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Case Report

Reinforcement clipping over energy-sealed arteries: a technical caution

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ABSTRACT

Energy-based vessel sealing is a trusted technique in modern surgery. However, the application of mechanical clips over a thermally sealed vessel can paradoxically disrupt the integrity of the seal. A 55-year-old male underwent radical surgery for a retromolar trigone malignancy. The facial artery was sealed with LigaSure and secondarily clipped. On postoperative day four, torrential bleeding from the stump led to a cardiac arrest. Re-exploration revealed that the clip had transected the energy-sealed segment. Reinforcement clipping over energy-sealed stumps may compromise vessel integrity. If additional control is needed, clips should be applied before sealing, not after. This case highlights the need for adherence to energy device principles and avoidance of reinforcement clipping over thermally sealed vessels.

Keywords: Energy sealing, LigaSure, Facial artery, Postoperative hemorrhage, Vascular clip, Case report

INTRODUCTION

Energy-based vessel sealing systems such as LigaSure Exact (Medtronic), robotic Vessel Sealers (Intuitive Surgical), and other advanced bipolar sealing devices have revolutionized vascular control across virtually all surgical domains-whether in open, laparoscopic, or robotic procedures. These instruments offer reliable closure of vessels up to 7 mm in diameter through controlled thermal denaturation of vascular collagen and elastin fibers, forming a fused protein matrix capable of withstanding high burst pressures.[1,2] The widespread confidence in these devices stems from their consistent performance across a wide range of vessel calibers and tissues. Nonetheless, reinforcement clipping is sometimes practiced intraoperatively to provide perceived additional security-particularly when surgeons face large vessels or borderline cases. However, the safety of such reinforcement clipping over energy-sealed stumps remains largely unaddressed in literature. This report highlights a hemorrhagic complication resulting from reinforcement clipping over an energy-sealed facial artery stump and proposes technical refinements to prevent such events.

CASE REPORT

A 55-year-old male presented with a retromolar trigone (RMT) malignancy extending into the infratemporal fossa (ITF). Following neoadjuvant chemotherapy, near-complete tumor response was achieved, though residual cervical lymphadenopathy persisted on PET-CT. An open classical radical neck dissection was performed, including infratemporal fossa clearance, upper alveolectomy, segmental mandiblectomy, and microvascular anterolateral thigh (ALT) flap reconstruction. Intraoperatively, the facial artery was Ligasured (sealed using LigaSure Exact, Medtronic). The vessel measured approximately 5 mm in diameter—within the device's recommended limits. For added reassurance, a mechanical clip was applied directly over the sealed stump. The postoperative course was initially

uneventful for three days. On the fourth day, the patient developed sudden torrential oropharyngeal bleeding while supine, leading to aspiration, asphyxiation, and cardiac arrest. Resuscitation was promptly achieved. Emergent neck re-exploration revealed active hemorrhage originating from the facial artery stump where the applied clip had cut through the previously sealed vessel. The artery was re-ligated surgically, and a tracheostomy was performed. The patient ultimately recovered well.

DISCUSSION

This case illustrates a rare but serious complication arising from reinforcement clipping over energy-sealed vascular stumps. The LigaSure system achieves vessel closure by delivering controlled pressure and bipolar thermal energy, resulting in collagen shrinkage and elastin fusion into a stable protein coagulum capable of withstanding burst pressures several times normal systolic levels.[1,2] The sealed segment, however, remains biologically devitalized and structurally homogenized, lacking the normal resilience of native vessel wall.[3]

Application of metallic clips over such thermally altered tissue introduces concentrated focal pressure, which may disrupt the fused collagen matrix and create mechanical points of weakness.[4,5] In highly mobile tissue beds such as the neck, ongoing postoperative motion, traction, and positional shifts may exacerbate these vulnerabilities. The muscular nature of arteries like the facial artery-with thicker media and active pulsatility-further compounds the risk of clip-induced disruption.

Universal surgical relevance

This technical issue extends well beyond head and neck surgery. Advanced vessel sealing systems are routinely used across abdominal, thoracic, hepatobiliary, colorectal, gynecologic, and endocrine surgeries. Robotic platforms employ vessel sealers (Intuitive Vessel Sealer Extend, Vessel Sealer 2.0), which rely on identical physical principles. Therefore, the lessons from this case apply universally across surgical disciplines.

The principle of complete trust or early reinforcement

The very nomenclature-vessel sealer, LigaSure-reflects the expectation of complete and permanent sealing. When used properly within device specifications, energy-sealed vessels require no additional reinforcement. The surgeon may confidently rely upon the seal. However, when the surgeon perceives that vessel caliber or wall characteristics approach or exceed the safety threshold, a better strategy emerges. First, apply two vascular clips proximally on healthy, unsealed arterial wall. Then, for the distal side (specimen side) either apply a clip to prevent backflow bleeding, or divide the vessel using the vessel sealer for convenience. This sequence allows for maximum security without risking clip-induced disruption of sealed tissue. Critically, clips should never be applied after energy sealing directly over the coagulum.

Technical recommendation

When confident: seal directly with energy-based vessel sealer. When doubtful: Apply two clips proximally on healthy vessel. Either clip distally or divide with energy device. Avoid applying clips directly over previously sealed segments.

CONCLUSION

Reinforcement clipping over energy-sealed arterial stumps carries the paradoxical risk of delayed hemorrhage by compromising the thermal seal's integrity. Surgical decision-making should follow a disciplined algorithm: either trust the vessel sealer fully, or perform early clip ligation before energy application. Avoidance of clipping over sealed segments enhances safety across all surgical specialties where energy sealing devices are used.

Disclaimer

This manuscript was prepared with the assistance of ChatGPT (OpenAI, 2024) to support the author in structuring, editing, and refining the scientific narrative. All clinical content, surgical details, and final interpretations are original, based on the author's direct experience and expertise. The AI tool was used strictly as an editorial aid and did not contribute to the generation of medical data, analysis, or clinical decision-making.

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