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MAIN ARTICLE

Utility of the LigaSure vessel sealing system during major head and neck cancer surgery

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Abstract

Objective: To evaluate the haemostatic efficacy and safety of the LigaSure vessel sealing system in major head and neck cancer surgery.

Methods: This two-year, prospective study included 34 patients who underwent major head and neck cancer surgery at a university hospital. The LigaSure Precise handpiece and LigaSure 8 vessel sealing system were utilised as the primary means of haemostasis, except when sealing vessels larger than 7 mm in diameter. Surgical outcomes were evaluated. In addition, in each patient the diameter of the largest vein and artery sealed (all were >2 mm) was measured before sealing.

Results: In all cases except one (33/34 patients), a sutureless technique was performed. Post-operative bleeding was observed in two cases. Thirty veins and 22 arteries were measured. The mean diameter of the largest sealed vein was 3.8 mm, while that of the largest sealed artery was 2.7 mm.

Conclusion: Our experience indicates that the surgical technique described is safe and effective. The main advantages of the LigaSure system are that it simplifies the procedure and eliminates the need for clips and suture ligations.

Key words: Hemostasis; Surgical Procedures, Operative; Larynx; Carcinoma; Ligasure

Introduction

In the field of head and neck surgery, the LigaSure vessel sealing system has been shown to be safe and effective for thyroid surgery, parotid gland surgery and tonsillectomy.[1–3] However, to date no studies have evaluated the usefulness of this system in cancer surgery of the upper aerodigestive tract.

The aim of this study was to evaluate the haemostatic efficacy and safety of the LigaSure vessel sealing system in major head and neck cancer surgery.

Materials and methods

Patients

This prospective study was conducted from September 2008 to November 2010 within a university hospital, and involved 34 patients who presented with squamous cell carcinoma of the head and neck. All patients underwent major head and neck cancer surgery, including primary tumour excision, cervical lymph node dissection and reconstruction when necessary.

Surgical technique

The LigaSure Precise handpiece and LigaSure 8 vessel sealing system (Covidien, Boulder, Colorado, USA) were utilised as the primary means of haemostasis, except when vessels were wider than 7 mm in diameter.

All patients received general anaesthesia. Concerning neck surgery, after the skin incision the subcutaneous tissue and the platysma were divided, and skin flaps were constructed using monopolar electrocautery. During neck dissection, all tissues (particularly muscles) and vessels were sealed using the LigaSure Precise handpiece (Figure 1). Primary tumour excision was performed utilising ‘cold steel’ or monopolar electrocautery for mucosal sections and the LigaSure Precise handpiece for all other haemostasis, particularly during glossal resection (Figure 2).

Surgical outcomes were recorded and evaluated. In each patient, we also measured the diameter of the largest vein and artery sealed using the LigaSure system (all were wider than 2 mm), before sealing.

Results

Details of the surgical procedures performed in all 34 patients are shown in Table I.

Of the 34 patients, six presented with a recurrence after definitive (chemo)radiation therapy, and underwent salvage surgery.

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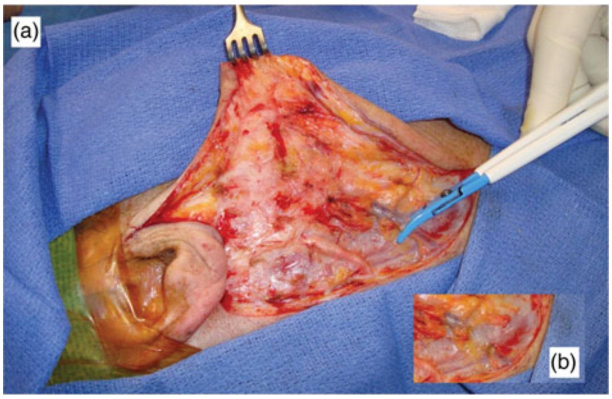

FIG. 1

Surgical photograph showing coagulation of the external jugular vein during the approach of a right modified radical neck dissection for salvage surgery: (a) during sealing, (b) after section.

In all cases except one (33/34 patients), a sutureless technique was performed (i.e. no sutures or surgical clips were used, and all vessels were sealed using the LigaSure Precise handpiece). In one case involving modified radical neck dissection with multiple pathological lymph nodes, intra-operative bleeding necessitated the use of standard haemostasis techniques utilising surgical ties, in order to achieve complete haemostasis.

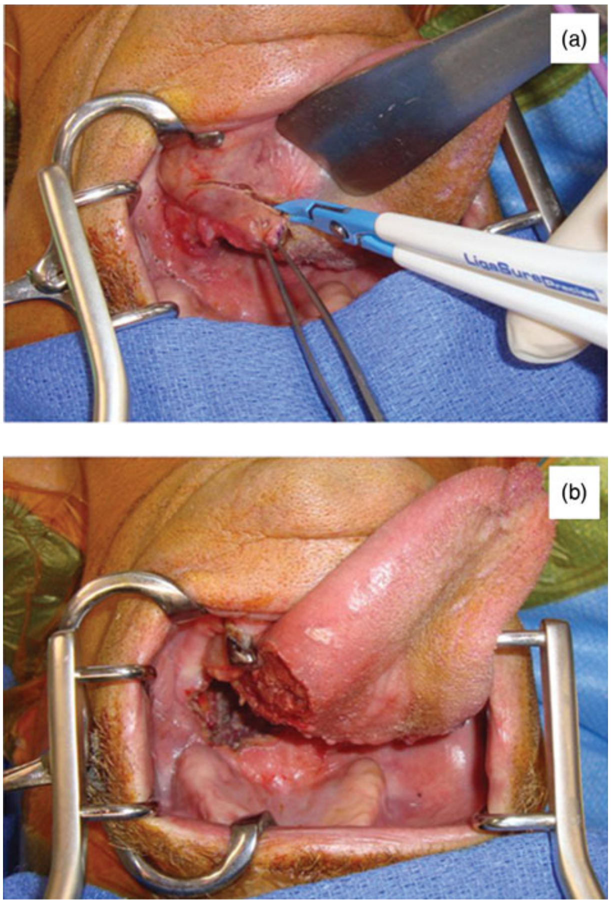

FIG. 2

Surgical photograph showing transoral excision (viewed from the patient's head) of an oropharyngeal carcinoma (staged tumour 2 node 0): (a) pre-resection, (b) post-resection.

TABLE I
PATIENT CHARACTERISTICS

Parameter	Value
Patients (*n*)	34
Sex ratio (M:F; *n*)	28:6
Age (mean (range); years)	59 (44–85)
Tumour location (pts; *n*)	
– Oral cavity	12
– Oropharynx	12
– Hypopharynx	3
– Larynx	4
– Cervical lymphadenopathy*	3
Tumour stage (pts; *n*)	
– I	6
– II	10
– III	15
– IV	3
Primary tumour surgery (pts; *n*)	
– Transoral glossectomy	11
– Oropharyngectomy	10
– Partial laryngectomy	2
– Total laryngectomy	4
– Laryngopharyngectomy	2
– None (lymph node surgery only)	5
Lymph node surgery (pts; *n*)	
– Modified radical neck dissection	45
– Radical neck dissection	3
Reconstruction (pts; *n*)	
– Radial forearm free flap	7
– Pectoralis major muscle flap	6
– Infrahyoid muscle flap	2
Largest sealed vessel diam (mean (range); mm)	
– Vein	3.8 (2–6)
– Artery	2.7 (2–4)

*Unknown primary. M = male; F = female; pts = patients; diam = diameter

Post-operative bleeding was observed in two cases: in one case as a result of partial necrosis of a radial forearm free flap, and in the other case at the pectoralis major donor site due to a small intercostal perforator that had probably not been coagulated during the procedure.

A total of 30 veins were measured. In 28/30 cases (87 per cent), the largest vein was the external jugular vein, while in four of 30 cases (13 per cent) it was the facial vein. The mean diameter of the largest sealed vein was 3.8 mm (range, 2–6 mm). A total of 22 arteries were measured (the facial artery in 17 cases and the superior thyroid artery in five cases). The mean diameter of the largest sealed artery was 2.7 mm (range, 2–4 mm).

Discussion

The LigaSure vessel sealing system has the potential to provide a safe, quick and effective alternative to conventional vessel ligation during major head and neck cancer surgery.

The LigaSure system consists of a bipolar radiofrequency generator and forceps. The system evaluates the impedance of the tissue in the instrument jaws

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and delivers the appropriate amount of energy needed to seal that tissue. The generator is designed to produce a high-current (4 A), low-voltage (<200 V) output. The system applies a precise amount of pressure and energy to transform the collagen and elastin within vessel walls, creating a permanent seal with a width of several millimetres. The LigaSure system can safely seal and divide large vessels 4–7 mm in diameter.[4,5] This system has been used to achieve haemostasis in various types of head and neck surgery, such as thyroid surgery, parotid gland surgery and tonsillectomy.[1–3]

- **The LigaSure vessel sealing system comprises a bipolar radiofrequency generator and forceps**
- **The system evaluates tissue impedance within the forceps jaws and delivers the appropriate energy to seal the tissue**
- **It can safely seal and divide large vessels 4–7 mm in diameter**
- **It may provide a safe, quick, effective alternative to conventional haemostasis in major head and neck cancer surgery**

In our study, for all patients except one we performed a completely sutureless technique using the LigaSure system. The device was used successfully to coagulate small vessels, tissues and muscle (particularly in the oral cavity and oropharynx) before cutting. In addition, large vessels were successfully sealed using the LigaSure device, including the external jugular vein, facial vein, facial artery and superior thyroid artery.

Several studies have shown that this system significantly reduces the duration of surgery, particularly in thyroid surgery, without increases in intra-operative blood loss, morbidity or length of hospital stay, compared with conventional techniques.[5] Due to the single treatment nature of our study, an evaluation of time savings could not be performed.

The cost of the LigaSure system is considerable. Moreover, in addition to the cost of the main device, each operation requires a completely new handpiece. However, in major head and neck cancer surgery, and particularly when several surgical procedures are combined in the one operation (e.g. primary tumour excision, neck dissection and reconstruction procedure), the LigaSure system may be cost-effective due to the number of vessel ligations and surgical clips that would otherwise be needed.

Conclusion

Our experience indicates that the surgical technique described above is safe and effective. The main advantages of the LigaSure vessel sealing system are that it simplifies the procedure and eliminates the need for clips and suture ligations. These preliminary results need to be further investigated in prospective, randomised, controlled trials, in order to assess the time savings and cost-effectiveness of using the LigaSure system in major head and neck cancer surgery, particularly in comparison with other, more conventional haemostasis and vessel ligation techniques.

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