫描轴位图像。

A) 脑窗预设。右枕叶梗死（**白色箭头**）。

B) 同一患者使用窄窗口设置（"卒中窗"）。梗死灶轮廓显示更为清晰（**白色箭头**）。

/ Subarachnoid Haemorrhage

/ The most common causes of subarachnoid haemorrhage are trauma (> see next page) and aneurysm rupture.

/ Depending on the location of an aneurysm the haemorrhage can not only result in subarachnoid but also in intraventricular haemorrhage, see fig. 2 A. & B.

/ Saccular aneurysms are most frequently localised in the anterior or posterior communicating artery (35%, respectively), middle cerebral artery (20%) or basilar artery (5%), see fig. 2 B.

/ Therapeutic options are endovascular (coils and/or stents, see fig. 2 C.) or neurosurgical (clipping) occlusion of the aneurysm.

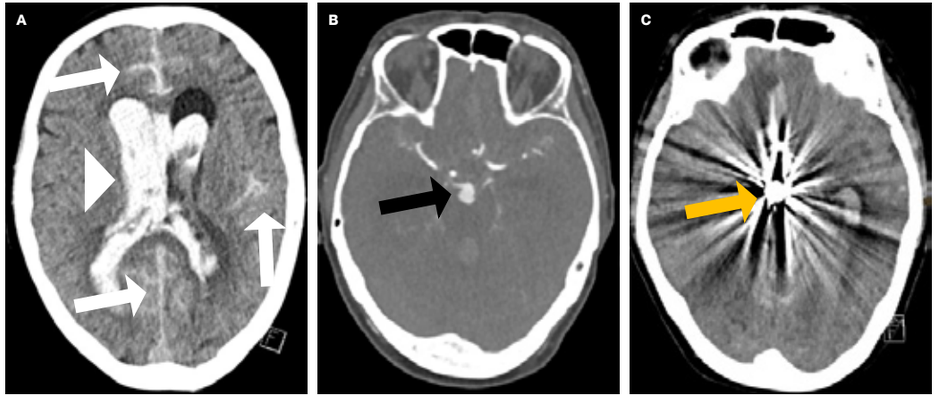


FIGURE 2

Axial images of a brain CT of the same patient.

A) Subarachnoid (**white arrows**) and intraventricular haemorrhage (**white arrowhead**).

B) CT angiography visualising a large aneurysm of the basilar artery (**black arrow**).

C) Control CT four days after endovascular therapy using coils. Note the extensive artefacts caused by the coils in the aneurysmal sac (**orange arrow**).

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 蛛网膜下腔出血

/ 蛛网膜下腔出血最常见的原因是创伤（> 请参阅下页）和动脉瘤破裂。

/ 根据动脉瘤的位置，其出血不仅可导致蛛网膜下腔出血，也可导致脑室内出血，请参阅图 2A 和 2B。

/ 囊状动脉瘤最常位于前或后交通动脉（分别为 35%）、大脑中动脉（20%）或基底动脉（5%），请参阅图 2B。

/ 治疗选择包括血管内介入（弹簧圈和/或支架，请参阅图 2C）或神经外科手术（夹闭术）行动脉瘤闭塞。

图 2

同一患者脑部 CT 的轴位图像。

A) 蛛网膜下腔（**白色箭头**）和脑室内出血（**白色箭头**）。

B) CT 血管成像可见基底动脉的大动脉瘤（**黑色箭头**）。

C) 血管内弹簧圈栓塞治疗术后第四天的相应 CT 扫描。注意动脉瘤囊内弹簧圈引起的大量伪像（**橙色箭头**）。

/ Trauma

If a patient is admitted to the hospital due to suspected traumatic brain injury, imaging is used to identify:

- / Location, size and type of intracranial haemorrhage
- / Signs of increased intracranial pressure
- / Fractures
- / Signs of open traumatic head injury
  > foreign bodies, intracranial gas bubbles

HOW TO APPROACH THE SCAN

Finding small intracranial haemorrhages can be challenging, these tips might help:

- / Look for a subgaleal haematoma first, this is the site of the coup, check for intracranial haemorrhage here.
- / Then look at the opposite site of the skull, this is the contra-coup site, check for haemorrhage here, fig. 3.

FIGURE 3

Domestic fall. The patient has hit his left forehead sustaining a small right frontal subgaleal haematoma. (**asterisk**). This is the site of the coup.

On the opposite side is a small contra-coup occipital subarachnoid haemorrhage (**white arrow**).

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 外伤

如果患者因疑似创伤性脑损伤而入院，影像学检查可用于识别：

- / 颅内出血的部位、大小和类型
- / 颅内压增高体征
- / 骨折
- / 开放性颅脑创伤的体征
  > 异物、颅内气泡

如何进行扫描

发现小的颅内出血可能比较困难，以下提示可能会有所帮助：

- / 首先寻找帽状腱膜下血肿（外伤着力点），此处需排查是否合并颅内出血。
- / 然后观察颅骨的对侧部位（即对冲伤部位），此处需排查出血情况（图 3）。

图 3

患者在家中跌倒，左前额部遭受撞击，形成右侧额部帽状腱膜下小血肿（**星号**）。此处为外伤着力点。

对侧可见小范围对冲性枕部蛛网膜下腔出血（**白色箭头**）。

HOW TO APPROACH THE SCAN

Distinguishing between the different types of intracranial haemorrhage can be tricky, these tips might help:

- Check the coronal reconstruction, subdural haematoma will be formed like a sickle, fig. 4
- An epidural haematoma will have lenticular shape in the axial and the coronal reconstruction, fig. 5. These are commonly associated with skull fracture so look carefully for a fracture
- Subarachnoid haemorrhage will be linear and follow the sulci, fig. 6
- Traumatic intraparenchymal haemorrhage can be round or oval and often shows a hypoattenuating ring, a perifocal oedema, fig. 7
- In many cases you will find more than one type of intracranial haemorrhage[10]

FIGURE 4

Thin subdural haematoma on the left side, marked by a **white arrow**.

FIGURE 5

Epidural haematoma on the left side (**white arrow**). There was a fracture adjacent to the haematoma (Not shown on the image).

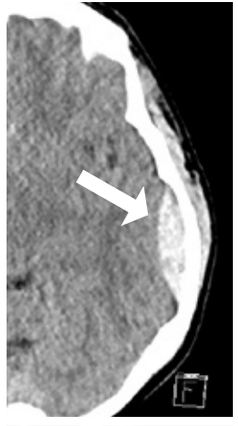


FIGURE 6

Small subarachoid haemorrhage frontal left (**white arrow**).

FIGURE 7

Intra-parenchymal haemorrhage left frontal lobe with perifocal oedema (**white arrow**).

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

如何进行扫描

区分不同类型的颅内出血可能很复杂，以下提示可能会有所帮助：

- 观察冠状位重建图像，硬膜下血肿将呈镰刀状（图 4）
- 硬膜外血肿在轴位及冠状位重建图像上均呈透镜状（图 5）。这些通常与颅骨骨折相关，因此请仔细观察是否有骨折
- 蛛网膜下腔出血常呈线性分布并沿脑沟回走行，图 6
- 创伤性脑实质内出血可呈圆形或椭圆形，常显示低密度环、灶周水肿（图 7）
- 多数情况下，患者可能同时存在多种类型的颅内出血[10]

图 4

左侧较薄硬膜下血肿，如白色箭头所示。

图 5

左侧硬膜外血肿（**白色箭头**）。血肿附近有骨折（图像上未显示）。

图 6

左侧额部小蛛网膜下腔出血（**白色箭头**）。

图 7

左额叶脑实质内出血伴灶周水肿（**白色箭头**）。

/ Infectious Disease

- / Common infections in the head and neck region are sinusitis, odontogenic infection, tonsillitis, peritonsillar or laryngeal abscess
- / Due to the close anatomical position of the different structures in the head and neck region infectious diseases in this area can cause life-threatening conditions
  - / Spread of the infection to the mediastinum, spine or intracranial compartments
  - / Airway obstruction
  - / Vascular complications (thrombosis, haemorrhage)

>▪< FURTHER KNOWLEDGE

https://pubs.rsna.org/doi/full/10.1148/rg.2019190159

FIGURE 8

Young male patient with fever, unable to open his mouth, and dysphagia.

Post contrast neck CT at the level of oropharynx.

Large right tonsillar abscess (**white arrow**).

HOW TO APPROACH THE SCAN

Look for:

- / Hypoattenuating muscles (oedema)
- / Fat stranding (soft tissue oedema)
- / Fluid collections with hyperattenuating ring (abscess)
- / Enlarged lymph nodes

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 感染性疾病

- / 头颈部区域的常见感染包括鼻窦炎、牙源性感染、扁桃体炎、扁桃体周围脓肿或喉脓肿
- / 由于头颈部区域不同结构的解剖位置较为接近，因此该区域的感染性疾病可导致危及生命的病症
  - / 感染扩散至纵隔、脊柱或颅内间隙
  - / 气道阻塞
  - / 血管并发症（血栓形成、出血）

图 8

年轻男性患者，伴有发热，不能张口，吞咽困难。

口咽水平颈部增强 CT 检查。

右侧扁桃体大脓肿（**白色箭头**）。

如何进行扫描

查找：

- / 肌肉低密度区（水肿）
- / 脂肪条索征（软组织水肿）
- / 伴高密度环的液性聚集区（脓肿）
- / 肿大淋巴结

>▪< 进阶知识

https://pubs.rsna.org/doi/full/10.1148/rg.2019190159

Chest Emergencies

胸部急症

Emergency Radiology

急诊放射学

CHAPTER OUTLINE:

章节大纲：

/ Acute Chest Pain

/ Is one of the most common complaints in the emergency department, so have your differential diagnoses at hand, most common DD's are listed in table 1.

/ Chest pain can be caused by acute life-threatening and harmless diseases, therefore it is important to exclude diagnoses with the highest short-term mortality risk first: acute coronary syndrome, pulmonary embolism and acute aortic syndrome.

/ Symptoms, medical history, physical examination, ECG and laboratory results help to confirm or eliminate acute life-threatening disease[11].

CARDIAC CAUSES	RESPIRATORY CAUSES	OTHER CAUSES
Acute coronary syndrome	Pulmonary embolism	Musculoskeletal
Aortic dissection	Pneumonia	Gastro-oesophageal reflux disease
Pericarditis	Pneumothorax	Anxiety/panic attack
Myocarditis	Pleurisy	–

TABLE 1

Most common causes of acute chest pain[12].

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 急性胸痛

/ 急诊科最常见的主诉之一，需备好鉴别诊断清单，最常见鉴别诊断见表 1。

/ 胸痛可能由危及生命的急症和良性疾病引起，因此需要首先排除短期死亡风险最高的疾病：急性冠脉综合征、肺栓塞和急性主动脉综合征。

/ 症状、病史、体格检查、ECG 和实验室检查结果有助于确认或排除危及生命的急性疾病[11]。

心脏原因	呼吸系统病因	其他原因
急性冠脉综合征	肺栓塞	骨骼肌肉
主动脉夹层	肺炎	胃食管反流病
心包炎	气胸	焦虑/惊恐发作
心肌炎	胸膜炎	-

表 1

急性胸痛最常见的原因[12]。

/ Pulmonary Embolism

/ Clinical signs and symptoms are nonspecific, it may be asymptomatic or discovered incidentally

/ Common symptoms: dyspnoea, chest pain, presyncope or syncope or haemoptysis

/ Assessment of clinical pre-test probability: The Wells score and PERC rule are the most validated tools that assist in clinical decision making and are important to limit overuse of imaging[11]

/ Ventilation/perfusion (V/Q) scanning, especially in the presence of a normal chest X-ray, is a more reliable test in pregnancy than in the non-pregnant population as they are generally younger and have fewer comorbidities

>|< COMPARE

ADVANTAGES:

+ CT pulmonary angiography (CTPA) is the method of choice:

  Readily available in most centres, excellent accuracy, may provide alternative diagnosis, short acquisition time

DISADVANTAGES:

– Radiation exposure, exposure to iodine contrast (limited use in iodine allergy and hyperthyroidism, tendency to overuse because of easy accessibility[11, 13]

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 肺栓塞

/ 临床症状和体征缺乏特异性，可能无症状或偶然发现

/ 常见症状：呼吸困难、胸痛、昏厥或晕厥或咯血

/ 临床前测概率评估：Wells 评分和 PERC 规则是经过最广泛验证的临床决策工具，对限制影像学检查的过度使用至关重要[11]

/ 通气/灌注 (V/Q) 显像在妊娠期人群中比非妊娠期人群更可靠（尤其在胸部 X 线正常时），因为妊娠人群通常更年轻且合并症较少

>|< 比较

优点：

+ CT 肺动脉造影（CT pulmonary angiography，CTPA）是首选方法：

  在多数医疗机构均可便捷实施，准确性高，可提供替代性诊断，且采集时间短

缺点：

– 存在辐射暴露、碘对比剂暴露风险（禁用于碘过敏及甲亢患者），且因检查便捷性易被过度使用[11, 13]

HOW TO APPROACH THE SCAN

- Check the main pulmonary arteries first to find central thromboembolism, fig. 9
- Then follow the lobar, segmental and then the subsegmental arteries in each lobe for thromboembolism, fig. 11
- Check if the right ventricle has a larger diameter than the left, a sign of right ventricular pressure overload, fig. 10
- Check for other pathologies (pneumonia, pleural or pericardial effusion, pulmonary oedema, etc.)

FIGURE 9

Transverse images of a CT pulmonary angiography scan. Extensive pulmonary embolism in the right main pulmonary artery and the left upper lobe artery (**white arrows**).

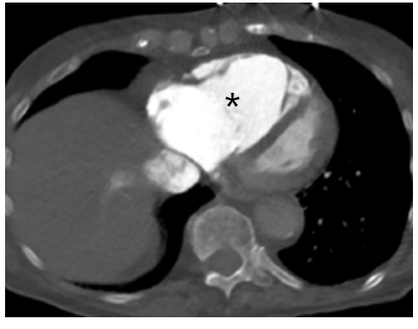


FIGURE 10

Same patient as in fig. 9. The right ventricle (**black asterisk**) is enlarged with mild leftward deviation of the interventricular septum, demonstrating right ventricle pressure overload caused by extensive pulmonary embolism.

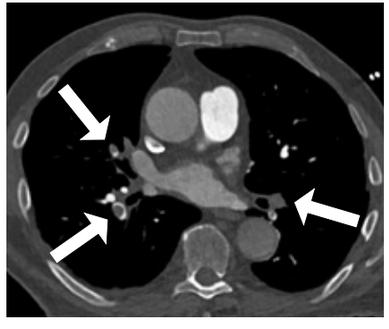


FIGURE 11

CT pulmonary angiography with bilateral segmental pulmonary embolism (**white arrows**).

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

如何进行扫描

- 首先检查主肺动脉，以便发现中央型血栓栓塞（图 9）
- 随后依次检查各肺叶的叶级、段级及亚段级肺动脉以寻找血栓栓塞（图 11）
- 观察右心室的直径是否大于左心室，这是右心室压力超负荷的征象（图 10）
- 观察是否有其他病症（肺炎、胸膜或心包积液、肺水肿等）

图 9

CT 肺动脉造影扫描的横断面图像。右主肺动脉及左肺上叶动脉广泛性肺栓塞（**白色箭头**）。

图 10

与图 9 为同一患者。右心室（**黑色星号**）扩大，室间隔轻度向左偏移，表明广泛肺栓塞引起右心室压力超负荷。

图 11

CT 肺动脉造影显示双侧肺段性肺栓塞（**白色箭头**）。

/ Acute Aortic Syndrome

/ Acute aortic syndrome includes the following pathologies: aortic dissection, intramural haematoma and penetrating atherosclerotic ulcer (PAU).

/ Risk factors: hypertension, genetic disorders (Marfan and Turner syndrome), inflammatory vasculitis, infective arteritis, iatrogenic factors (cardiac valve or aortic surgery), pregnancy.

CT-IMAGING

/ It is important to perform a non-enhanced and a contrast enhanced scan. The non-enhanced scan helps to visualise a hyperdense, thickened aortic wall in case of an intramural haematoma[11] (fig. 12).

/ We perform the CT using ECG gating to avoid moving artefacts in the ascending aorta caused by the beating heart, compare fig. 13 a) and b).

FIGURE 12

Non-contrast enhanced, ECG gated CT thorax. Hyperdense intramural haematoma of the ascending aorta, marked by a white arrow.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 急性主动脉综合征

/ 急性主动脉综合征包括以下病症：主动脉夹层、壁内血肿和穿透性动脉粥样硬化性溃疡（penetrating atherosclerotic ulcer，PAU）。

/ 风险因素：高血压、遗传性疾病（马凡氏综合征和特纳综合征）、炎症性血管炎、感染性动脉炎、医源性因素（心脏瓣膜或主动脉手术）、妊娠。

CT 成像

/ 进行平扫和增强扫描很重要。平扫有助于显示主动脉壁内血肿所致的高密度、增厚的主动脉壁[11]（图 12）。

/ 我们使用 ECG 门控进行 CT 检查，以避免心脏跳动引起的升主动脉移动伪像，参见图 13a) 与图 13b) 的对比。

图 12

平扫 ECG 门控胸部 CT。升主动脉高密度壁内血肿，如白色箭头所示。

<!> ATTENTION

Life-threatening complications of aortic dissections include organ ischaemia (abdominal, see fig. 14, limb, myocardial, brain), aortic rupture and pericardial tamponade[11]

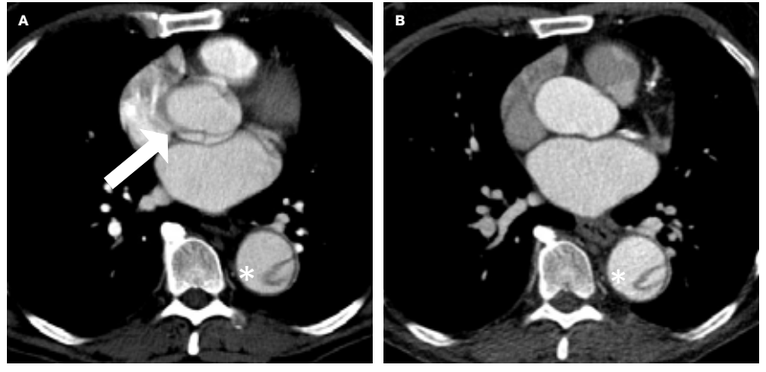


FIGURE 14

A) Non ECG gated CT scan of the thoracic aorta. The white arrow marks artefacts in the ascending aorta. Note the dissection in the descending aorta (**asterisk**).

B) Same patient as in figure 13 a) ECG gated CT scan eliminates the artefact in the ascending aorta.

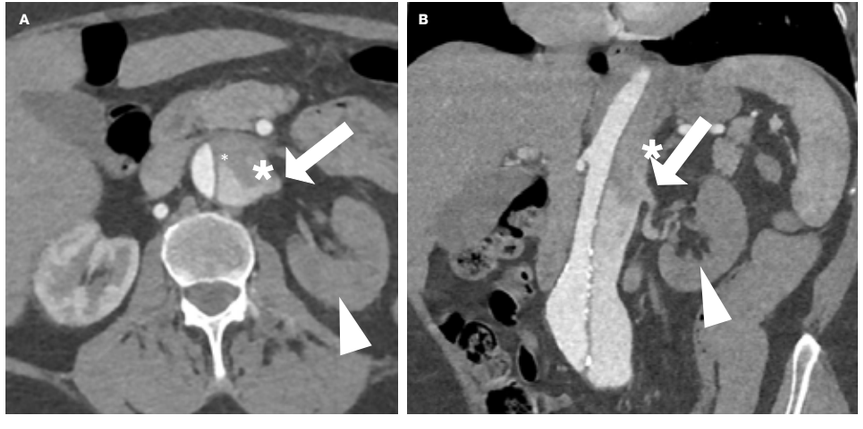


FIGURE 13

Transverse (**A**) and coronal (**B**) image of CT angiography of a patient with Stanford A dissection. The left renal artery (**white arrow**) originates from the false lumen (**asterisks**) and thus the perfusion of the left kidney (**white arrowhead**) is significantly reduced. The right renal artery arises from the true lumen and the right kidney enhances regularly.

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

<!> 注意

主动脉夹层的致命并发症包括器官缺血（腹部、肢体、心肌、脑部，请参阅图 14）、主动脉破裂及心包填塞[11]

图 13

Stanford A 型主动脉夹层患者的 CT 血管成像横断面 (**A**) 和冠状位 (**B**) 图像。左肾动脉（**白色箭头**）起源于假腔（**星号**），因此左肾（**白色箭头**）的灌注显著减少。右肾动脉起自真腔，右肾强化均匀。

图 14

A) 胸主动脉非 ECG 门控 CT 扫描。白色箭头所示为升主动脉伪像。注意降主动脉中的夹层（星号）。

B) 与图 13 为同一患者 a) ECG 门控 CT 扫描可消除升主动脉的伪像。

HOW TO APPROACH THE SCAN

- First check the non-contrast scan for a crescent hyperdense area (= intramural haematoma), it can be subtle, fig. 12
- Then check the contrast enhanced scan for a hypodense line (= intimomedial flap) within the aortic lumen. Aortic dissection is classified as Stanford A (involving the ascending aorta, fig. 15) or Stanford B (distal to the left subclavian artery)
- The intimomedial flap separates the aortic lumen in 2 parts: true lumen (= normal lumen) and false lumen (= pathologic lumen within the wall)

Check if you can trace the intimomedial flap to

- The coronary arteries
  > this can cause myocardial ischaemia
- To the supracoronary arteries
  > this can cause a stroke
- To the abdominal aorta and the visceral branch vessels
  > this can cause abdominal organ ischaemia[11], fig. 14

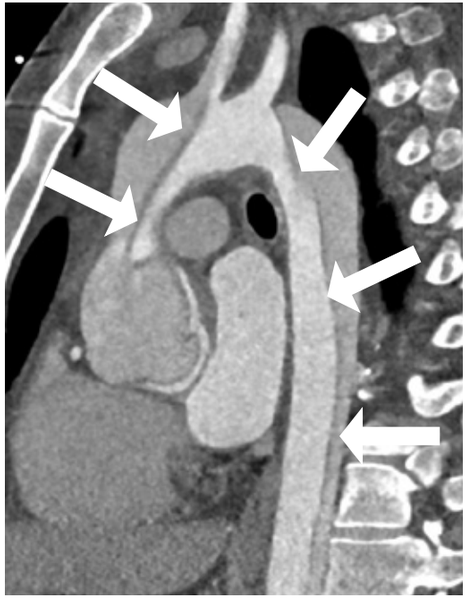


FIGURE 15

Contrast enhanced CT thorax in arterial phase, sagittal image. Stanford A aortic dissection extending from aortic valve to the descending aorta. The intimomedial flap is marked by white arrows.

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

如何进行扫描

- 首先检查平扫是否有新月形高密度区域（即壁内血肿），这种征象可能较隐匿（图 12）
- 随后在对比增强扫描中检查主动脉管腔内是否存在低密度线状影（即内膜瓣片）。主动脉夹层分为 Stanford A 型（累及升主动脉，图 15）和 Stanford B 型（左锁骨下动脉远端）
- 内膜瓣片将主动脉腔分成 2 个部分：真腔（即正常腔）和假腔（即壁内病理性腔）

检查是否可追踪内膜瓣片至

- 冠状动脉
  > 会导致心肌缺血
- 至冠状动脉开口以上层面
  > 可能导致卒中
- 至腹主动脉及内脏分支血管
  > 可能导致腹部脏器缺血[11]（图 14）

图 15

动脉期胸部增强 CT，矢状位图像。Stanford A 型主动脉夹层从主动脉瓣延伸到降主动脉。内膜瓣片如白色箭头所示。

/ Pneumothorax

- / Imaging modality of choice in case of suspected pneumothorax is an X-ray
- / Severely injured patients will get a CT scan to simultaneously check for injuries of the vessels, mediastinum, lung parenchyma, bones and pleural space
- / Pathophysiology: gas collection within the pleural space
- / A tension pneumothorax occurs if intrapleural gas accumulates progressively, the mediastinal shift compromises the blood flow to the heart. A tension pneumothorax is an emergency clinical condition > immediate recognition, communication and therapy are very important[11]

HOW TO APPROACH THE SCAN

- / Check if you can see fine vessels in the periphery of both lungs
- / Check if you can detect a very fine hyperattenuating line = visceral pleura
- / Check if you see a radiolucent area peripheral to the pleural line
- / Check if the mediastinum is moved to the other side and if the diaphragm is flattened > tension pneumothorax [11], figure 16

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 气胸

- / 在疑似气胸的情况下，首选的影像学检查方法是 X 线检查
- / 严重损伤患者将接受 CT 扫描，以便同时检查血管、纵隔、肺实质、骨骼和胸膜腔的损伤
- / 病理生理学：胸膜腔内积气
- / 如果胸腔内气体进行性积聚，则会发生张力性气胸，致使纵隔移位影响心脏血流。张力性气胸是一种紧急临床状况 > 及时的识别、沟通和治疗非常重要[11]

如何进行扫描

- / 观察双肺外周是否可见细小血管影
- / 检查是否可以观察到纤细高密度线样影（即脏层胸膜）
- / 观察胸膜线周围是否出现透亮区
- / 检查纵隔是否向对侧移位及膈肌是否低平 > 张力性气胸[11]（图 16）

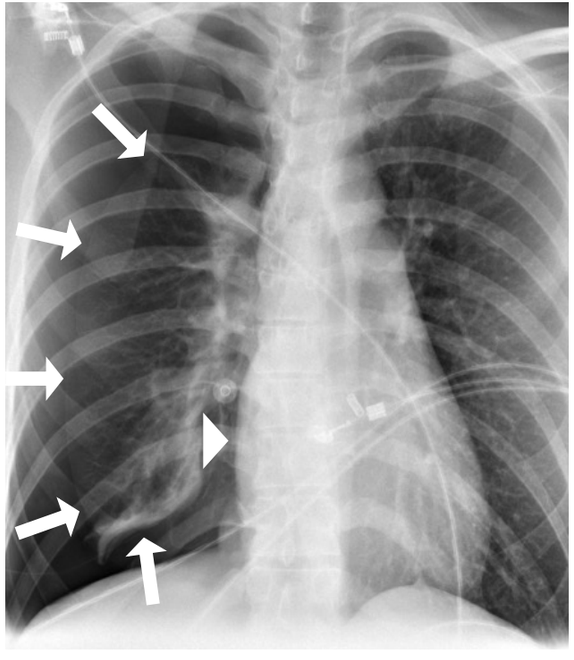


FIGURE 16

Tension pneumothorax. White arrows mark the visceral pleural edge on the right side. Note that the right heart contour is pushed to the contralateral side (**white arrowhead**) and the right side of the diaphragm is pushed downward and flattened.

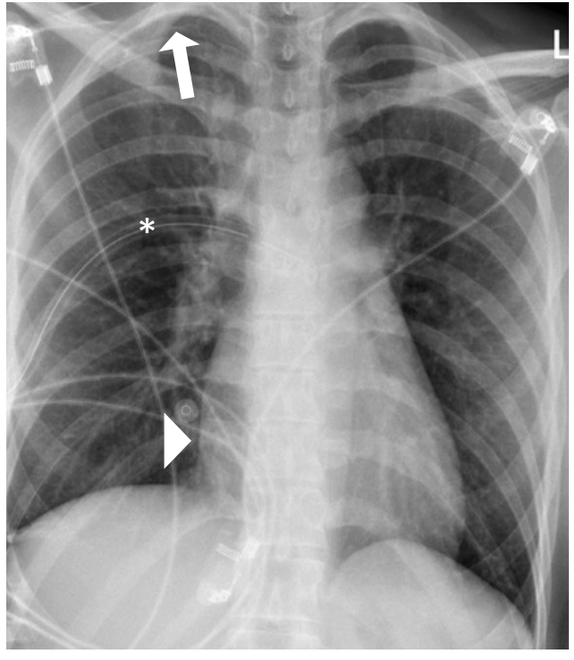


FIGURE 17

Same patient as in fig. 16, after placement of a chest drain (**white asterisk**) the mediastinum (**white arrowhead**) and right diaphragm contour and position are now normal. A small residual pneumothorax is marked by a white arrow.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

图 16

张力性气胸。白色箭头所示为右侧脏层胸膜边缘。请注意，右心轮廓被推向对侧（**白色箭头**），右侧膈肌被向下推压低平。

图 17

与图 16 为同一患者，在放置胸腔引流管（**白色星号**）后，纵隔（**白色箭头**）和右侧膈肌轮廓和位置均正常。小的残余气胸如白色箭头所示。

/ Pneumonia

/ Common symptoms are fever, cough, purulent expectoration and deep chest pain

/ Community-acquired pneumonia (CAP) can be classified into lobar pneumonia, broncho-pneumonia and interstitial pneumonia, imaging features are listed in table 2[11]

LOBAR PNEUMONIA	BRONCHO-PNEUMONIA	INTERSTITIAL PNEUMONIA
Infection of alveoli	Bronchial mucosal inflammation	Infection of pulmonary interstitium
Limited to one segment or lobe	Spreads through the airway into alveoli	Frequently peribronchial lobular tissue involved

TABLE 2

Characteristic imaging features of CAP[11].

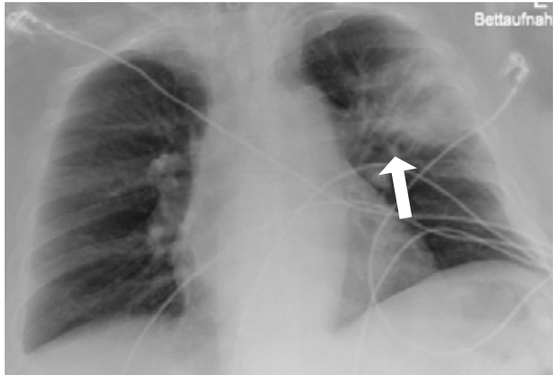


FIGURE 18

Chest X-ray of a patient presenting with a fever and cough. Lobar pneumonia on the left upper lobe (**white arrow**).

HOW TO APPROACH THE SCAN

/ Check for patchy, reticular or homogeneous changes in the lung parenchyma

/ Then check the pattern: one side or both sides involved? More than one lobe involved?

/ Check for parapneumonic effusion

/ Emergency Radiology

CHAPTER OUTLINE:

/ 肺炎

/ 急诊放射学

章节大纲：

/ 常见症状为发热、咳嗽、脓性痰和胸部深层疼痛

/ 社区获得性肺炎（Community-acquired pneumonia，CAP）可分为大叶性肺炎、支气管肺炎和间质性肺炎等，影像学特征见表 2[11]

大叶性肺炎	支气管肺炎	间质性肺炎
肺泡感染	支气管黏膜炎症	肺间质感染
限于一个肺段或肺叶	通过气道扩散到肺泡中	常累及支气管周围的小叶组织

表 2

CAP 的特征性影像学表现[11]。

如何进行扫描

/ 观察肺实质中是否有斑片状、网状或弥漫性改变

/ 随后观察气胸累及模式：单侧还是双侧？累及多个肺叶？

/ 观察肺炎相关胸腔积液

图 18

对出现发热和咳嗽的患者进行的胸部 X 线检查。左肺上叶大叶性肺炎（**白色箭头**）。

/ Airway and Lung Trauma

/ Trauma to the thorax can be blunt (for example fall from a height or a car accident) or penetrating (for example knife stabbing).

/ We look for bleeding in the lung parenchyma, which can be patchy or homogenously consolidated, for pneumothorax, emphysema of the soft tissues or the mediastinum, haemothorax and active bleeding[11].

HOW TO APPROACH THE SCAN

Check for

/ Air in the pleural space > pneumothorax

/ Air in the soft tissue > emphysema

/ Fluid in the pleural space, if the fluid has increased density > haemothorax, fig. 19

/ Ground glass opacities and consolidation in the parenchyma > bleeding[10], fig. 20

FIGURE 19

Haemothorax with clotted blood (**asterisk**) on the right side in a patient who fell down the stairs.

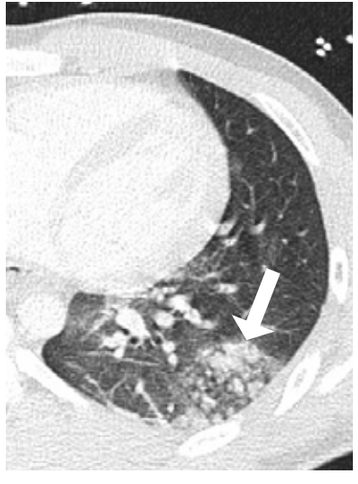


FIGURE 20

Pulmonary haemorrhage in the left lower lobe (**white arrow**) in a young patient who had a motorbike accident.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 气道和肺创伤

/ 胸部创伤可以是钝性（例如从高处坠落或车祸）或穿透性（例如刀刺伤）创伤。

/ 观察肺实质中可能表现为斑片状或弥漫性实变的出血、气胸、软组织或纵隔气肿、血胸和活动性出血[11]。

如何进行扫描

观察是否有：

/ 胸膜腔积气 > 气胸

/ 软组织积气 > 气肿

/ 胸膜腔积液，如果积液密度增高 > 血胸（图 19）

/ 肺实质内的磨玻璃影与实变 > 出血[10]（图 20）

图 19

楼梯坠落伤患者，右侧血胸伴凝血块（星号）。

图 20

摩托车事故的年轻患者，左肺下叶肺出血（白色箭头）。

/ Oesophageal Trauma

/ Oesophageal injuries are uncommon, but you should consider a potential oesophageal injury in case of penetrating wounds to the lower neck or mediastinum, following cervicothoracic instrumentation, following forceful retching/vomiting (Boerhaave syndrome) or in case of blunt thoracic trauma.

/ The patient's history is very important. A patient with deep chest pain might not report vomiting or a medical procedure such as a gastroscopy.

HOW TO APPROACH THE SCAN

Check for

/ Air in the mediastinum
> be aware that the air could originate from the airways as well

/ Check if the oesophageal wall is oedematous

/ Check for fluid in the mediastinal fat surrounding the oesophagus[10]

/ Oesophageal injury can result in mediastinitis and abscess formation, hence important to diagnose and treat early[11].

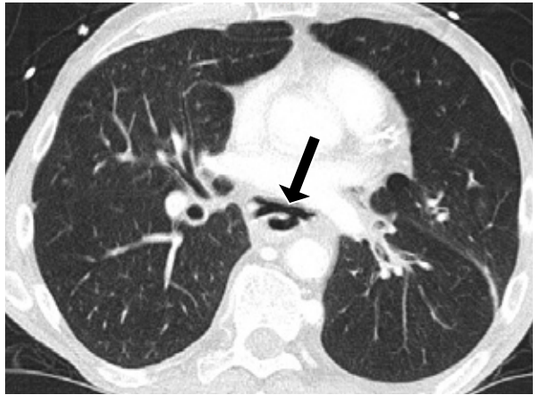


FIGURE 21

Pneumomediastinum (**black arrow**) in a patient who presented with deep chest pain 24 hrs post gastroscopy.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 食管创伤

/ 食管损伤不常见，但如果发生下颈部或纵隔穿透伤、颈胸段器械操作后、剧烈干呕/呕吐（Boerhaave 综合征）后或钝性胸部创伤时，应考虑食管损伤的可能。

/ 患者的病史非常重要。以胸部深层疼痛为主诉的患者，可能不会主动提供呕吐或胃镜检查等医疗操作史。

/ 食管损伤可导致纵隔炎和脓肿形成，因此早期诊断和治疗很重要[11]。

如何进行扫描

检查是否有：

/ 纵隔内积气
> 请注意，空气也可能来自气道

/ 观察食管壁是否水肿

/ 观察食管周围的纵隔脂肪中是否有液体[10]

图 21

一例患者在胃镜检查后 24 小时出现深部胸痛，纵隔积气（**黑色箭头**）。

Abdominal Emergencies

急腹症

Emergency Radiology

急诊放射学

CHAPTER OUTLINE:

章节大纲：

/ Acute Abdomen

/ Is a frequent reason for consultation in the emergency department.

/ Various conditions can cause an acute abdomen and it is important to know the potential differential diagnoses.

/ Fig. 22 and table 3 demonstrate the most common differential diagnoses in relation to pain localisation.

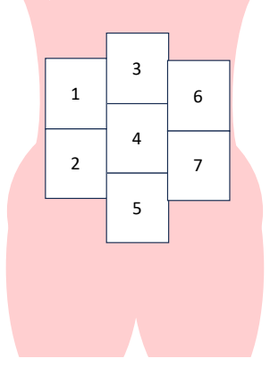


FIGURE 22

Schematic drawing of localisations of the differential diagnoses discussed in table 3.

1	/ Cholecystitis, choledocholithiasis, cholangitis / Hepatitis, liver abscess, pancreatitis / Pyelonephritis / Basal pneumonia, myocardial infarction
2	/ Appendicitis, bowel obstruction, inflammatory bowel disease, infectious enteritis, hernia / Adnexitis, ectopic pregnancy, gonadal torsion / Kidney stones
3	/ Appendicitis (early stage), gastritis, duodenal ulcer, oesophagitis / Pancreatitis
4	/ Appendicitis (early stage), gastroenteritis, enterocolitis, bowel obstruction
5	/ Bladder infection, acute bladder retention / Gonadal torsion
6	/ Pancreatitis / Gastritis / Pyelonephritis / Basal pneumonia, myocardial infarction
7	/ Acute diverticulitis / Adnexitis, ectopic pregnancy, gonadal torsion / Kidney stones

TABLE 3

Common differential diagnoses of an acute abdomen.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 急腹症

/ 急诊科会诊的常见原因。

/ 有多种疾病均可导致急腹症，了解可能的鉴别诊断非常重要。

/ 图 22 和表 3 显示了与疼痛定位相关的最常见鉴别诊断。

图 22

表 3 显示鉴别诊断定位的示意图。

1	/ 胆囊炎、胆总管结石、胆管炎 / 肝炎、肝脓肿、胰腺炎 / 肾盂肾炎 / 基底段肺炎、心肌梗死
2	/ 阑尾炎、肠梗阻、炎症性肠疾病、感染性肠炎、疝气 / 附件炎，宫外孕，性腺扭转 / 肾结石
3	/ 阑尾炎（早期）、胃炎、十二指肠溃疡、食管炎 / 胰腺炎
4	/ 阑尾炎（早期）、胃肠炎、小肠结肠炎、肠梗阻
5	/ 膀胱感染、急性膀胱尿潴留 / 性腺扭转
6	/ 胰腺炎 / 胃炎 / 肾盂肾炎 / 基底段肺炎、心肌梗死
7	/ 急性憩室炎 / 附件炎，宫外孕，性腺扭转 / 肾结石

表 3

急腹症的常见鉴别诊断。

/ -itis

/ If the patient's history, clinical examination and the laboratory results indicate an abdominal inflammation there are many differential diagnoses to be considered, the location of the pain gives important information, see fig. 22 and table 3.

/ **In an acute setting a CT of the abdomen in the portal venous phase is the imaging protocol of choice.**

/ Important CT findings are such as free fluid, stranding of the abdominal fat tissue, wall thickening of bowel/ bladder/ gallbladder, will lead you to the organ inflamed, fig. 23.

FIGURE 23

Patient presented with severe lower right abdominal pain, fever and elevated inflammation parameters.

CT abdomen in portal-venous phase confirms acute appendicitis - enlarged and oedematous appendix (**white arrow**) with surrounding fat stranding (**asterisk**) and a small amount of adjacent free fluid (**white arrowhead**).

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ -炎

/ 如果患者的病史、临床检查和实验室检查结果表明存在腹部炎症，则需要考虑多种鉴别诊断，疼痛部位可提供重要信息，请参阅图 22 和表 3。

/ **在急诊情况下，门静脉期的腹部 CT 是首选的影像学检查方案。**

/ 重要CT征象包括腹腔游离积液、腹部脂肪组织条索影、肠管/膀胱/胆囊壁增厚等，此类表现可定位发生炎症的器官（见图 23）。

图 23

患者出现重度右下腹痛、发热和炎症指标升高。

门静脉期腹部 CT 可确认急性阑尾炎 - 阑尾增大、水肿（**白色箭头**），周围脂肪条索征（**星号**）和少量相邻游离积液（**白色箭头**）。

/ Hollow Organ Perforation

- / Ulcer, inflammation, ischaemia, tumour or gastro-intestinal instrumentation can result in perforation.
- / The patient's history can assist in identifying an aetiology.
- / Free abdominal gas is normal in the first days after abdominal surgery.
- / X-ray of the abdomen can be performed in an erect or in a lateral decubitus position, but small amounts of free abdominal gas can be missed using X-ray.
- / Using CT very small amounts of free gas as well as the origin of the free gas can be detected, fig. 24 A. and B.

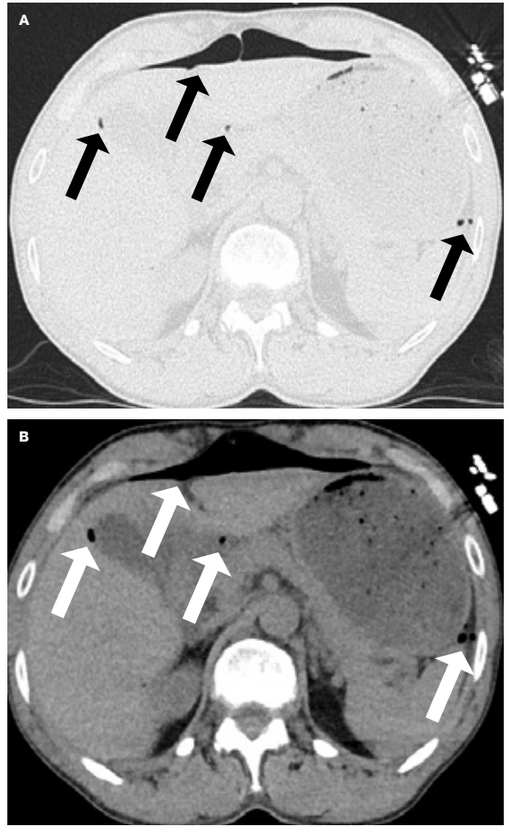


FIGURE 24

The patient presented with acute epigastric pain and guarding on examination.

A CT scan of abdomen in lung window (**A**) and soft tissue window (**B**) shows a large amount of free intra-peritoneal gas (**black and white arrows**).

At surgery a perforated gastric ulcer was found.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 空腔脏器穿孔

- / 溃疡、炎症、缺血、肿瘤或胃肠器械操作可导致穿孔。
- / 患者的病史可以帮助确定病因。
- / 腹部手术后数日内存在游离气体是正常现象。
- / 腹部 X 线检查可以在直立位或侧卧位进行，但使用 X 线检查可能会遗漏少量的腹部游离气体。
- / 使用 CT 可以检测非常少量的游离气体以及游离气体的来源，如图 24A 和 24B 所示。

图 24

检查时，该患者表现为急性上腹痛，查体可见腹肌紧张。

肺窗 (**A**) 和软组织窗 (**B**) 中的腹部 CT 扫描显示大量的游离腹腔积气（**黑色和白色箭头**）。

手术时发现胃溃疡穿孔。

/ Bowel Obstruction

/ Common causes in the small bowel obstruction are adhesions or hernia and in the large bowel malignancy or volvulus. Inflammatory/anastomotic strictures can be seen in small and large bowel obstruction.

/ Imaging is important to differentiate it from an adynamic ileus and to find the location of the mechanical obstruction, fig. 26.

HOW TO APPROACH THE SCAN

/ Think of it as a traffic jam: the roads are crowed up to the point where the accident happened and beyond the accident the road is empty = the bowel will be dilated and filled up to the point of the obstruction and collapsed beyond that.

/ To find the obstruction you must follow the dilated bowel from oral to aboral.

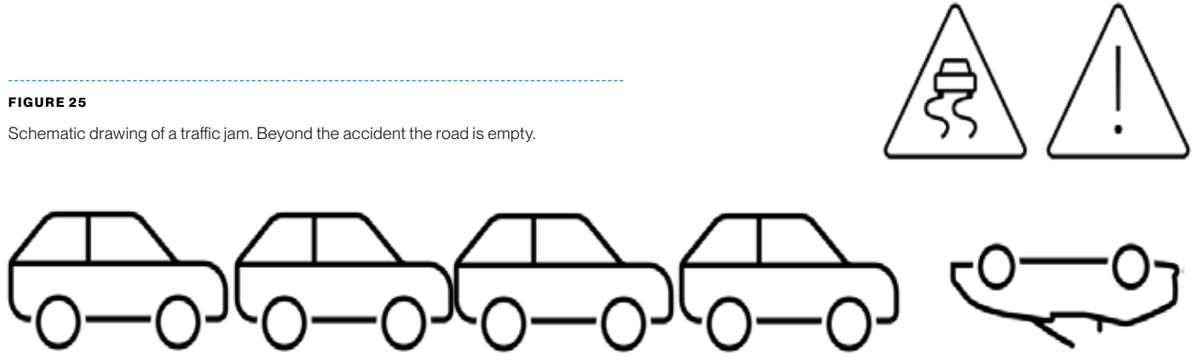


FIGURE 25

Schematic drawing of a traffic jam. Beyond the accident the road is empty.

CHAPTER OUTLINE:

/ 肠梗阻

章节大纲：

/ 小肠梗阻的常见原因是粘连或疝气，而大肠梗阻的常见原因则是恶性肿瘤或肠扭转。炎症性/吻合口狭窄可见于小肠和大肠梗阻。

/ 影像学检查对于鉴别麻痹性肠梗阻和定位机械性梗阻的位置非常重要（图 26）。

如何进行扫描

/ 可以将其想象为交通堵塞：道路拥堵一直延伸到事故发生点，而事故点前方的道路却空无一车，肠梗阻时，肠管会在梗阻点近端扩张、积液，而梗阻点远端则塌陷无内容物。

/ 要定位梗阻点，必须从口侧（近端）向肛侧（远端）追踪扩张的肠管。

图 25

交通阻塞示意图。事故点前方道路是空的。

FIGURE 26

The patient had a history of hemicolectomy for ascending colon carcinoma. CT scan of abdomen (**A**) transverse and (**B**) coronal images show dilated bowel loops (**asterisks**) and a transition point (**white arrow**) with collapsed loops distally. Diagnosis of bowel obstruction caused by an adhesion was confirmed during operation.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

图 26

患者有因升结肠癌行半结肠切除术的病史。腹部 (**A**) 横断面和 (**B**) 冠状位视图的 CT 扫描显示扩张的肠袢（**星号**）和远端有塌陷肠袢的过渡点（**白色箭头**）。术中确诊为粘连引起的肠梗阻。

/ Bowel Ischaemia

- It can be caused by arterial embolism (e.g. caused by atrial fibrillation), arterial thrombosis (caused by arteriosclerosis), venous thrombosis (e.g., hypercoagulation disorders) or nonocclusive (e.g. use of vasoactive agents).
- Symptoms are often nonspecific with diffuse or periumbilical, constant, severe pain.
- Begins with reversible mucosal ischaemia > irreversible ischaemia > bowel necrosis causing pneumatosis, perforation, peritonitis, and possibly death.
- CT-imaging is important to look for patency of the arteries (arterial phase), patency of the veins and ischaemic bowel wall changes (venous phase)[14].

HOW TO APPROACH THE SCAN

Check if

- the celiac trunk, superior and inferior mesenteric artery are patent
- the mesenteric veins and the portal veins are patent
- the bowel walls are enhancing with contrast media (see fig. 27A.) or not (wall look grey fig. 27B.). Non-enhancing bowel wall looks similar to the fluid inside the bowel loops

TIP: The coronal view gives a better overview of the small and large bowel and makes comparing the contrast enhancement easier

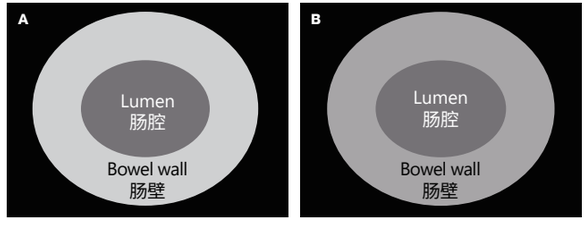


FIGURE 27

A) Schematic drawing of a normal bowel wall enhancement.

B) Schematic drawing of a non-enhancing bowel wall in ischaemic bowel.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 肠缺血

- 血栓可由动脉栓塞（例如，由心房颤动引起）、动脉血栓形成（由动脉硬化引起）、静脉血栓形成（例如，血液高凝状态）或非闭塞性疾病（例如，使用血管活性药物）引起。
- 症状通常无特异性，表现为弥漫性或脐周持续性剧烈疼痛。
- 开始时表现为可逆性黏膜缺血 > 不可逆性缺血 > 肠坏死，导致肠壁积气、穿孔、腹膜炎，并可能导致死亡。
- CT 成像对于检查动脉通畅性（动脉期）、静脉通畅性和缺血性肠壁变化（静脉期）非常重要[14]。

如何进行扫描

检查：

- 腹腔干、肠系膜上动脉和肠系膜下动脉均通畅
- 肠系膜静脉和门静脉通畅
- 肠壁增强（请参阅图 27A）或未增强（肠壁看起来是灰色的，图 27B）。非增强的肠壁看起来像肠袢内的液体

提示： 冠状位视图能更全面地观察小肠和大肠的分布，并更容易对比不同肠段的对比剂增强程度

图 27

A）正常肠壁强化示意图。

B）缺血肠中非强化肠壁的示意图。

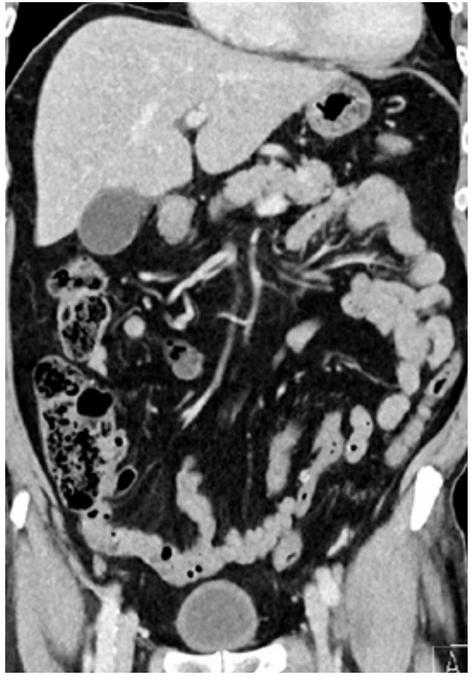


FIGURE 28

CT abdomen in portal venous phase, coronal view, demonstrating normal contrast enhancement and calibre of bowel loops.

FIGURE 29

Different patient. CT abdomen in portal venous phase, coronal view. Ischaemic bowel loops (**asterisks**) lack adequate contrast enhancement and are dilated due to ileus. White arrows mark extraluminal gas caused by focal perforation of ischaemic bowel loops.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

图 28

门静脉期腹部 CT（冠状位视图），显示正常对比剂增强和肠袢口径。

图 29

另一例患者。门静脉期腹部 CT（冠状位视图）。缺血肠袢（星号）因肠梗阻而扩张，且缺乏足够的强化。白色箭头标记了缺血肠袢局灶性穿孔导致的肠腔外气体。

/ Bleeding

/ Can occur anywhere in the body: pleural or peritoneal cavity, intramuscular, subcutaneous, intraparenchymal.

/ Can be caused by trauma, blood thinner, operations/interventions, tumours, inflammation, vascular anomalies, coagulopathy in sepsis, congenital coagulopathies.

/ For unstable patients CT is the imaging modality of choice; the bleeding protocol includes a non-contrast scan to highlight any pre-existing hyperdense material (calcifications, clips, blood clots etc.), an arterial phase to demonstrate vascular anatomy and contrast extravasation and a venous phase to visualise the increasing contrast extravasation[15].

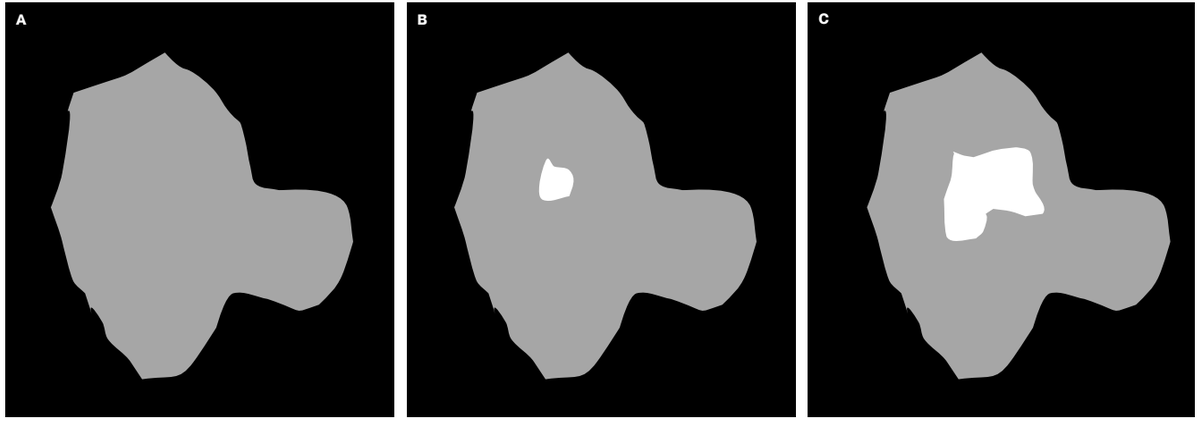


FIGURE 30

Schematic drawing of a haemorrhage in

A) a non-contrast scan,

B) a scan in arterial phase with arterial extravasation within the haemorrhage and

C) in a scan in venous phase showing increasing extravasation within the haemorrhage.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 出血

/ 可发生在身体任何部位：胸膜或腹膜腔、肌内、皮下、器官实质内。

/ 可由创伤、抗凝血药、手术/干预、肿瘤、炎症、血管畸形、脓毒症凝血障碍、先天性凝血障碍引起。

/ 对于不稳定患者，CT 是首选的影像学检查方法；出血方案包括平扫，突出显示任何预先存在的高密度物质（钙化、金属夹、血块等），动脉期扫描显示血管解剖结构和对比剂外渗，静脉期扫描显示对比剂外渗增加[15]。

图 30

患者出血示意图

A) 平扫，

B) 动脉期扫描显示出血部位内动脉外渗，以及

C) 静脉期扫描中显示出血部位内外渗增加。

HOW TO APPROACH THE SCAN

- Look for hyperdense blood clots, asymmetry in the soft tissue, fat stranding or blood-filled bowel loops (in case of gastrointestinal bleeding) in the non-contrast scan, see fig. 31 A.
- When you find a haematoma look for contrast extravasation (**white arrow**), which is visualised as hyperdense spots/areas within the haematoma that can't be found in the non-contrast scan, see fig. 31 B., then check if the extravasation becomes larger in size in the venous phase (**white arrowhead**), see fig. 31 C.

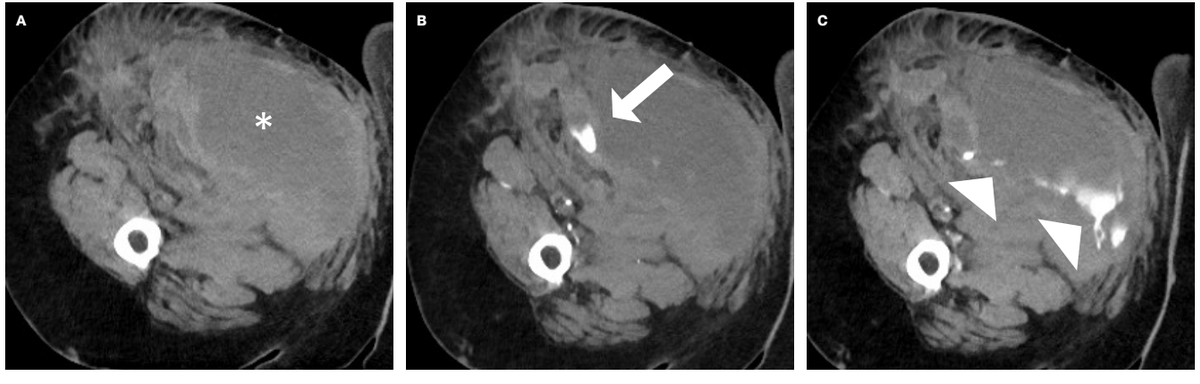


FIGURE 31

Triphasic CT scan of the right proximal thigh with non-enhanced (**A**), arterial phase (**B**) and venous phase scan (**C**). The patient had a massive swelling in the right groin and upper thigh after cardiac intervention. The asterisk marks the haematoma, the white arrow marks the contrast extravasation in the arterial phase and the white arrowheads marks the enlarging contrast extravasation.

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

如何进行扫描

- 在平扫中探查高密度血凝块、软组织不对称、脂肪条索征或充血性肠袢（在胃肠道出血的情况下），请参阅图 31A。
- 发现血肿时，应查看是否出现对比剂外渗（**白色箭头**），这表现为血肿内无法在平扫中发现的高密度斑点/区域，请参阅图 31B。然后检查外渗在静脉期是否变大（**白色箭头**），请参阅图 31C。

图 31

右大腿近端 CT 三期扫描，包括平扫 (**A**)、动脉期 (**B**) 和静脉期 (**C**) 扫描。患者接受心脏介入治疗后，右腹股沟和大腿上部出现大面积肿胀。星号标记血肿，白色箭头标记动脉期对比剂外渗，白色箭头标记扩大的对比剂外渗。

Musculo-skeletal Emergencies

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

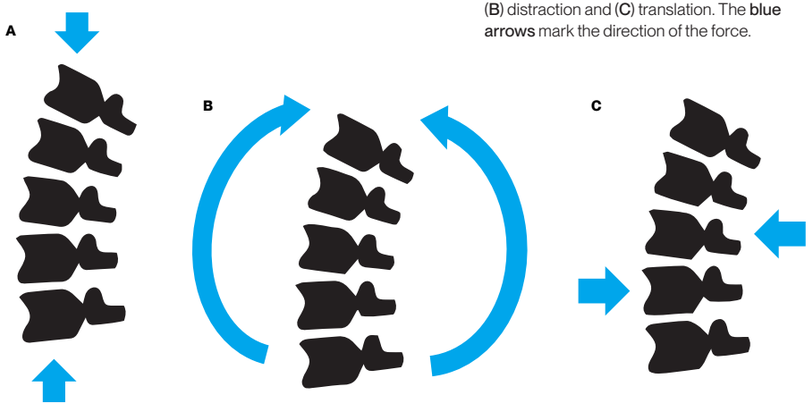
骨骼肌肉急症

/ Spinal Trauma

- / 2 important components:
  - / Vertebral body fractures can be detected using X-ray, CT and MRI.
  - / Spinal cord, ligamentous and intervertebral disc injuries are detected using MRI.
- / Most often caused by motor vehicle accidents or fall from a great height.
- / The patho-mechanism can assist in predicting the injuries: we differentiate between compression (fig. 32 A), distraction fig. 32 B) and translation (fig. 32 C) injuries.
- / Spinal cord injury is more likely to occur in distraction and translation injuries.
- / The patients are often seriously injured.

FIGURE 32

Schematic drawing of the three main mechanisms of spinal trauma: (**A**) compression, (**B**) distraction and (**C**) translation. The **blue arrows** mark the direction of the force.



<∞> REFERENCE

> see also eBook chapter Conventional X-Ray Imaging

>∎< FURTHER KNOWLEDGE

Link to the poster of the AO Spine thoraco-lumbar injury classification system

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 脊柱创伤

- / 2 个重要组成部分：
  - / 椎体骨折可以使用 X 线、CT 和 MRI 进行检查。
  - / 使用 MRI 检查脊髓、韧带和椎间盘损伤。
- / 最常见的原因是机动车事故或从高处坠落。
- / 病理机制有助于预测损伤：我们区分了压迫性损伤（图 32A）、牵引性损伤（图 32B）和移位性损伤（图 32C）。
- / 脊髓损伤在分离型损伤和平移型损伤中更易发生。
- / 伤者多为重伤。

<∞> 参考文献

> 另请参阅《常规 X 线成像》电子书章节

图 32

脊柱创伤的三种主要机制示意图：(A) 压缩，(B) 牵拉和 (C) 移位。蓝色箭头标记力的方向。

>∎< 进阶知识

AO 脊柱胸腰椎损伤分类系统海报链接

HOW TO APPROACH THE SCAN

Look for:

- Dislocation or displacement within the vertebral column
- Asymmetric ventral or dorsal gap between the osseous structures
- Fracture lines, dorsal fragments and reduction in height of the vertebral bodies

<!> ATTENTION

In distraction and translation injuries the structures linking the vertebral bodies (ligaments, intervertebral discs) and the vertebral bodies are damaged.

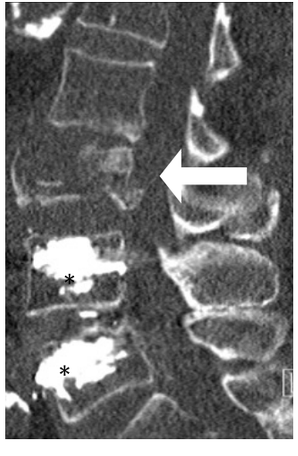


FIGURE 33

Sagittal image of a CT scan of an 85-year-old patient who fell on the left hip. Burst compression fracture of L3 (L3: A4 AO spine) is marked by a white arrow. Note previous vertebroplasty of L4 and L5 (**asterisks**).

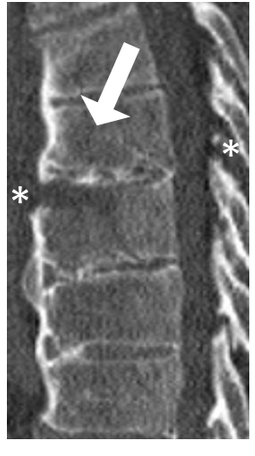


FIGURE 34

Sagittal image of a CT scan of an 80-year-old patient who fell down the stairs. A distraction fracture of Th7/8 (Th7/8: B3, Th8: A2 AO spine) is marked by a white arrow. Note the widening (**asterisks**) ventrally and dorsally caused by the distraction.

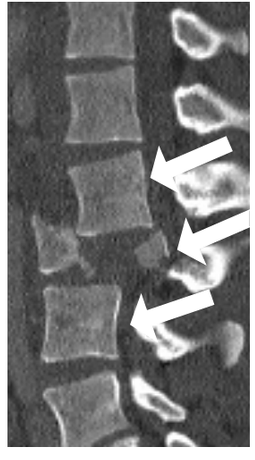


FIGURE 35

Sagittal image of a CT scan of a translation injury of L2-4 (L2-4: C AO spine) (**white arrows**) in a patient involved in a motorbike accident. Note the burst fracture of L3 and the disruption of the posterior vertebral line.

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

如何进行扫描

查找：

- 脊柱脱位或移位
- 骨性结构之间的腹侧或背侧间隙不对称
- 骨折线、背侧骨碎片及椎体高度降低

<!> 注意

在牵拉性和移位性损伤中，连接椎体的结构（韧带、椎间盘）和椎体本身均会受到破坏。

图 33

85 岁左髋部着地摔倒患者的 CT 扫描矢状位图像。L3 爆裂性压缩性骨折（L3：A4 AO 脊柱分型）用白色箭头标记。既往曾行 L4 和 L5 椎体成形术（星号）。

图 34

80 岁楼梯跌倒患者的 CT 扫描矢状位图像。Th7/8 节段牵拉性骨折（AO 脊柱分型：Th7/8 B3 型，Th8 A2 型 AO 脊柱分型）由白色箭头标记牵拉性损伤导致的腹侧和背侧间隙增宽（星号）。

图 35

摩托车事故患者 L2-4 节段移位性损伤（L2-4：AO 脊柱分型 C 型）的 CT 扫描矢状位图像（**白色箭头**）。L3 椎体的爆裂性骨折及椎体后缘线的中断。

Pelvic Trauma

- The pelvis is a complex ringlike structure composed by bones and ligamentous structures, the interosseous sacroiliac ligaments are the strongest, while the symphysis is the weakest link in the pelvic ring.
- In young patients, pelvic fractures result from high energy trauma, such as motor vehicle accidents or falls from a height and can be associated with injuries of arteries, veins, the bladder or nerves.
- In elderly patients, non-displaced pelvic fractures can also result from low-energy trauma or falls[16].

HOW TO APPROACH THE SCAN

- First, search for fractures in the anterior and posterior pelvic ring and for widening of the pubic symphysis and the sacroiliac joint.
- Second, look for pelvic and surrounding soft tissue haematomas.

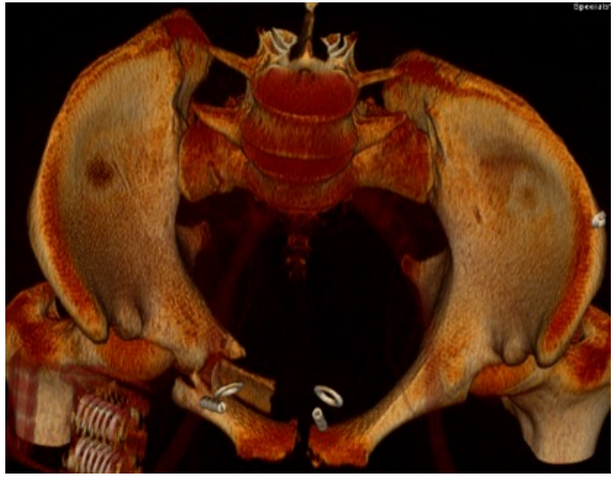


FIGURE 36

3-D reconstruction of a CT scan of a complex, unstable pelvic ring fracture (anterior and posterior ring is injured). The patient was hit by a truck.

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

骨盆创伤

- 骨盆是由骨骼和韧带结构组成的复杂环状样结构，其中骶髂骨间韧带最为强韧，而骨联合是骨盆环中最薄弱的连接。
- 在年轻患者中，骨盆骨折通常由高能量创伤引起，例如机动车事故或从高处坠落，并且可能伴随动脉、静脉、膀胱或神经损伤。
- 在老年患者中，低能量创伤或跌倒也可导致非移位性骨盆骨折[16]。

如何进行扫描

- 首先，寻找骨盆前后环的骨折以及耻骨联合和骶髂关节的增宽。
- 其次，寻找盆腔和周围软组织血肿。

图 36

复杂、不稳定骨盆环骨折（前环和后环均受损）CT 扫描的三维重建。患者被卡车撞伤。

/ Spondylodiscitis

/ Most of the patients present with back pain, only a few have a fever.

/ > 50 % are caused by Staphylococcus aureus.

/ Caused by

  / Haematogenous spread secondary to bacteraemia (commonly caused by endocarditis or intravenous drug use),

  / Extension from an adjacent abscess (oropharyngeal infection or sacral decubitus ulcers) or,

  / Direct inoculation after spinal surgery or penetrating trauma.

/ Most frequent presentation: single level involvement commonly in the lumbar spine.

/ MRI is the imaging modality of choice; sensitivity and specificity are higher compared to CT.

HOW TO APPROACH THE SCAN

/ Look for a high signal on T2 sequences and for enhancement on T1 post contrast in the disc space, adjacent endplates and paravertebral soft tissue[17], fig. 37.

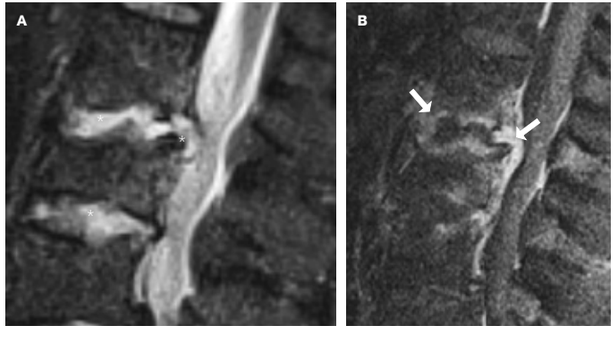


FIGURE 37

MRI scan of a patient with history of intravenous drug use and back pain, diagnosed with spondylodiscitis L1-L3.

A) Sagittal T2 sequence with fat suppression. Asterisks marks fluid signal in the disc and epidural space.

B) Sagittal T1 sequence post contrast with fat suppression. White arrows marks contrast enhancement in the discs, the endplates and epidural space.

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

/ 椎间盘炎

章节大纲：

/ 多数患者表现为腰背痛，少数伴有发热。

/ > 50% 由金黄色葡萄球菌引起。

/ 原因

  / 继发于菌血症的血源性扩散（通常由心内膜炎或静脉注射药物引起），

  / 邻近脓肿蔓延（口咽感染或骶骨褥疮溃疡）或，

  / 脊柱手术或穿透性外伤后的直接植入感染。

/ 最常见的表现：常为腰椎单节段受累。

/ MRI 是首选的影像学检查方法；灵敏度和特异性均高于 CT。

如何进行扫描

/ 在 T2 序列上寻找椎间盘间隙、相邻终板及椎旁软组织的高信号，并在 T1 增强图像上观察这些区域的增强表现[17]（图 37）。

图 37

一例有静脉注射毒品和背痛史的患者 MRI 扫描图像，诊断为 L1-L3 椎间盘炎。

A) 脂肪抑制矢状位 T2 序列。星号标记椎间盘和硬膜外腔的液体信号。

B) 脂肪抑制矢状位 T1 增强序列。白色箭头标记椎间盘、终板和硬膜外腔的增强信号。

Polytrauma

Emergency Radiology

CHAPTER OUTLINE:

急诊放射学

章节大纲：

多发性创伤

/ Polytrauma

<!> ATTENTION

= major trauma

/ The definition of "polytrauma/major trauma" has changed over time and different definition exist in the literature. It can be defined based on the Abbreviated Injury Score (AIS) or the Injury Severity Score (ISS). The most pragmatic definition is the following: combination of injuries in different body regions of which at least one or the combination of different injuries is potentially life-threatening[18].

/ Polytraumatised patients are evaluated in an inter-disciplinary team in the shock room.

/ The extent of imaging depends on the mechanism of injury and the suspected injuries and can include:

  / E-FAST – checking for free fluid and pneumothorax,

  / Polytrauma CT scan – checking for injuries of head, neck, thorax and abdomen,

  / X-ray – checking for injuries of the extremities.

/ When reporting on a polytrauma scan it is important to **diagnose first what kills first**: e.g. large intracranial haemorrhage, signs of increased intracranial pressure, spine injury, hemopericardium, injury of large vessels, large pneumothorax, haemothorax, haemo-peritoneum, extensive injury to parenchymal abdominal organs, active bleeding, mispo-sitioning of foreign material [19, 20].

/ Emergency Radiology

CHAPTER OUTLINE:

/ 急诊放射学

章节大纲：

/ 多发性创伤

<!> 注意

= 严重创伤

/ "多发性创伤/严重创伤"的定义随着时间的推移而发生变化，文献中存在不同的定义。可根据"简明损伤评分"（Abbreviated Injury Score，AIS）或"损伤严重程度评分"（Injury Severity Score，ISS）进行定义。最实用的定义如下：不同身体部位损伤的组合，其中至少一种损伤或不同损伤的组合可能危及生命[18]。

/ 多发性创伤患者需在休克抢救室接受多学科团队的联合评估。

/ 影像学检查的范围取决于损伤机制和疑似损伤类型，可包括：

  / E-FAST – 检查游离积液和气胸，

  / 多发性创伤 CT 扫描 – 检查头部、颈部、胸部和腹部的损伤，

  / X 线检查 – 检查四肢的损伤。

/ 报告多发性创伤扫描时，首要任务是**诊断可能最快致命的损伤**：例如，颅内大出血、颅内压增高体征、脊柱损伤、心包积血、大血管损伤、大量气胸、血胸、腹腔积血、腹部实质器官广泛损伤、活动性出血、异物错位等[19, 20]。

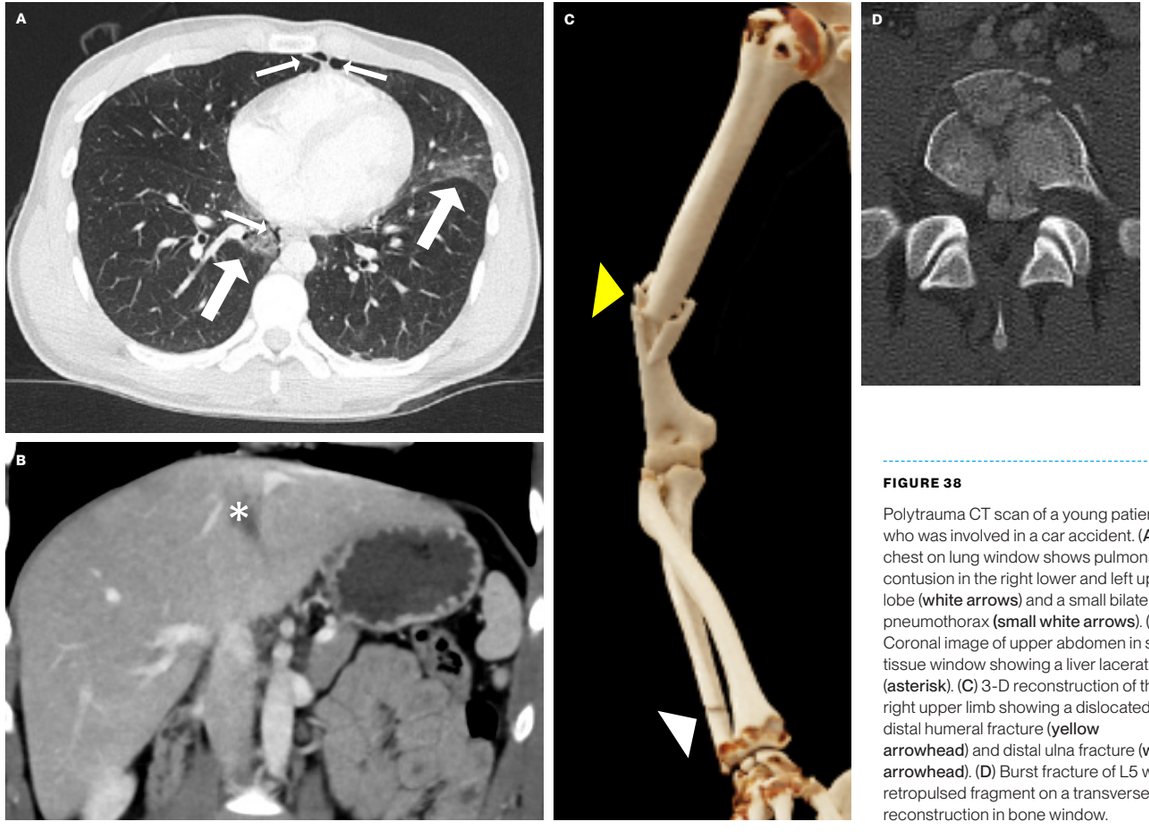


FIGURE 38

Polytrauma CT scan of a young patient who was involved in a car accident. (**A**) CT chest on lung window shows pulmonary contusion in the right lower and left upper lobe (**white arrows**) and a small bilateral pneumothorax (**small white arrows**). (**B**) Coronal image of upper abdomen in soft tissue window showing a liver laceration (**asterisk**). (**C**) 3-D reconstruction of the right upper limb showing a dislocated distal humeral fracture (**yellow arrowhead**) and distal ulna fracture (**white arrowhead**). (**D**) Burst fracture of L5 with retropulsed fragment on a transverse reconstruction in bone window.

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章节大纲：

图 38

一例发生车祸的年轻患者多发性创伤 CT 扫描图像。(**A**) 胸部 CT 肺窗显示右肺下叶和左肺上叶有肺挫伤（**白色箭头**）同时伴有双侧少量气胸（**白色小箭头**）。(**B**) 上腹部软组织窗的冠状位图像显示肝破裂（**星号**）。(**C**) 右上肢三维重建图像显示肱骨远端骨折（**黄色箭头**）和尺骨远端骨折（**白色箭头**）。(**D**) L5 爆裂性骨折，骨窗横断位重建图像可见向后移位的骨碎片。

/ Take-Home Messages

- A detailed patient history, clinical examination and laboratory results are very important in considering which imaging modality is necessary to confirm or exclude the suspected diagnosis.
- Do you need intravenous contrast? Do you need one phase or a multiphasic scan?
- Check for contraindications to intravenous contrast in CT and any absolute contraindications for MRI.
- It is important to communicate critical findings immediately that require urgent treatment and intervention.
- **First look**: look for life-threatening pathologies.
- **Second look**: look for other pathologies and incidental findings.

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章节大纲：

/ 核心要点

- 详细的病史采集、临床检查和实验室检查结果对于确定需要采用何种影像学检查方法来确诊或排除疑似诊断非常重要。
- 是否需要使用静脉对比剂？需要单期相扫描还是多期相扫描？
- 确定是否存在 CT 检查中使用对比剂的禁忌症以及 MRI 检查中的任何绝对禁忌症。
- 对于需要紧急治疗和干预的重要发现，务必立即通报。
- **初步筛查**：优先排查危及生命的病症。
- **二次评估**：评估其他病变及偶然发现。

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章节大纲：

知识测试

/ Test Your Knowledge

<?> QUESTION

1 What is a possible respiratory cause for acute chest pain?

- ☐ Pericarditis
- ☐ Pleurisy
- ☐ Acute coronary syndrome
- ☐ Myocarditis

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章节大纲：

/ 知识测试

<?> 问题

1 急性胸痛的呼吸系统病因可能是什么？

- ☐ 心包炎
- ☐ 胸膜炎
- ☐ 急性冠脉综合征
- ☐ 心肌炎

/ Test Your Knowledge

<?> ANSWER

1 What is a possible respiratory cause for acute chest pain?

- ☐ Pericarditis
- ■ Pleurisy
- ☐ Acute coronary syndrome
- ☐ Myocarditis

> see page 24 for further information

CHAPTER OUTLINE:

/ 知识测试

章节大纲：

<?> 回答

1 急性胸痛的呼吸系统病因可能是什么？

- ☐ 心包炎
- ■ 胸膜炎
- ☐ 急性冠脉综合征
- ☐ 心肌炎

> 更多信息请参考第 24 页

Test Your Knowledge

<?> QUESTION

2 What is ultrasound used for in an emergency setting?
(Multiple answers might be correct)

- ☐ In a patient with abdominal pain and elevated inflammatory parameters to exclude cholecystitis
- ☐ To exclude free fluid in a polytraumatised patient
- ☐ To look for deep vein thrombosis in a young female patient with dyspnoea and shortness of breath
- ☐ To look for urinary stasis in a patient with colicky abdominal pain

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章节大纲：

<?> 问题

2 超声检查在急诊中的临床应用有哪些？
（可能有多个正确答案）

- ☐ 对于一名腹痛伴炎症指标升高的患者，用于排查胆囊炎
- ☐ 用于排查多发性创伤患者体内的游离积液
- ☐ 对于出现呼吸困难和气促的年轻女性患者，用于排查深静脉血栓形成
- ☐ 用于检查腹部绞痛患者的泌尿系梗阻

/ Test Your Knowledge

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2 What is ultrasound used for in an emergency setting?
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> see page 12 for further information

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- 对于出现呼吸困难和气促的年轻女性患者，用于排查深静脉血栓形成
- 用于检查腹部绞痛患者的泌尿系梗阻

>更多信息请参考第 12 页

/ Test Your Knowledge

<?> QUESTION

3 A patient fell and hit his head against a rock. What is the diagnosis?

- ☐ Subdural haematoma
- ☐ Epidural haematoma with skull fracture
- ☐ Intraparenchymal haemorrhage
- ☐ Subarachnoid haemorrhage

CHAPTER OUTLINE:

/ 知识测试

章节大纲：

<?> 问题

3 患者摔倒头部撞击石头。诊断是什么？

- ☐ 硬膜下血肿
- ☐ 硬膜外血肿伴颅骨骨折
- ☐ 脑出血
- ☐ 蛛网膜下腔出血

/ Test Your Knowledge

<?> ANSWER

3 A patient fell and hit his head against a rock. What is the diagnosis?

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- ☐ 脑出血
- ☐ 蛛网膜下腔出血

/ Test Your Knowledge

<?> QUESTION

4

A 78-year-old male patient is brought to the emergency department. He has a severe abdominal pain, is pale and sweaty and on examination shows abdominal guarding. His blood pressure is 80/50 mmHG. His wife reported to the paramedics that he has a known abdominal aortic aneurysm. Which answer is correct?

- ☐ A ruptured abdominal aortic aneurysm is a likely diagnosis. The patient should undergo MRI imaging to visualise the aortic diameter.
- ☐ A ruptured abdominal aortic aneurysm is a likely diagnosis. Ultrasound ca be used to measure the abdominal aortic diameter und to look for free fluid, while he is undergoing resuscitation.
- ☐ A ruptured abdominal aortic aneurysm is a likely diagnosis. A monophasic CT scan in portal venous phase is the protocol of choice to look for an active bleeding.
- ☐ A ruptured abdominal aortic aneurysm is not a likely diagnosis in this case.

/ 知识测试

<?> 问题

4

一位 78 岁男性患者被送至急诊科就诊。患者有剧烈腹痛，面色苍白，大汗淋漓，查体可见腹肌紧张。血压为 80/50 mmHg。患者妻子向急救医生告知，患者既往有腹主动脉瘤病史。以下哪个选项是正确的？

- ☐ 腹主动脉瘤破裂可能性大。患者应接受 MRI 影像学检查以评估主动脉管径。
- ☐ 腹主动脉瘤破裂可能性大。在抢救过程中，可使用超声测量腹主动脉直径并探查有无积液。
- ☐ 腹主动脉瘤破裂可能性大。门静脉期单相增强 CT 扫描是探查活动性出血的首选方案。
- ☐ 本例诊断腹主动脉瘤破裂的可能性不大。

/ Test Your Knowledge

<?> ANSWER

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<?> 回答

4

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- ■ 腹主动脉瘤破裂可能性大。在抢救过程中，可使用超声测量腹主动脉直径并探查有无积液。
- ☐ 腹主动脉瘤破裂可能性大。门静脉期单相增强 CT 扫描是探查活动性出血的首选方案。
- ☐ 本例诊断腹主动脉瘤破裂的可能性不大。

/ Test Your Knowledge

<?> QUESTION

5 **In a CT scan of a polytrauma patient we want to look for acute life-threatening injuries first. What kind of injury would classify as potentially life-threatening and needs your attention in the initial review of the images?**
(Multiple answers might be correct)

- ☐ Displaced rib fracture with consecutive haemothorax in a patient who was found unconsciousness on the street.
- ☐ Displaced distal radial fracture in a bicycle accident.
- ☐ Abdominal periaortic haematoma in a car accident.
- ☐ Subcutaneous haematoma of the right flank in a patient who fell from a ladder.

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/ 知识测试

<?> 问题

5 **在对多发性创伤患者的 CT 扫描中，我们首先需要排查是否存在危及生命的急性损伤。以下哪种损伤属于潜在危及生命、需要在初次阅片时重点关注的情况?**
（可能有多个正确答案）

- ☐ 街头发现的昏迷患者出现肋骨骨折移位伴继发性血胸。
- ☐ 自行车事故导致的桡骨远端骨折伴移位。
- ☐ 车祸事故中腹主动脉周围血肿。
- ☐ 从梯子上跌落的患者右侧腰腹部皮下血肿。

/ Test Your Knowledge

<?> ANSWER

5 **In a CT scan of a polytrauma patient we want to look for acute life-threatening injuries first. What kind of injury would classify as potentially life-threatening and needs your attention in the initial review of the images?**
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- [ ] Displaced distal radial fracture in a bicycle accident.
- [x] Abdominal periaortic haematoma in a car accident.
- [ ] Subcutaneous haematoma of the right flank in a patient who fell from a ladder.

> see slide 49 for further information

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章节大纲：

/ 知识测试

<?> 回答

5 **在对多发性创伤患者的 CT 扫描中，我们首先需要排查是否存在危及生命的急性损伤。以下哪种损伤属于潜在危及生命、需要在初次阅片时重点关注的情况?**
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- [x] 车祸事故中腹主动脉周围血肿。
- [ ] 从梯子上跌落的患者右侧腰腹部皮下血肿。

> 更多信息请参考第 49 张幻灯片

/ Test Your Knowledge

<?> QUESTION

6 Which statement regarding a stroke is correct?
(Multiple answers might be correct)

- ☐ Stroke imaging can be performed using MRI.
- ☐ A non-enhanced CT scan is not necessary if a CT scan with arterial contrast is performed.
- ☐ The clinical symptoms of a stroke can be caused by an intracranial haemorrhage.
- ☐ A CT angiography of the arteries supplying the brain is used to look for arterial vessel occlusions.

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章节大纲：

/ 知识测试

<?> 问题

6 以下关于脑卒中的表述正确的是：
(可能有多个正确答案)

- ☐ 脑卒中影像学检查可应用 MRI。
- ☐ 如果进行 CT 动脉增强扫描，则无需进行平扫 CT。
- ☐ 脑卒中的临床症状可能由颅内出血引起。
- ☐ 脑 CT 动脉血管成像用于检查动脉血管闭塞。

/ Test Your Knowledge

<?> ANSWER

6 Which statement regarding a stroke is correct?
(Multiple answers might be correct)

- [x] Stroke imaging can be performed using MRI.
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- [x] A CT angiography of the arteries supplying the brain is used to look for arterial vessel occlusions.

> see page 19 & 20 for further information

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章节大纲：

/ 知识测试

<?> 回答

6 以下关于脑卒中的表述正确的是：
(可能有多个正确答案)

- [x] 脑卒中影像学检查可应用 MRI。
- [ ] 如果进行 CT 动脉增强扫描，则无需进行平扫 CT。
- [x] 脑卒中的临床症状可能由颅内出血引起。
- [x] 脑 CT 动脉血管成像用于检查动脉血管闭塞。

> 更多信息请参考第 19 页和第 20 页

Test Your Knowledge

<?> QUESTION

7 Which statement regarding spondylodiscitis is correct?

- ☐ All patients are febrile.
- ☐ Back pain is an uncommon symptom.
- ☐ Can be caused by haematogenous spread.
- ☐ Staphylococcus aureus in an uncommon pathogen to cause spondylodiscitis.

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章节大纲：

知识测试

<?> 问题

7 以下关于椎间盘炎的表述哪项是正确的？

- ☐ 所有患者均会出现发热症状。
- ☐ 背痛是一种不常见的症状。
- ☐ 可由血源性播散引起。
- ☐ 金黄色葡萄球菌是导致椎间盘炎的一种罕见病原体。

/ Test Your Knowledge

<?> ANSWER

7 Which statement regarding spondylodiscitis is correct?

- ☐ All patients are febrile.
- ☐ Back pain is an uncommon symptom.
- ■ Can be caused by haematogenous spread.
- ☐ Staphylococcus aureus in an uncommon pathogen to cause spondylodiscitis.

> see page 47 for further information

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<?> 回答

7 以下关于椎间盘炎的表述哪项是正确的？

- ☐ 所有患者均会出现发热症状。
- ☐ 背痛是一种不常见的症状。
- ■ 可由血源性播散引起。
- ☐ 金黄色葡萄球菌是导致椎间盘炎的一种罕见病原体。

> 更多信息请参考第 47 页

Test Your Knowledge

<?> QUESTION

8 Which is not a common indication for an unenhanced CT scan?

- ☐ Intracranial haemorrhage
- ☐ Sinusitis
- ☐ Active abdominal bleeding
- ☐ Spinal fracture
- ☐ Renal colic

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<?> 问题

8 以下哪项情况不是平扫 CT 的常见适应证？

- ☐ 颅内出血
- ☐ 鼻窦炎
- ☐ 腹腔活动性出血
- ☐ 脊柱骨折
- ☐ 肾绞痛

/ Test Your Knowledge

<?> ANSWER

8 Which is not a common indication for an unenhanced CT scan?

- ☐ Intracranial haemorrhage
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- ■ Active abdominal bleeding
- ☐ Spinal fracture
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> see page 16 for further information

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> 更多信息请参考第 16 页

/ Test Your Knowledge

<?> QUESTION

9 A patient with sudden onset of a severe headache was admitted to the emergency room. What is the most likely diagnosis in the non-enhanced CT scan of the head shown here?

- ☐ Tumour-related haemorrhage
- ☐ Subarachnoid haemorrhage caused by the rupture of an arterial aneurysm
- ☐ Epidural haematoma caused by a traumatic injury
- ☐ Intraparenchymal haemorrhage caused by hypertension

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<?> 问题

9 一名突发剧烈头痛的患者被送入急诊就诊。根据下图 CT 平扫图像所示，最可能的诊断是什么？

- ☐ 肿瘤相关性出血
- ☐ 动脉瘤破裂引起的蛛网膜下腔出血
- ☐ 创伤所致的硬膜外血肿
- ☐ 高血压引起的脑出血

/ Test Your Knowledge

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> see page 22 for further information

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- ☐ 高血压引起的脑出血

> 更多信息请参阅第 22 页

/ Test Your Knowledge

<?> QUESTION

10 What is an advantage of CT imaging?

- ☐ Higher costs compared to ultrasound and X-ray
- ☐ Radiation exposure
- ☐ Potential allergic reactions to contrast medium
- ☐ Contrast medium allows the evaluation of pathologies of vascular structures, parenchyma and soft tissue

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<?> 问题

10 CT 成像的优势是什么？

- ☐ 与超声和 X 线相比成本更高
- ☐ 辐射暴露
- ☐ 对对比剂有潜在的过敏反应
- ☐ 对比剂可实现对血管结构、实质脏器及软组织病变的评估

/ Test Your Knowledge

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> see page 14 for further information

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<?> 回答

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> 更多信息请参考第 14 页