See Article page 76.

# Commentary: How did that happen?

Todd L. Demmy, MD

Todd L. Demmy, MD

**CENTRAL MESSAGE**

Surgeons need to appreciate the general and device-specific mechanisms by which endomechanical staplers cause vascular injuries.

The article by Matsui and Murakawa demonstrates a mechanism of stapler-induced tissue injury that is probably more common than we appreciated.[1] Furthermore, they were fortunate enough to capture the problem "in the act." And because they were in control of the hand-fired stapler (rather than a motorized product going automatically through its cycle) stopping the action before injury was possible.

Like many unforeseen events, this one required the interaction of problems. First, was an errant staple with one end embedded firmly into the vessel and the another partially deformed (resembling a hook) ready to latch onto something. Although loose remnant staples pose their own laceration risks by becoming little knives wedged in instruments like suction holes, the partially embedded staple can catch things like dissecting sponge gauze and be avulsed.

The thing that caught the staple, in this case, was the external cap on the I-beam like component of the stapler reload, which moves along its tracks bringing together the anvil and cartridge. As it moves, this central component compresses the tissue, ejects the staples, and cuts the tissue with the external cap providing visual confirmation of the division and stapling progress. However, monitoring the progress of the stapler is also evident on the external handle. Therefore, there is not an expectation for surgeons to always keep the cap under visualization unless they happen to know about this unusual, potentially dangerous chain of events.

This might be why, on rare occasions, bleeding starts from vascular structures during thoracoscopic lung resections that were previously hemostatic. Without a mechanism like that depicted in this report, the titular question either goes unanswered or is attributed to other local factors like free staple bodies, loose clips, or trauma caused by retractor instruments or other stapler components while they were passed or fired.

Although this stapler design allows such an event, this unusual safety concern might be acceptable to surgeons who wish to avoid other problems. For instance, the design of another major vendor of staplers compresses the tissue upon closing of the stapler (as opposed to high-force compression that occurs only during firing as the cap and underlying components advance). Some surgeons, like myself, believe that this softer closure allows safer "test clamping" whereas others see this as a disadvantage because the tissue is not held as snugly within the stapler. In any case, high compression on delicate vessels can cause damage away from the closed ends of the divided structure leading one group of investigators to cite stapler gap distance as an important consideration during pulmonary stapling.[2]

In any case, this report underscores the need to surveil for errant, partially embedded, and malformed staples while operating. To the extent that small vessel division might increase this problem because there is less vascular wall for staple incorporation, we might consider greater use of

From the Department of Thoracic Surgery, Roswell Park Comprehensive Cancer Center, Buffalo, NY; and Department of Surgery, University at Buffalo, Buffalo, NY.

Disclosures: The author is a Medtronic consultant.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Nov 7, 2021; revisions received Nov 7, 2021; accepted for publication Nov 12, 2021; available ahead of print Nov 17, 2021.

Address for reprints: Todd L. Demmy, MD, Department of Thoracic Surgery, Roswell Park Comprehensive Cancer Center, Elm and Carlton Sts, Buffalo, NY 14263 (E-mail: todd.demmy@roswellpark.org).

JTCVS Techniques 2022;11:78-9
2666-2507



https://doi.org/10.1016/j.xjtc.2021.11.013

energy devices for such structures, which have been tested and appear safe and effective.[3]

## References

1. Matsui HM, Murakawa T. Potential surgical challenge; hooking the staple stump. *J Thorac Cardiovasc Surg Tech*. 2022;11:76-7.
2. Tsunezuka Y, Tanaka N, Fujimori H. The impact of endoscopic stapler selection on bleeding at the vascular stump in pulmonary artery transection. *Med Devices (Auckl)*. 2020;13:41-7. https://doi.org/10.2147/mder.S240343
3. Liberman M, Goudie E, Morse C, Hanna W, Evans N, Yasufuku K, et al. Prospective, multicenter, international phase 2 trial evaluating ultrasonic energy for pulmonary artery branch sealing in video-assisted thoracoscopic surgery lobectomy. *J Thorac Cardiovasc Surg*. Published online September 30, 2019. https://doi.org/10.1016/j.jtcvs.2019.09.061