Modified Blalock clamp: a single-hand autostatic device for pulmonary vessel occlusion during lung cancer resection

Francesco Petrella,*, Piergiorgio Solli, Alessandro Borri and Lorenzo Spaggiari

a Department of Thoracic Surgery, European Institute of Oncology, Milan, Italy
b University of Milan School of Medicine, Milan, Italy

* Corresponding author. Department of Thoracic Surgery, European Institute of Oncology, Via Ripamonti 435, 20141 Milan, Italy. Tel: +39-02-57489362; fax: +39-02-94379218; e-mail: francesco.petrella@ieo.it, fpetrella@libero.it (F. Petrella).

Received 7 October 2011; received in revised form 15 November 2011; accepted 21 November 2011

Abstract

Vascular clamping during lung cancer resection may be difficult in patients with short vessels or large neoplasms preventing adequate and safe exposure. In addition, the physiological vicinity of some vessels to rigid structures like the bronchi may interfere with ideal clamp positioning even in ordinary procedures. We have modified the original Blalock clamp to facilitate the control of pulmonary vessels and physiologically compress the vessel walls, thereby allowing optimal vascular resection and reconstruction during lung cancer surgery. This clamp allows easy, safe and physiological control of pulmonary vessels thanks to its double-branched guillotine mechanism.

Keywords: Vascular clamp • Lung cancer

INTRODUCTION

Vascular control of hilar and intraparenchymal pulmonary vessels is the key step in almost all emergency and elective thoracic surgical procedures including pulmonary artery sleeve resection or patching and pulmonary vein or left atrium resections [1–4].

However, vascular clamping may be difficult in patients with short vessels or large neoplasms preventing adequate and safe exposure. In addition, the physiological vicinity of some vessels to rigid structures like the bronchi may interfere with ideal clamp positioning even in ordinary procedures.

We have modified the original Blalock clamp to facilitate the control of pulmonary vessels and physiologically compress the vessel walls, thereby allowing optimal vascular resection and reconstruction during lung cancer surgery.

CLINICAL SUMMARY

Clamp description

This clamp works with two co-axial branches: one is fixed representing the static branch of the clamp; the other is the sliding branch compressing the vessel wall from top to bottom against the internal face of the static branch. The sliding branch is controlled by the operator with three fingers, allowing a ‘guillotine’ shift towards the fixed branch thereby clamping the vessels. To remove the clamp, the operator gently engages the clutch with the tip of the thumb, gradually returning the sliding branch to the starting position.

Surgical technique

After having dissected and isolated the target vessel on a standard silicon loop, maximal field exposure is achieved to ensure safe clamp positioning. The open vertical clamp is placed around the vessel with the fixed branch being under the vessel and the sliding branch above (Fig. 1). The clamping action is obtained by shifting the sliding branch towards the fixed branch at a 90° angle of strength application with the vascular axis, creating an apico-caudal clamping action rather than the latero-lateral compression of standard clamps (Fig. 2).

DISCUSSION

Pulmonary vessel clamping may be challenging in some areas because of narrow surgical fields, compressing or displacing lesions or simply due to unfavourable vascular anatomy.

Unlike many vessels in the systemic circulation, pulmonary vessels have their own angle and relation with adjacent rigid structures like the bronchi that may interfere with fast and effective standard clamp positioning.

In 1948, Alfred Blalock and Vivien Thomas first described a similar clamp (with no autostatic mechanism and without the clutch allowing single-hand handling) for the temporary occlusion of the pulmonary artery in newborns, to perform an anastomosis between the left subclavian artery and the left pulmonary artery during the Blalock-Taussig operation [5].

This clamp reproduces a guillotine functioning, very similar to the thoraco-abdominal stapler (TA) that dovetails with pulmonary vessel orientation.
This device allows clamp positioning perpendicular to the vessel course, exerting an apico-caudal clamping action rather than the latero-lateral compression of standard clamps.

An ideal indication for this clamp is the control of the left main pulmonary artery in the case of arterioplasty (Fig. 1) and segmental vein clamping where simple stapling or ligation may be difficult for narrow surgical fields and vascular clamping may be required for direct vascular sutures, etc. In addition, left atrium or proximal vein clamping is easily achieved without cardiac luxation.

The autostatic compression and decompression action is gradually controlled by the operator with a single hand, thereby minimizing reperfusion injury after a prolonged clamping time.

CONCLUSION

This clamp allows easy, safe and physiological control of pulmonary vessels thanks to its double-branched guillotine mechanism. The autostatic functioning guarantees a gradual clamping and declamping action, preventing reperfusion injuries and allowing straightforward intraoperative handling.

We propose the use of the ‘modified’ Blalock clamp with the autostatic mechanism and the new clutch, allowing an easy single-hand use, for standard vascular resection during lung cancer surgery.

ACKNOWLEDGEMENTS

The authors thank Antonello Spinnato and Angelo Mauri of Janach Srl for technical support and also Anne Collins for English.

Conflict of interest: The clamp described in this article was designed by Francesco Petrella; the prototype was made by Janach Srl: Como, Italy. The clamp trade mark was registered.

REFERENCES