H39 Saddle Pulmonary Embolism With Paradoxical Coronary Artery Embolism Through a Patent Foramen Ovale: A Case Study

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The goals of this presentation are for attendees to: (1) consider the possibility of coronary artery embolism through a patent foramen ovale in sudden death from thromboembolism; (2) recognize the autopsy appearance of a thromboembolus propagating through a foramen ovale; and, (3) identify risk factors for deep venous thrombosis that could lead to life-threatening pulmonary embolism.

This presentation will impact the forensic science community by assisting attendees to: (1) recognize coronary artery embolism as a potential complication of patent foramen ovale in thromboembolism cases; (2) identify its role as a contributor to sudden death; (3) consider underlying natural causes of sudden death in patients presenting in motor vehicle accidents or by other accidental mechanisms; and, (4) detect unusual complications of pulmonary thromboembolism.

A 35-year-old White male with a medical history of knee surgery and a vague history provided by the family of an episode of severe meningitis a number of years ago was found in cardiac arrest on the side of the road after his car slowed below highway speeds and ran up onto the curb. There was reportedly minor damage to the vehicle and no major injuries noted on the patient. Cardiopulmonary resuscitation by Emergency Medical Services (EMS) and the local emergency room staff was not successful. The day prior to the fatal incident, the decedent had complained to his wife of a swollen right leg, shortness of breath, and chest pain. His wife strongly encouraged him to seek medical care. On the day of the incident, she reported that he was on his way to pick up diapers and then drive himself to the emergency room.

Upon autopsy, a saddle pulmonary embolism was discovered. As was suspected based upon the health complaints prior to death, a completely occlusive thrombus occupied the right pulmonary artery with distention and dilatation, as well as an incompletely occlusive thrombus in the left pulmonary artery. Histology confirmed the left thrombus was close to the hilum, with evidence of scar tissue and recent thrombus in the artery, suggesting a prior partial thromboembolism at that site.

Beyond the saddle embolism, findings were atypical. A patent foramen ovale was noted with a large paradoxical embolus extending from right atrium to left atrium and a thrombus noted in the circumflex coronary artery. Also of note, not only the right but both lower extremities showed Deep Venous Thrombosis (DVT); it was not possible to determine which leg supplied the embolus which was ultimately responsible for his death. Histology of the deep veins in the legs showed incompletely occluded veins with a clot appearing similar to the paradoxical embolism and no endothelialization (suggesting no old clot) and no evidence of previous endothelial injury.

Saddle embolism with paradoxical embolism in the coronary artery is a rare complication of DVT and patent foramen ovale. While a patent foramen ovale can be present in up to 30% of the population under 30, it is suggested that "paradoxical coronary embolism accounts for 10%-15% of all paradoxical emboli," but is more common in patients under the age of 35.[1,2] While patent foramen ovale and pulmonary embolism are both common occurrences, the combination of saddle pulmonary embolism leading to death in a patient with patent foramen ovale and coronary artery embolism is an anomaly with few documented cases.

Virchow's triad, the set of risk factors that can help explain the formation of a thrombus, includes venous stasis, injury to the endothelium, and a tendency for hypercoagulability, such as malignancy or clotting factor deficiency.[3] In review of the patient's risk factors for DVT, a history of knee surgery was obtained; however, since no surgical scars could be identified on external examination, the decedent's knee surgery may have been minor. He also had a distant history of severe meningitis and it is possible that during that time he developed an undetected and untreated DVT and/or pulmonary embolism while he was septic and immobilized. This may have put him at risk for further thrombus, supported by the histology report suggesting new thrombus at the site of prior thromboembolism in the lung. It is also possible that the decedent had an unknown clotting factor deficiency which put him at risk for thrombosis. Relevant family history includes the patient's father's development of a partial stroke, in the absence of hypertension and hypercholesterolemia, which resolved with treatment a few months prior to the decedent's fatal event. Liver samples were retained at -70°F for genetic testing availability.

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Pulmonary Embolism, Paradoxical Embolism, Patent Foramen Ovale