

TAKE-HOME MESSAGE

Hypotension, a pulse deficit, and a focal neurologic deficit increase the likelihood of acute aortic dissection, whereas a low Aortic Dissection Detection score decreases the likelihood of acute aortic dissection.

METHODS**DATA SOURCES**

The authors searched PubMed, MEDLINE, EMBASE, and the Cochrane databases from January 1968 to July 2016 for eligible studies, without language or age restrictions. The reference lists of all included studies, as well as articles citing the included studies on Google Scholar, were also searched. Additionally, the authors searched OpenSIGLE for conference abstracts and both ProQuest and DissOnline for dissertations and theses.

STUDY SELECTION

The authors included studies of adult patients presenting to the emergency department (ED) with suspected acute aortic dissection that reported data on historical features, physical examination findings, or basic investigations (ie, chest radiograph, WBC count, or electrocardiography), with an outcome assessing the accuracy of these features. All patients must have received a reference standard, which could include computed tomography (CT), magnetic resonance imaging (MRI), or transesophageal echocardiography. Patients with a confirmed diagnosis of acute aortic dissection before enrollment were excluded. Two authors independently reviewed studies for inclusion, with disagreements resolved by discussion with inclusion of a third

What Signs Increase the Likelihood of Acute Aortic Dissection?**EBEM Commentators**

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**Results****Table.** Accuracy of Select Physical Examination Findings for Acute Aortic Dissection.

Predictor	Number of Studies (Number of Participants)	Sensitivity, % (95% CI)	Specificity, % (95% CI)	LR+ (95% CI)	LR- (95% CI)
Neurologic deficit	3 (1653)	18 (11-30)	95 (93-97)	4.3 (3.3-5.7)	0.8 (0.6-1.0)
Pulse deficit	3 (297)	24 (13-41)	92 (86-96)	2.5 (1.5-4.1)	0.8 (0.5-1.4)
Hypotension	4 (1866)	10 (5-16)	92 (81-98)	1.2 (0.41-3.6)	1.0 (0.9-1.1)
		20 (10-34)	92 (82-97)	2.6 (0.94-7.0)	0.9 (0.7-1.0)
		22 (17-27)	95 (93-96)	4.3 (3.06-6.1)	0.8 (0.8-0.9)
		12 (7-19)	94 (89-98)	2.0 (0.86-4.8)	0.9 (0.9-1.0)

LR+, Positive likelihood ratio; LR-, negative likelihood ratio.

The initial literature review yielded 792 results, of which 9 studies (n=2,400) met the inclusion criteria. Three of the studies were conducted in the United States, 3 in Italy, and the remaining 3 in China, Canada, and Germany. Six prospective studies and 3 retrospective studies were included. The publication dates ranged from 1986 to 2013, sample sizes ranged from 41 to 1,328 patients, and the prevalence of acute aortic dissection ranged from 21.9% to 76.1%.

The clinical signs most suggestive of acute aortic dissection were focal (motor or sensory)

neurologic deficits, pulse deficits, and hypotension (ie, blood pressure <90 mm Hg or signs of shock) (Table). Clinical symptoms traditionally associated with acute aortic dissection, such as pain migrating to the back or “tearing or ripping” pain, had likelihood ratios (LRs) that did not substantially increase or decrease the probability of acute aortic dissection. Physical examination findings of pulmonary edema, a murmur of aortic insufficiency, and hypertension on presentation (blood pressure >150 mm Hg) were also not strong predictors of acute aortic dissection. The absence of a

reviewer if agreement could not be reached.

DATA EXTRACTION AND SYNTHESIS

Two authors independently abstracted data from the individual studies, with disagreements resolved by discussion and, as necessary, in consultation with a third reviewer. Quality assessment was performed with the Quality Assessment of Diagnostic Accuracy Studies–2 and the Cochrane Risk of Bias tools. A bivariate random-effects model was used to calculate summary estimates. Heterogeneity was assessed with the I^2 statistic and visually with forest plots.

widened mediastinum on chest radiograph had a negative LR ranging from 0.14 to 0.60, making it a potential indicator for a decreased risk of acute aortic dissection. Finally, the authors assessed 2 common risk stratification tools: the American Heart Association Aortic Dissection Detection score and the Von Kodolitsch score. An Aortic Dissection Detection risk score less than 1 was useful for decreasing suspicion of acute aortic dissection (negative LR 0.22; 95% confidence interval [CI] 0.15 to 0.33); however, 5.9% of patients classified as low risk (Aortic Dissection Detection risk score 0) still had aortic dissection. The Von Kodolitsch score, which includes 3 variables of aortic pain (ie, immediate-onset, tearing, or ripping pain), mediastinal widening on chest radiograph, and pulse or blood pressure differential, was useful only if all 3 variables were absent (negative LR 0.07; 95% CI

0.06 to 0.09) or all 3 were present (positive LR 65.79; 95% CI 4.08 to 1,061.41).

Commentary

Acute aortic dissection is a rare but catastrophic event with an annual incidence of approximately 3 cases per 100,000 people in the United States.^{1,2} With mortality increasing 1% to 2% every hour after initial presentation, diagnosing acute aortic dissection in the ED requires sharp clinical acumen and poses a high medicolegal risk.³ Studies have demonstrated that emergency physicians fail to diagnose acute aortic dissection in up to 38% of cases.^{4,7} Despite classic signs and symptoms (eg, severe chest pain, radiating pain, focal neurologic deficits), there are numerous mimics and variations in the clinical presentation that can make the diagnosis of acute aortic dissection challenging.

This systematic review demonstrated that focal neurologic deficits, pulse deficits, and hypotension were suggestive of aortic dissection, whereas the majority of other traditional risk factors and symptoms (eg, history of hypertension, syncope, chest pain, abdominal pain, tearing pain, migrating pain) were weak predictors of aortic dissection. Although the high specificities with some of the included studies may help to increase one's clinical suspicion of acute aortic dissection, the sensitivities were inadequate to exclude the disease. However, combining history and examination features may improve diagnostic accuracy. Although an

Aortic Dissection Detection risk score of zero can be used to stratify patients to low risk (negative LR 0.2), it should not be used alone to exclude the diagnosis. A recent study demonstrated that when an Aortic Dissection Detection score of zero was combined with a negative D-dimer result (<500 ng/mL), the risk of acute aortic dissection was 0.3% (95% CI 0.1% to 1%).⁸

Several limitations with respect to this systematic review must be considered. First, the reference standard to confirm the diagnosis of acute aortic dissection varied between studies, ranging from invasive aortography to CT or MRI. Additionally, there were variations in the definition of “pulse deficits” and “pain” used in the study. There was also significant statistical heterogeneity in the studies reporting on pain characteristics. Moreover, most of the analyzed studies did not describe any of the interventions performed (eg, intravenous fluids, medications), which may also have influenced some of the findings. Finally, the study prevalence of acute aortic dissection in this review was higher than what is observed in a typical community setting. As a result, the study population may not reflect the lower-risk population more common in most EDs, which may limit the applicability and generalizability when lower-risk populations are evaluated.

Editor's Note: This is a clinical synopsis, a regular feature of the *Annals'* Systematic Review Snapshot (SRS) series. The source for this systematic review snapshot is: **Ohle R, Kareemi HK, Wells G, et al.**

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