H40 Fatalities Due to Major Vascular Trocar Injuries in Laparoscopic Surgery

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Learning Overview: After attending this presentation, attendees will understand the epidemiology, risk factors, and autopsy findings associated with major vascular trocar injuries in laparoscopic surgery during the past 16 years in New York City, NY, and Houston, TX.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by identifying risk factors and discussing autopsy findings associated with major vascular trocar injuries in laparoscopic surgery, with the aim of reducing these deaths.

In the United States, approximately two million laparoscopic operative procedures are performed every year.[1] The incidence of complications is as high as six percent for major procedures.[2] More than half of the associated serious injuries and deaths occur during the first step of the operation, when a trocar is used to gain entry into the peritoneal cavity to create a pneumoperitoneum.[3,4] The most common injury is to vascular structures, even when shielded or optical trocars are used, and the aorta is the most common vascular injury in fatal cases.[1] The estimated incidence of major vascular injuries is 0.05%, with a resulting mortality of up to 17%.[5]

The Office of Chief Medical Examiner of the City of New York and the Harris County Institute of Forensic Sciences electronic databases were searched for all fatalities where the cause of death was associated with major vascular injuries sustained during laparoscopic surgery between 2004 and 2020. Ten cases were identified, seven in New York City and three in Houston.

Of these cases, nine were female, and one was male. The ages ranged from 31 to 79 years (average, 56.6 years); five were Black, four were White, and one was Hispanic. The body mass index ranged from 26.7 to 46.7 kilograms per square meter (average, 37.3kg/m^2). Nine cases underwent autopsy examination, and one underwent external examination only. The manner of death was accident in six cases and therapeutic complication in four cases (defined as when the death is caused by predictable complications of appropriate therapy and would not have occurred but for the medical intervention). The blood vessels injured during the procedure were the aorta (5), inferior vena cava (5), renal vein (4), superior mesenteric artery (1), hepatic vein (1), and left common iliac artery (1). In five cases, more than one major blood vessel was injured. The indications for surgery were cancer (4), cholelithiasis (2), uterine leiomyoma (1), and others (3)—including elective kidney donation. Five cases were pronounced dead on the operating table; and five cases survived for up to 12 hours.

Nine cases were obese or severely obese. Obesity was an initial contraindication to laparoscopic surgery in the 1980s, and although subsequent studies have shown it may be performed safely, it does present some technical difficulties, especially with the creation of the pneumoperitoneum.[6] Some modifications can be made, such as changing the initial trocar entry point. Another recognized risk factor for vascular injury is previous abdominal surgery with the presence of adhesions.

A meticulous dissection at autopsy, as for any penetrating injury of the body, can help delineate the injury pathway from the trocar entry point and identify the injured structures. This can provide helpful feedback to the operating surgeon and trocar designers and improve safety in laparoscopic procedures. The trocar device that caused the injury can be reported to the United States Food and Drug Administration (FDA) by the user to help track these fatalities.

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