EJVES | DISSECT:一种基于记忆的主动脉夹层分类方式

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摘 要

背景：

主动脉夹层分类系统为临床决策提供了重要的指导，在血管内技术在这很复杂和危险的疾病中发挥着越来越重要作用的时代，传统的分类方案的适用性受到质疑。介入治疗的扩大范围的辨识现在被用来作为替代传统治疗方案，DEFINE项目里的主动脉疾病小组提出了一个分类系统，它是以该疾病进程里特定的解剖结构和临床表现为特征，可以和疾病治疗决策做到更同步。

方法和结果：

DISSECT分类系统是以记忆为基础用来评估主动脉夹层的方案。它通过对六个关键特征的评估来指导临床医生，这些特征有助于优化目前影响治疗方案选择的最显著细节的交流，包括那些在考虑血管内手术时至关重要，但DeBakey或Stanford分类方案没有考虑到的发现。这六个主动脉夹层的特征包括：疾病持续时间，内膜撕裂位置，主动脉的尺寸，主动脉受累范围，夹层的并发症，夹层假腔内血栓。

结论：

在目前的临床实践中，血管内治疗越来越被认为是治疗B型主动脉夹层的一种替代方法。目前，血管内主动脉修复术不适用于A型主动脉夹层患者，但针对可能使A型主动脉夹层复杂化的外周分支血管缺血的导管技术被认为是有价值的辅助干预措施。主动脉夹层分类新系统DEFEST的使用解决了40多年前在血管内技术引入之前设计的众所周知的既定方案的缺点。它将作为指南，支持对当代治疗选择的批判性分析，并根据疾病过程的具体特征为管理决策提供信息。

背 景

临床实践会遇到多样的心血管病理，包括各种复杂的疾病过程。然而，医学生和有经验的临床医生一致认为，没有任何疾病比主动脉夹层更复杂、更糟糕和更令人烦恼。主动脉夹层是一个灾难性事件，导致广泛的临床表现。在任何个体中，所经历的特殊影响与主动脉和分支血管受累的模式和程度有关，这种受累是夹层的结果，从长远来看，还与主动脉抵抗循环扩张力的能力有关。

最初由Morgagni在1761年描述，主动脉夹层仍然是一种高度致命的疾病，直到1955年引入外科修复术，才获得有效的治疗，包括药物治疗。这是第一次出现一种似乎有利于改变疾病自然史的治疗方法。从手术治疗的早期经验来看，很明显，患有升主动脉夹层的患者与患有降主动脉夹层的患者之间存在明显的差异，前者的近期预后较差。这种差异的重要性最初由Hume 和Porter认识到，后来在两个最常用的分类系统(分别于1965年和1970年提出的DeBakeyand和Stanford系统)中得到强调。

随后，导管动脉造影、超声心动图、计算机断层扫描和磁共振扫描的诊断成像有助于我们对观察到的多形性疾病的夹层模式的理解。反过来，对主动脉夹层的各种表现和独特的夹层表现的普遍认识，促进了用于对公认的病人亚型进行分类的方法的逐步改进，相继地，这些可供选择的分类系统包含了一些以前未涉及到的解剖学特征，但是它们要么不完整，要么在实用上过于复杂，无法在临床实践中广泛使用。

Table 1. The DeBakey and Stanford Classifications Systems of Aortic Dissection.

	Type	Characteristic
DeBakey[4] (1965)	I	Originates in the ascending aorta, but extends distally and involves the descending aorta
	II	Originates in and is confined to the ascending aorta
	III	Originates in and involves the descending aorta
Stanford[8] (1970)	A	Involves the ascending aorta irrespective of the site of origin
	B	Involves the descending aorta exclusively

最近，血管内支架移植物首次应用于胸降动脉瘤的修复，然后扩展到其他胸主动脉疾病，包括急性和慢性夹层，已经成为最佳药物治疗或开放手术修复的治疗替代物。再次，一种新的治疗方法和随之而来的影响其使用的解剖学和病理学变化挑战了现有诊断方案、治疗算法和介入计划的现状。

事实上，正是血管内治疗的广泛采用引起了人们对已建立的分类系统的能力的不满。血管内治疗已经成为内科和外科治疗的一种可行的替代方法，并拓宽了主动脉夹层的治疗选择。医学上最好的分类系统是那些被普遍采用和日常使用的系统。在很大程度上，这是因为他们考虑了所有患者，定义了在各个亚组中不同的鉴别标准，并且以有意义地影响医疗决策的方式提供了临床信息。胸主动脉瘤腔内修复技术在急性和慢性主动脉夹层治疗中的全球认可，促使开发一种新的分类方案，该方案包括在治疗决策中考虑内移植物放置时最相关的特定元素。

虽然DeBakey和斯坦福的分类已经建立了40多年，但对于哪一个更可取，还没有共识。可以说，两者都是在外科手术选择有限的时代使用复杂的诊断成像模式之前发展起来的，当时的目的只是根据手术或医疗的可取性将患者分组，而不是探索可能严重影响近期和长期结果的疾病特征的全部范围。

DeBakey和斯坦福系统是两种最常用的夹层分类方案，它们不仅被广泛使用，而且被广泛理解。这两种方法都非常适用于需要决定开放手术修复或保守药物治疗的患者。因此，重要的是要认识到，任何新的分类都应建立在这些既定系统的优势之上。

从纳入血管内治疗的当代心血管临床以及药物和开放手术治疗的角度来看，目前的分类系统存在问题。两者都不是特别适合于适应不断增加的血管内修复的临床，因为两者都不能精确地包含位于主动脉弓中的原发性撕裂口，不能定义介于急性和慢性组(即亚急性组)之间的症状发作的中间期，不能评估夹层延伸的方向(顺行、逆行、混合)，不能考虑急性或慢性分支血管闭塞继发的远端并发症，也不能基于主动脉假腔的开放性进行鉴别。

主动脉夹层分类系统的目标是提供一种易于接受和记忆的方法，用于解释影响当代主动脉夹层管理决策的重要因素。人们希望这种基于记忆的方法在临床上简化医疗保健提供者之间的数据，促使他们关注一系列类别，包括在夹层的急性评估期间需要评估的最显著的临床和影像学发现，这是一个复杂的过程。

主动脉夹层分类的目的不是指导紧急处置，而是提供一个框架，促进关于影响其当代管理的主动脉夹层关键方面的交流。希望它将通过包含关键的解剖学来补充传统的DeBakey和斯坦福分类方案。这两个系统所考虑的因素，以及识别关键的临床表现和额外的影像学数据，这些数据现在告知并影响当代的管理决策。该系统还可用于确保报告治疗结果的形态学和病理生理学参数的标准化。分类的前提是基于六个因素的确定: 疾病持续时间，内膜撕裂位置，主动脉的尺寸，主动脉受累范围，夹层的并发症，夹层假腔内血栓。

1.剥离的持续时间被定义为从症状开始的时间

急性Ac:<从症状开始的2周。

Sa亚急性:症状出现后2周至3个月。

Ch慢性:> 从症状开始的3个月。

任何主动脉夹层的分类系统必须确保病理的持续时间被定义和表征。夹层持续时间对预后、治疗和治疗反应具有重要意义。在未来，预计在夹层过程中，急性、亚急性和慢性的任意标记将被简单地指示自患者经历促使诊断的症状以来的时间(天、月或年)所取代。

从预后来看，急性主动脉夹层比亚急性或慢性主动脉夹层更有可能导致危及生命的并发症。急性升主动脉夹层在接受药物治疗时预后不佳，约60%的患者在短时间内由于该疾病的并发症死亡，而急性胸降主动脉夹层的结果不太差，最初的医院死亡率约为13%。

相比之下，与急性状态相比，慢性夹层的自然史相对良性。Winnerkvist等人报告说，接受药物治疗的慢性B型夹层患者的实际生存率在5年时为82%，在10年时为69%。蔡氏等人证实了慢性状态下相对良性的预后，他们报告了经药物治疗的B型夹层患者3年生存率为78%。

慢性状态下威胁生命的并发症发生率较低反映在治疗模式中。慢性夹层比急性夹层更有可能得到非紧急治疗，最近的一系列研究表明，慢性B型夹层的血管内治疗比急性B型夹层的治疗具有更低的死亡率和并发症发生率。

主动脉夹层的慢性化也与血管内治疗后的主动脉重塑有关，这在急性主动脉夹层患者中明显更高。急性夹层的血管内修复与真腔的快速扩张和假腔的塌陷有关。相比之下，慢性夹层的血管内治疗可在治疗段诱发假腔血栓形成，但与真腔和假腔直径的显著变化无关。

拟议的夹层分类系统还包括一个亚急性夹层类别，因为有增加证据表明，这些患者可以通过血管内治疗表现出一定程度的主动脉重塑，并且在未来几年中，可能会有大量的讨论，涉及无并发症急性夹层患者亚组的识别，这些患者具有快速疾病进展的高风险，并且将在亚急性期从血管内治疗中获益。当进一步的研究更好地确定不同时间点主动脉的可塑性时，确定亚急性夹层的确切时间可能需要重新评估。

2.主动脉内膜撕裂(主要)位置

- A=升主动脉
- Ar=主动脉弓
- D=降主动脉
- Ab=腹主动脉
- Un=未知

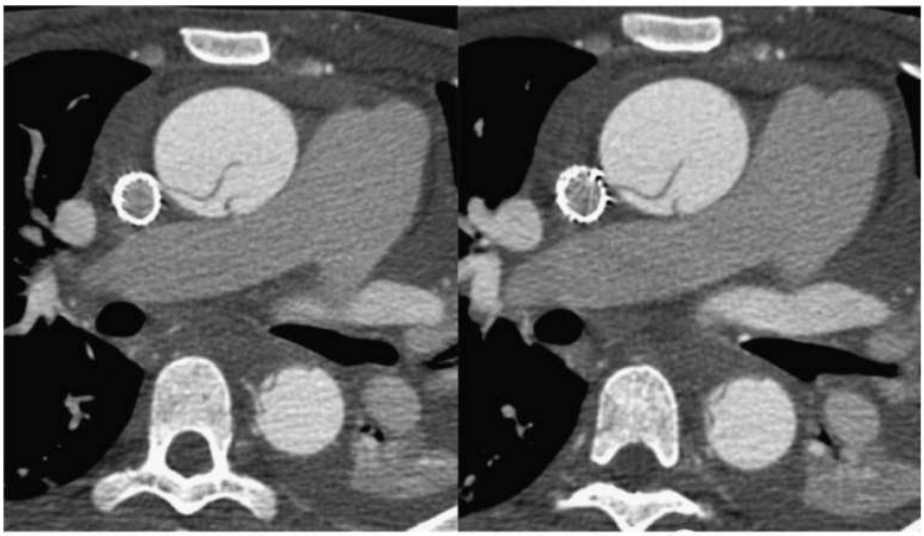

Figure 1. Axial computed tomography images of a patient with an acute aortic dissection and a primary intimal tear in the ascending segment of the aorta.

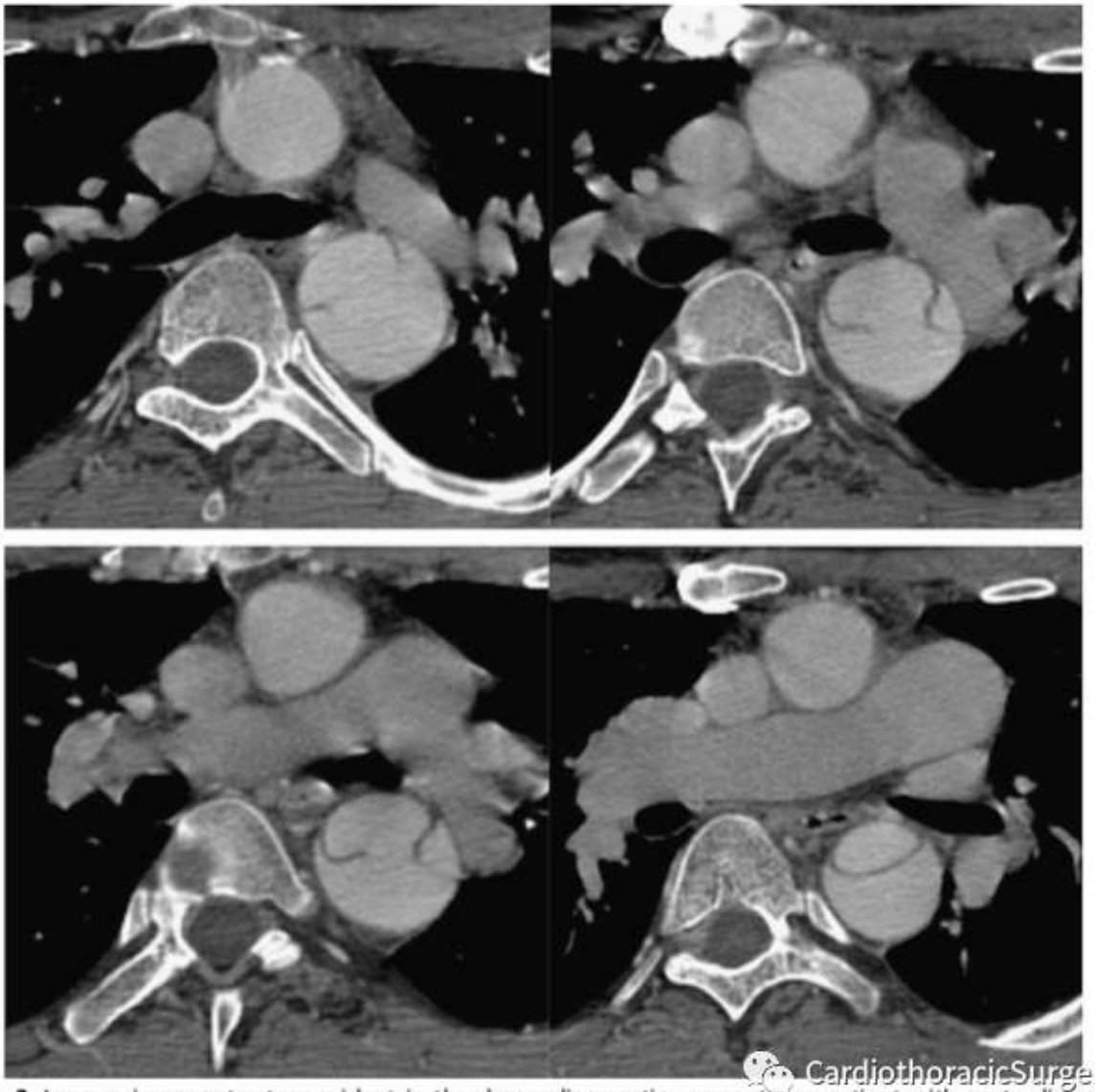

Figure 2. Large primary entry tear evident in the descending aortic segment in a patient with acute dissection.

主要撕裂口的位置直接影响DeBakey和斯坦福分类系统，并通常确定紧急手术干预的适应症。原发性撕裂口的分类显然对定义夹层至关重要，但最近的影像学进展证实，撕裂口通常在主动脉弓和腹主动脉以及升主动脉和降主动脉中发现。主动脉弓和腹主动脉的撕裂口在以前的分类系统中没有明确的特征，也没有提供描述夹层传播方向的重要信息。

3.主动脉的尺寸

基于通过中心线分析(真实管腔)测量的主动脉最大跨主动脉直径，单位为毫米，位于主动脉解剖段内的任何位置。

Figure 3. Trans-aortic dimensions measured from an axial computed tomography image performed at the level of the maximum aortic diameter in a patient with chronic aortic dissection.

4.主动脉受累的节段范围从近端到远端

A=仅升主动脉

Ar=仅主动脉弓

D=仅降主动脉

Ab=仅腹主动脉

AAr=升主动脉到主动脉弓

AAD=升主动脉到降主动脉

AAb=升主动脉到腹主动脉

AI=升主动脉到髂骨

ArD=主动脉弓到降主动脉

ArAb=主动脉弓到腹主动脉

ArI=主动脉弓到髂骨

DAb=降主动脉到腹主动脉

DI=腹主动脉到髂骨

主动脉夹层的节段范围决定了主动脉夹层的纵向受累，也决定了主动脉瓣层中继发穿孔的可能位置。主动脉夹层的远端范围影响治疗的表现、治疗、预后和疗效。显然，夹层的远端范围可能通过影响远端分支血管或下肢动脉供应的并发症而影响外观。胸主动脉和腹主动脉之间的区别由横膈膜决定。

DeBakey和斯坦福系统更关注主要撕裂口，而不是夹层的范围，尽管改良的DeBakey分类确实区分了有限(II和IIIa)和更广泛(I和IIIb)主动脉受累的夹层。随着对主动脉夹层患者的更大随访，显而易见的是，即使在成功的升主动脉手术干预后，仍有显著的远端假腔扩张和慢性夹层动脉瘤形成的发生率。夹层的远端范围和假腔的开放性影响晚期并发症的可能性。因此，准确定义主动脉受累的总范围是很重要的。

就血管内治疗而言，已表明夹层的节段范围影响治疗反应。Rodriguez等人证实，在DeBakey IIIa夹层的患者中，64%发生了完全的胸腔假腔血栓形成，而在胸廓内移植后进行更广泛的远端夹层(IIIb)的患者中，只有45%发生了完全的胸腔假腔血栓形成。

5.**与夹层相关的临床并发症。**

C=复杂

- 主动脉瓣受累
- 心脏填塞
- 破裂（图4和图5）
- 分支血管灌注不良——有症状的分支血管受累定义为分支血管损害的解剖学和临床表现（例如，静态和/或动态分支受累并伴有中风、截瘫、冠状动脉、肠系膜、内脏、肾脏和/或肢体症状）（图6-9）
- 其他——无法控制的高血压，在最初诊断的前2周内出现不可控的临床症状，或快速假腔扩张和/或整个跨主动脉直径增大> 10 mm（图11）。

UC=不复杂(没有上面列出的复杂情况)

Figure 4. Axial computed tomography angiography depicts the primary tear location and associated rupture of the descending aorta in a 30-year-old woman with back pain immediately post-partum.

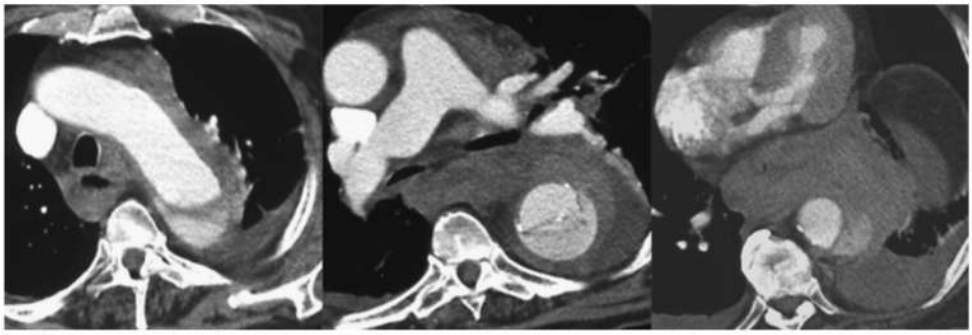

Figure 5. Computed tomography diagnostic imaging in a 64-year-old man with acute chest and back pain details an aortic dissection that extends into the aortic arch and is complicated by rupture of the descending segment with associated mediastinal and pleural blood/ hematoma.

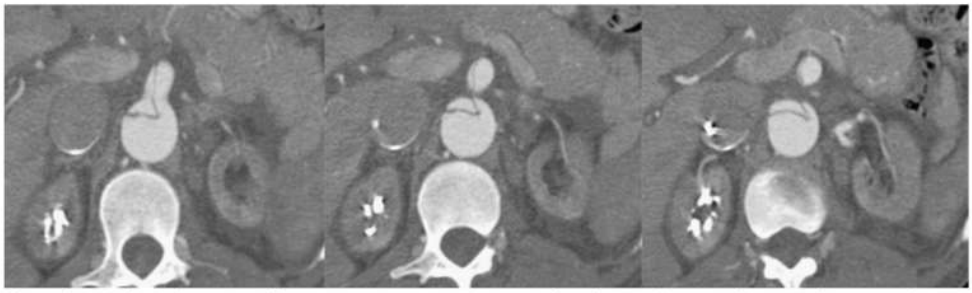

Figure 6. Static branch vessel involvement of the superior mesenteric artery (SMA) is evident on these axial computed tomography images from a patient with acute dissection. Anatomically, this branch vessel complication occurs when the intimal flap of the dissection extends directly from the aorta into one of its branches. Depending on a number of factors, this branch involvement may be associated with clinical symptoms and ischemic sequelae. In this case, the aortic true lumen is small and located anterior. The dissention septum intersects the SMA and extends into the branch, bisecting the artery, and creating dual channel or "double barrel" flow in the vessel. The resultant diminutive true channel hugs the right side of the branch as it courses distally.

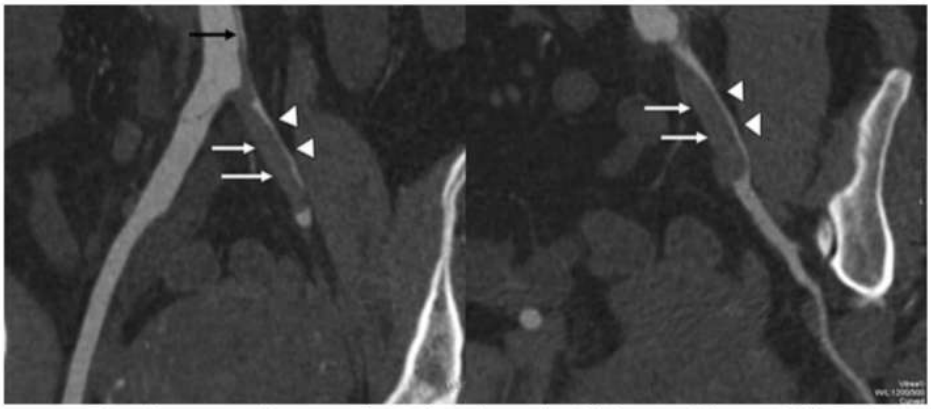

Figure 7. Coronal reconstruction of a computed tomography angiography study with images of the aortic bifurcation and iliac arteries in a 45-year-old man with acute dissection complicated by left leg ischemia. In this case, there is static involvement of the left iliac artery with extension of the plane of the dissection septum from the left side of the aorta into the branch (black arrow); however, unlike the static involvement detailed in Fig. 6, the false lumen within the left iliac branch does not re-enter with a terminal tear. This lack of distal false lumen communication within the involved branch causes a "no re-entry" phenomenon often associated with no blood flow or clot within the blind cul-de-sac of terminal false lumen (white arrows). This is commonly associated with near obliteration of the true lumen (white arrowhead) by the expanded, stagnant false lumen within the branch. The lack of false lumen branch flow and severely compromised true lumen create a complication frequently accompanied by critical ischemia that may lead to irreversible tissue damage in the distal vascular bed.

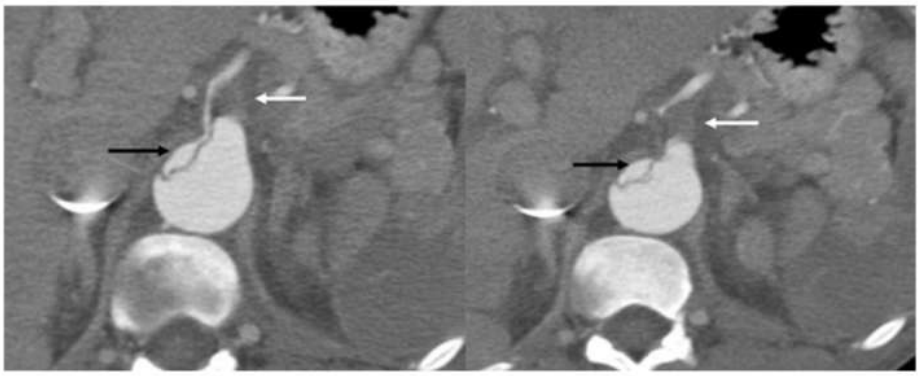

Figure 8. Axial computed tomography images at the level of the celiac trunk in a patient with acute aortic dissection illustrate the complication of static branch vessel involvement with "no re-entry" of the false lumen within the involved branch. This example of branch vessel compromise presents an anatomic manifestation of dissection that is similar to the phenomenon shown in Fig. 7. The aortic true lumen is small and located along the right anterior border of the aorta (black arrow). The dissection septum is oriented parallel to the origin and course of the proximal celiac artery. The flap bisects the branch as it extends into it, but at its distal extent within the branch there is no re-entry tear in the flap to allow communication between the false lumen and the distal non-dissected artery. Without an exit for flow, blood within the false lumen of the celiac can be stagnant or clot (white arrow). The true lumen is compressed (white arrowhead) by the turgid and expanded false lumen, and distal perfusion is often inadequate.

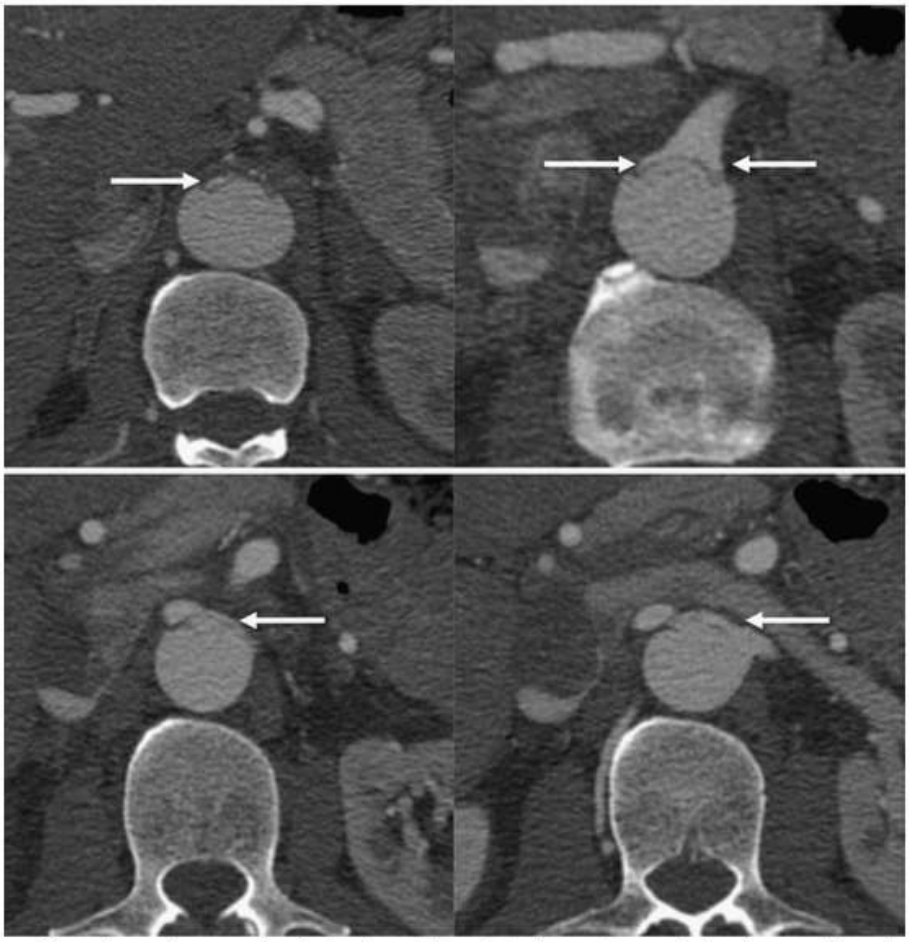

Figure 9. Illustration of branch vessel compromise due to dynamic branch involvement or aortic true lumen collapse in a 52-year-old man with acute dissection complicated by azotemia, back, and abdominal pain. In this example of a complicated aortic dissection, the anterior located aortic true lumen (arrows) is nearly obliterated and dwarfed by a large false lumen. In contradistinction to static branch involvement, in this form of branch vessel compromise the aortic septum does not extend directly into a branch artery, but instead it prolapsed like a curtain over the ostia of vessels originating from the true lumen. When this occurs, the true lumen is most commonly located along the anterior aspect of the aorta in its distal descending and abdominal segments. Thus, the celiac and superior mesenteric arteries with their anterior origins are often affected by poor in-flow from a compromised aortic true lumen that is frequently crescentic or slit-like in appearance. In this case, both of these vessels are affected, but, in addition, the renal arteries have relatively anterior origins and are also involved.

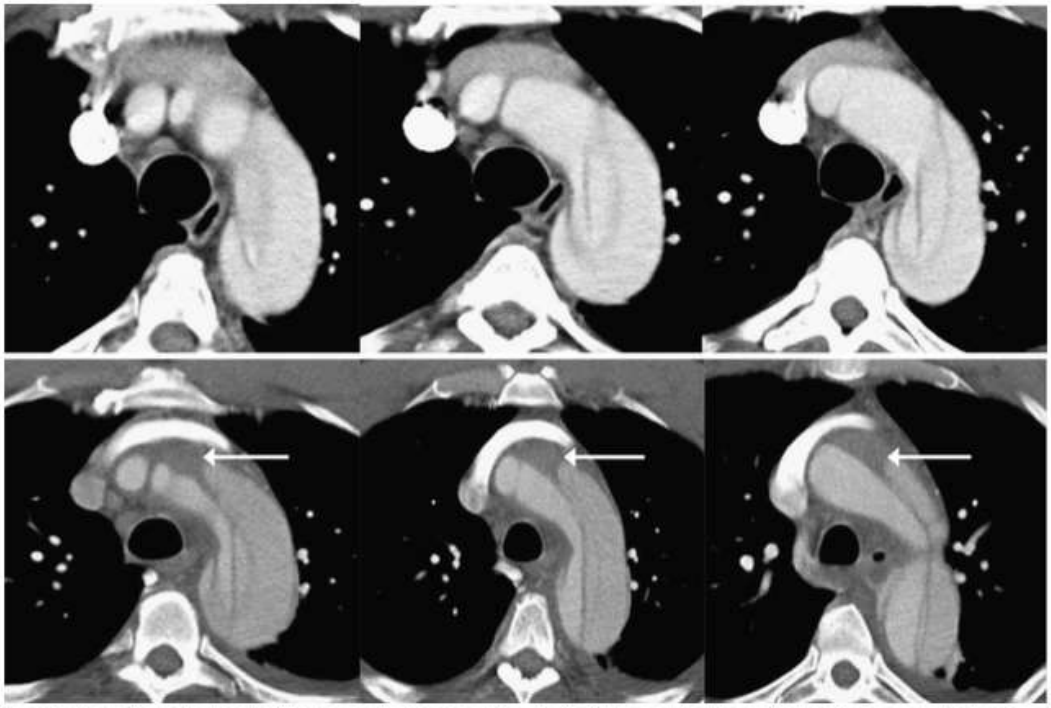

Figure 10. Comparison of axial computed tomography images at the level of the aortic arch performed when a patient was admitted for evaluation of acute chest and back pain (top row), and 4 days later when he experienced another episode of pain (bottom row). Interval proximal extension of the dissection process is evident with progression of aortic involvement from the descending to the ascending and aortic arch (arrows).

准确记录症状和并发症对于描述与主动脉夹层相关的临床状况至关重要。显然，主动脉夹层会导致过多的危及生命的情况。通常，这些并发症决定了干预的必要性。临床表现的最简单分类是区分复杂和不复杂的主动脉夹层。

复杂夹层和不复杂夹层的区别对B型夹层的预后有重要意义。Estrera等报道了159例B型夹层患者的结果。47%的患者发生了复杂的夹层，与18%的医院死亡率相关；这与1.2%的无并发症夹层死亡率(53%，85/159)相比。

6.主动脉假腔血栓形成(通过计算机断层扫描、磁共振、超声或经食管超声心动图成像，评估切开的主动脉段内的开放性)

P=主动脉假腔的开放——在整个主动脉夹层的假腔内有血流或造影剂混浊的迹象

CT=主动脉假腔完全血栓形成——在主动脉夹层假腔的以下部分没有血流或造影剂混浊的迹象:A=升主动脉 Ar=主动脉弓 D=降主动脉 Ab=腹主动脉

PT=主动脉假腔部分血栓形成——主动脉假腔一部分的纵向血栓形成或部分填充假腔的环状血栓构成在主动脉夹层的下列部分内构成部分或不完全血栓形成：

- A=升主动脉
- Ar=主动脉弓
- D=降主动脉
- Ab=腹主动脉

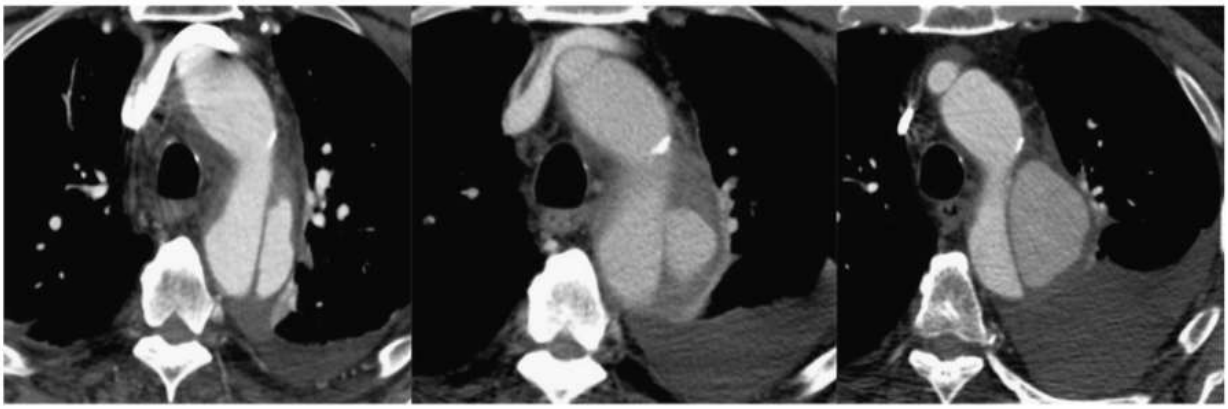

Figure 11. A series of axial computed tomography images located at the same level of the aortic arch in a patient with dissection documents a progressive increase in the trans-aortic diameter of the proximal descending segment over 30 days following the diagnosis of acute dissection. This early dilation of the aorta is a manifestation of disease progression that can complicate clinical course following acute aortic dissection.

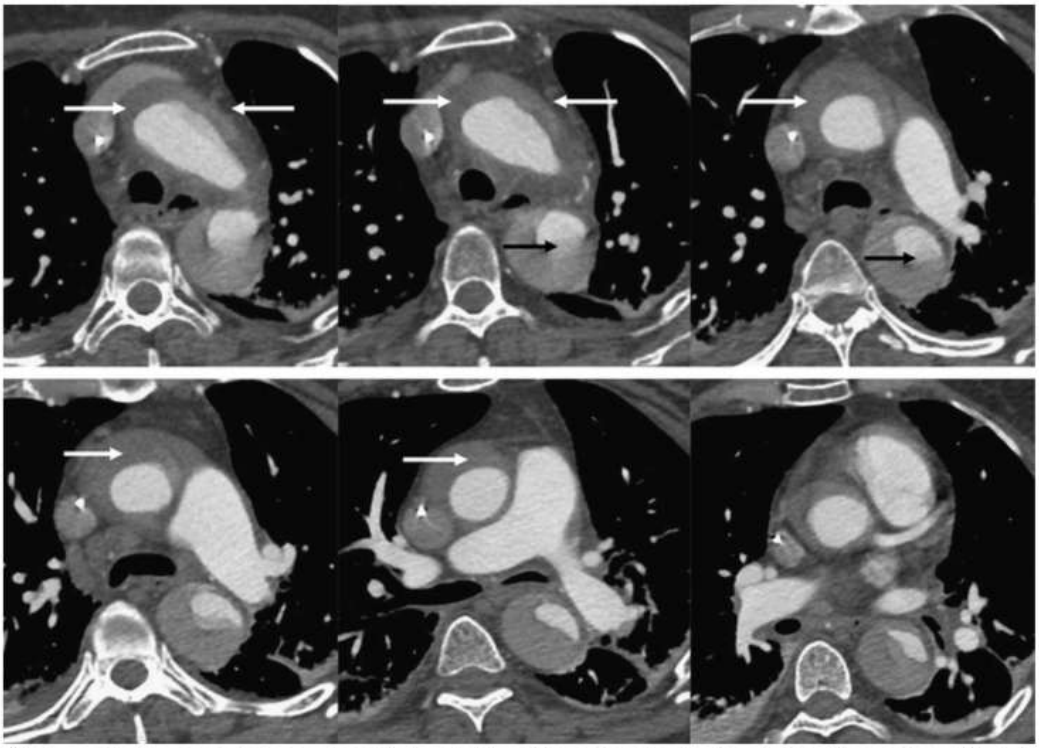

Figure 12. Axial computed tomography images from the level of the mid-aortic arch extending distal to the aortic root illustrate an aortic dissection in a patient with acute chest and back pain. The primary entry tear is located in the proximal descending aorta (black arrows), and the process extends retrograde to the ascending aorta, as well as to distal aortic segments. This case is an example of complete thrombosis of the ascending and arch segments of the aortic false lumen. There is no evidence of flow or contrast opacification within these zones (white arrows) compared with appearance of descending segment of the aorta where obvious increased contrast attenuation is noted within the false lumen. The true lumen within the ascending aorta retains a relatively cylindrical contour. This appearance is frequently associated with a lack of false lumen flow and is indicative of clot molded by the hydrostatic forces in the patent true channel. This appearance is clearly different than the geometry of the true lumen in the descending segment where the true lumen is not circular, but ovoid, and changes shape between phases of the cardiac cycle as the contour of the aortic septum relative to the true lumen dynamically alternates between convex (systole) and concave (diastole). This observation is typically evident in an aortic dissection with a patent false lumen and "double barrel" aortic flow.

主动脉夹层假腔开放具有预后意义，应在任何分类系统中报告。Fattouch等人证明，A型夹层手术治疗后出现明显的假腔是晚期死亡的预测因素，需要对降主动脉进行治疗。蔡氏等人报道了说明假腔血栓形成重要性的最重要的研究，他们研究了B型夹层患者，并证明假腔部分血栓形成与死亡率增加有关(相对风险:2.79)。

图15和16是详细说明夹层分类系统应用的案例。自从莫加尼首次描述主动脉夹层以来，对心血管疾病感兴趣的人一直在努力理解是什么影响其发生、并发症和预后。在主动脉夹层患者的开放手术治疗出现后不久，这项研究开始认真界定哪些患者从手术治疗中受益最大，哪些患者不手术后活得更长。第一次尝试将病例分解为亚组，以确定可能决定患者预后的因素，包括检查主动脉疾病的程度，包括涉及的精确夹层段及其与生存率的相关性。很明显，所有的夹层在预后、早期破裂、延伸和外科治疗方面表现不同。

随后，持续根据手术治疗的适当性将夹层患者分为夹层相关亚组的努力推动了实用分类系统的发展，该系统指导临床实践已超过40年。在血管内时代使用这种方案仍然为心血管专

家提供了良好的指导，但忽略了对疾病其他特征的考虑，这些特征有助于评估血管内替代药物治疗和手术的效果。

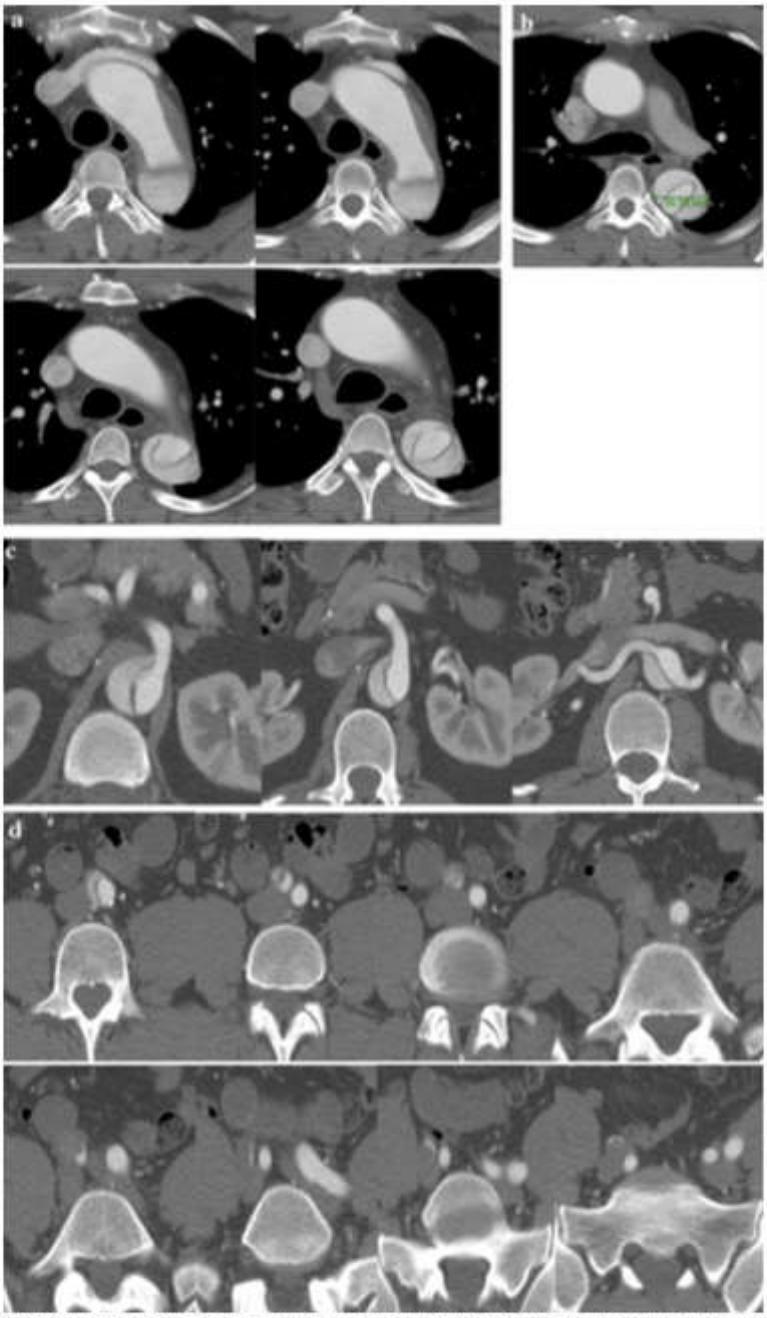

Figure 15. (a–g) A forty-year-old man presents to the emergency department with sudden onset of back pain radiating to chest. Severity is described as 8 on a scale of 10. The "squeezing" sensation is associated initially with shortness of breath, diaphoresis, and right leg discomfort. On physical examination there is a marked discrepancy in the femoral pulses with a weak right femoral pulse and no palpable pulses in the right foot. His past medical history is positive for hypertension, coronary artery disease with a prior myocardial infarction,

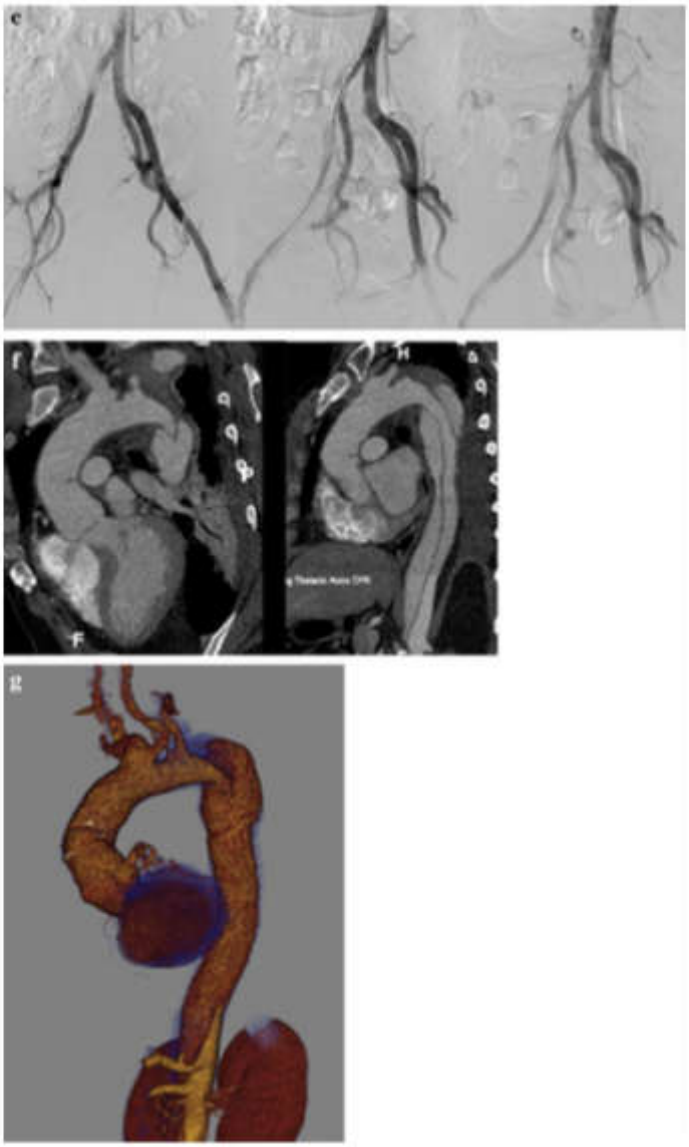

Fig. 15. (*continued*).

prior ascending aorta graft repair, and a family history of aortic disease. Laboratory evaluations are unremarkable. (a) Axial computed tomography (CT) images at the level of the aortic arch. (b) Trans-aortic measurement at level of maximum aortic diameter. (c) Axial images through levels of celiac, superior mesenteric, and renal arteries. (d) Axial scans from the level of the aortic bifurcation through the bifurcation of the iliac arteries. (e) Frontal images from an abdominal aortogram centered over the pelvis and focused on the iliac arteries. (f) Curved planar sagittal CT reformations of the thoracic aorta. (g) Shaded surface display of a CT angiography data set of the thoracic and abdominal aorta. The salient observations include primary entry tear in proximal descending segment; largest aortic diameter at level of proximal descending segment; dissection extends from arch to right iliac; anatomic branch vessel involvement with static "no re-entry" extension into the right iliac artery; complete thrombosis of false lumen in the arch segment and partial thrombosis of proximal portion of descending segment. The DISSECT classification for this case is as follows: **d**uration = acute; **i**ntimal tear = descending; size (maximum diameter) = 38.35 mm; **s**egmental **e**xtent = arch to iliac; clinical complications = complicat... **t**hrombosis = complete thrombosis of arch and partial thrombosis of descending.

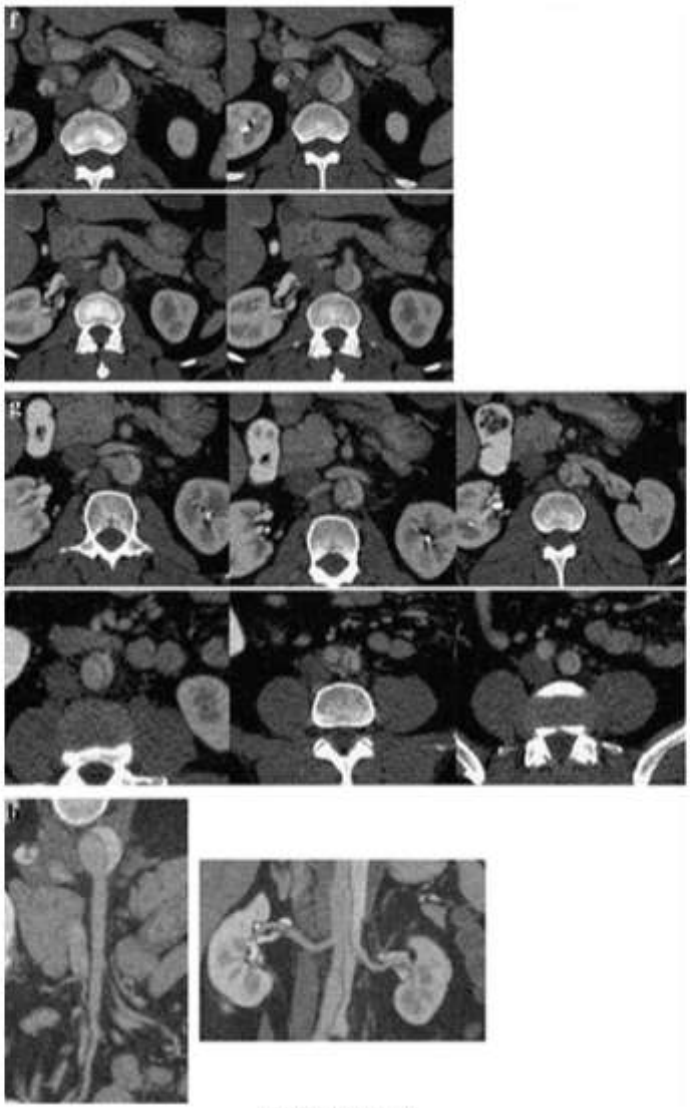

Fig. 16. (*continued*).

radiographs obtained during a 21-hour interval after presentation to an emergency department and eventual transfer from another hospital. (b, c) Axial computed tomography (CT) images through the level of the aortic arch and location of primary entry tear (arrow). (d) Trans-aortic diameter measured at level of maximum aortic size. (e) Axial CT scans through the mid and distal descending aorta. (F, G) Series of sequential axial slices through the origins of the celiac, superior mesenteric, renal, and inferior mesenteric arteries, and at the level of the aortic bifurcation. (h) Curved planar CT reformation through the course of the superior mesenteric artery and frontal projection through the origins of the renal arteries. The notable imaging findings include primary entry tear in the proximal descending aorta (arrow); maximum aortic diameter at level of proximal descending segment; aortic false lumen extends from ascending to iliac arteries; obvious aortic rupture with mediastinal and pleural blood/hematoma; no imaging evidence of branch vessel compromise, and complete thrombosis of ascending segment false lumen. The DISSECT classification for this case is detailed as follows. Duration = acute; intimal tear = descending; size = 42.40 mm; segmental extent = ascending to iliac; clinical c[illegible] thrombosis = complete thrombosis of ascending.

结 论

本文详述的基于记忆的分类系统提供了一个速记框架，该框架涵盖了心血管从业者在为主动脉夹层患者做出治疗决策时感兴趣的所有夹层特征。添加以前未解决的因素，包括原发性内膜撕裂的位置、临床症状和近端主动脉假腔的开放性，定义了在考虑放置内移植物时需要理解的重要特征。在对分类方案中的六个要素进行评估后，DISSECTF分类有助于简洁地传达基本的临床和解剖特征，这些特征对于根据主动脉夹层的现有知识对药物治疗、开放手术修复或血管内治疗进行成功的管理处置是必要的。

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