

Facilitation of Soft Tissue Surgery

Surgical Staplers and Vessel Sealing Devices



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KEYWORDS

- Stapling • Vascular sealing • Vessel sealing devices • Endoscopic staplers
- Endoscopic vessel sealing devices • Surgical devices • Mechanical hemostasis

KEY POINTS

- Medical surgical devices have improved efficiency of surgery without compromising confidence in hemorrhage control.
- Surgical stapling instruments can decrease tissue trauma, contamination, and the anesthetic period in multiple body systems, including gastrointestinal, urogenital, cardiovascular, pulmonary, and skin.
- Vascular sealing devices can coagulate vessels and hemorrhagic tissues effectively and quickly.
- When used within recommended guidelines, vascular sealing devices are reported to reduce surgical time and provide occlusion sufficient to counteract arterial pressures without using foreign material.
- Endoscopic stapling and vessel sealing devices follow similar concepts as conventional surgical staplers and vascular sealing devices, but are designed to be used with laparoscopic and thoracoscopic procedures.

INTRODUCTION

Recent advances and acceptance of various medical devices have clearly helped in the efficiency, simplicity, and effectiveness of veterinary surgery. The goals of surgery include efficient methods and minimal surgical times, delicate tissue handling techniques, confidence with tissue reconstruction, and minimizing contamination, leakage and complications. Mechanical means of suturing, cutting, and hemostasis assist with accomplishing these goals. Most recently, stapling instrumentation and vascular sealing devices have become common instruments on all levels of surgery because of their ease of use and increase in surgical efficiency.

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STAPLING INSTRUMENTS

Surgical stapling methods have been explored widely and used in veterinary surgery. Relationships between surgical goals and their use have been shown and their development has been enhanced by modifications for ease of use in veterinary surgery.¹ By the early 1980s, the use of stapling instrumentation was being recognized and used in the United States based on clinical studies and greater availability.²

The use of surgical stapling requires the knowledge of use for each stapling device. In no situation, however, should the use of a stapler compensate for poor surgical practice. Attention to principles of soft tissue surgery (Halstead's principles), as well as proper use of each surgical stapler must be followed to ensure surgical success. Principles that have been reported include³:

1. Do not staple tissues that are inflamed, edematous, or lack a vascular supply.
2. Every staple must penetrate all tissue layers.
3. Staple size should be accurate; tissues should not be too thick to be penetrated or too thin to support the staple.
4. Tissues should be inspected thoroughly before stapler application to ensure proper alignment and no capturing of inadvertent tissues.
5. Stapling devices should be removed carefully to avoid disrupting the staples.
6. Tissues should be grasped gently before removal of the stapler to check for hemorrhage, leakage, or loose staples.

Conventional Stapling Devices

Thoracoabdominal stapler

The thoracoabdominal (TA) stapler is a versatile stapler that applies staggered rows of B-shaped, titanium or stainless steel staples into tissue or across vascular pedicles.⁴ The instrument consists of a handle with a handle and trigger configuration and a "U-shaped" end that accepts the vascular tissues or pedicle to be ligated. The non-crushing nature of the B-shaped staples allows for normal capillary blood flow between the staggered rows of staples, but adequately provides hemostasis at the border of excised tissues or vascular structures.⁵ Reusable and disposable TA staplers are available and come in various widths for multiple tissue types. Reusable TA staple instruments have staple cartridge widths that are color-coded and are available in 30 mm (white), 55 mm (blue), and 90 mm (green). Disposable staplers come in 30, 45, 60, and 90 mm widths. Decisions on which staple size to use depend on confidence with compression of tissues and vessels with the size of staples selected. Exceeding the width of the pedicle or tissue is a better decision than stopping short of the tissue edge.⁶ White cartridges (also known as V3), are only available in 30 mm widths and apply 3 rows of staples 3.0 mm wide by 2.5 mm in length and compress to a height of 1.0 mm.⁴⁻⁶ Blue cartridges are available in 55 and 90 mm widths and apply 2 rows of staples that are 4.0 mm wide by 3.5 mm in length and compress to a height of 1.5 mm.⁴⁻⁶ Green cartridges are available in 55 and 90 mm widths and apply 2 rows of staples that are 4.0 mm wide by 4.8 mm in length and compress to a height of 2.0 mm.⁴⁻⁶

Tissues are inserted through the anvils of the staple cartridge and secured when the approximating lever is closed. At this point, alignment is checked and adjustments made by releasing the approximating lever and realigning the tissues, if necessary. Excessive force should not be necessary to close the approximating lever and the retaining pin should engage to ensure appropriate compression of tissues. The safety is released and the trigger is squeezed to apply the staples across the tissue.^{4,5} Before

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