Dissecting the Evidence

In the year 2000, my good friend Mark Courtney and I painstakingly reviewed a decade's worth of medical examiner's cases in Mecklenburg, NC (county of Charlotte, NC). Reading these fascinating paper files, one by one, we sought to learn about the clinical features of patients who died suddenly and unexpectedly from pulmonary embolism. As we hoped, we learned a few facts about what sudden death from PE "looks like."[1,2] We also learned much more in general about unexpected death in young people. At the time, the rule of the chief medical examiner (Dr. Michael Sullivan) was that all patients who died unexpectedly, under the age of 65, received an autopsy, and the associate examiners interviewed families and witnesses about the death circumstances. So this database provided an incredibly valuable teaching tool to learn what kills people out of the blue, and what the decedent said and did in the days and hours before death.

This sample showed that the top three causes of non-traumatic sudden medical death were acute coronary syndrome, pulmonary embolism, and aortic dissection–with prevalences in that order–descending roughly in successive 10:1 ratios. In other words, acute coronary syndrome was roughly 100 times more common than aortic dissection as a cause of sudden death. In 2010, I and a multicenter team published outcomes of 840 low-risk patients with chest pain and dyspnea.[3] Zero of these 840 (0%) had aortic dissection.

These experiences support the statement that aortic dissection is very uncommon. But it can be fatal, and it can be fixed by surgery. For these reasons, aortic dissection warrants a prominent position in the pantheon of dangerous, easy to miss, but can't miss, diagnoses.*

But dang, aortic dissection is so easy to miss. For many learners of emergency care, the first five cases have classic symptoms and signs: ripping midscapular pain in hypertensive, writhing patients. Then the sixth case we luck into diagnosing is a blown out, humongous aortic root dissection, with pericardial fluid, and a flap extending to the renal arteries…all in that dude chillin' out over there in Room 6, reading his novel, cowboy boots crossed, with normal blood pressure. "Wife made me come in," he says. Attend any given M&M at an emergency medicine residency, and there is a 10% chance you will see an aortic dissection presented. Ironically, it is also quite possible to complete an emergency medicine residency without having primarily diagnosed a patient with an aortic arch dissection.

We need a prospective cohort to determine with accuracy, the positive and negative clinical predictors of aortic dissection. However, the rarity of the diagnosis renders the design and funding for this hypothetical cohort a total buzzkill to imagine. We'd have to prospectively collect data on 10,000 chest pain patients and follow their outcomes to yield 100 aortic dissections. This database does not exist. I do not think it ever will. It is a unicorn.

Accordingly, we lack data to state with confidence which clinical features distinguish aortic dissection from non-dangerous causes of chest pain. Ohle, et al, show this lack of data in their **systematic review and meta-analysis**, and then go on to

help close this gap with their carefully done **case control study**. These two papers are put into clinical context in an accompanying **commentary by Smith and Miller.** Ohle and colleagues collected data on 164 patients with aortic dissection, and compared them to 776 control patients who had similar symptoms, but no aortic dissection. With guidance from their systematic review, the authors chose 33 candidate predictor variables to compare between groups. They found that 16 of these 33 were potentially significant. Many are classic positive predictors (tearing/ripping pain), but some are surprising (radiation to the abdomen). The papers' meta-data, such as the 16 percent initial miss rate and the high survival rate, were also informative and alone are worth reading.

Ohle et al provide data to support the decision to order a CT for suspected aortic dissection, as well as useful variables to document as absent to help justify not ordering a CT. This paper is not the unicorn, but it provides a practical reference to learn more about how acute aortic dissection does and does not present.

Myocardial infarction, pulmonary embolism, aortic dissection, subarachnoid hemorrhage, mesenteric ischemia.

1.   Courtney DM, Sasser H, Pincus B, Kline J, A. Pulseless electrical activity with witnessed arrest as a predictor of sudden death from massive pulmonary embolism in outpatients. Resuscitation. 2001;49(3):265-72.
2.   Courtney DM, Kline JA. Identification of prearrest clinical factors associated with outpatient fatal pulmonary embolism. Acad Emerg Med. 2001;8(12):1136-42.
3.   Kline JA, Shapiro NI, Jones AE, Hernandez-Nino J, Hogg MM, Nelson RD, et al. Outcomes and radiation exposure of

emergency department patients with chest pain and shortness of breath and ultralow pretest probability. Ann Emerg Med. 2014;63:281-8.

Best wishes,
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