

Internal jugular vein blowout complicating head and neck surgery

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Abstract

Internal jugular venous rupture after head and neck surgery is a rare but important condition to recognize. The Toronto General Hospital experience of this condition, together with its identification and management is reported.

Jugular vein rupture should be considered in patients undergoing primary tumour excision with modified or functional neck dissection complicated by a pharyngo-cutaneous fistula. Typically, bleeding is venous and occurs repeatedly. However, haemorrhage may be substantial and life-threatening. Treatment requires exploration and ligation of the venous system. The carotid artery should be assessed and protected at surgery, since there is a likelihood of a carotid blowout as the conditions have a common aetiology. It is important to distinguish jugular vein haemorrhage from carotid arterial rupture, since the former has a far better outcome if treated properly.

Key words: Jugular veins; Haemorrhage; Surgery, head and neck

Introduction

Major head and neck surgical procedures may result in life-threatening consequences as a result of vascular damage. The internal jugular vein lies alongside the carotid system in the neck, and is subject to similar trauma and complications as is the carotid artery following this type of surgery. Damage and subsequent jugular vein haemorrhage is most likely following its exposure and preservation during a modified neck dissection (Wurster *et al.*, 1985). Despite the increased popularity of functional and modified radical neck dissections in the last 25 years, there exists only one publication describing this phenomenon of post-operative internal jugular vein erosion and rupture (Wurster *et al.*, 1985).

In our Institute, a patient who developed this complication (jugular vein rupture after head and neck surgery) prompted a retrospective eight-year database review of patients undergoing primary tumour ablation together with a modified or functional neck dissection. In all, four cases of internal jugular vein blowout were identified. This study describes these four case reports and discusses the aetiology and management of this condition.

Case reports

Case 1

A 41-year-old gentleman underwent a right modified neck dissection (jugular vein and accessory nerve preserved) and total laryngectomy for an advanced laryngeal cancer (T₄N₁M₀) after failed radiotherapy (6000 cGy over 30 fractions) nine months prior to admission.

On the 10th post-operative day a suprastomal fistula was treated with intravenous antibiotics and packing. On the 18th and 19th day post-operatively small amounts of blood from the fistula (approximately 50 ml) were noticed, however exploration was retarded by the finding of possible pulmonary metastases, on a routine post-operative chest X-ray, not previously diagnosed. On the 21st day post-operatively a significant bleed

(approximately 750 ml) prompted emergency neck exploration. At surgery, a large pharyngeal defect with associated tissue necrosis, and a right jugular vein rupture were noted. In addition the viability of the right carotid artery was questionable. In view of the fact that the patient had developed pulmonary metastases, a carotid resection and by-pass was not contemplated. The jugular vein was divided and ligated, a levator scapula flap elevated to protect the carotid wall, and the wound was packed.

On the 28th day post-operatively a carotid blowout occurred resulting in the death of the patient.

Case 2

A 62-year-old gentleman underwent a total laryngectomy and bilateral modified neck dissections (accessory and jugular vein bilaterally preserved) for a transglottic laryngeal cancer (T₄N₀M₀).

On the 5th post-operative day neck exploration was prompted by bleeding by mouth followed by an increase in the drainage of fresh blood mixed with saliva from his neck drains, indicating a possible fistula. This bleeding was aggravated by coughing. At operation under local anaesthetic, a ruptured right jugular vein was evident, which bled profusely when the patient coughed. The vein was divided and ligated. The wound was debrided and packed and the resulting skin defect was subsequently repaired with a delto-pectoral flap.

After discharge, the patient underwent post-operative radiotherapy but succumbed to pulmonary metastases one year after surgery.

Case 3

A 62-year-old lady was admitted with recurrent hypopharyngeal cancer having undergone failed radiotherapy and a right functional neck dissection nine months previously. Surgery included a total laryngo-pharyngo-oesophagectomy with gastric

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pull-up and a left classical functional neck dissection, with the preserved sternomastoid muscle used to bolster the pharyngo-gastric suture line.

On the 14th post-operative day a pharyngo-cutaneous fistula of the left lower neck developed. This was treated conservatively with packing, however on the 21st post-operative day a large venous bleed, which followed several sentinel bleeds, resulted in hypotension and circulatory decompensation. After resuscitation a neck exploration showed bleeding from a ruptured jugular vein, which was ligated, the wound debrided and packed. In total, 16 units of blood were required for resuscitation. Two days following exploration, the fistula was closed with a myocutaneous flap and the patient was subsequently discharged without any further complications.

The patient is still alive two years after surgery.

Case 4

A 52-year-old lady underwent a total laryngectomy and bilateral functional neck dissections (accessory nerves, jugular veins and sternomastoid muscle preserved) for a poorly-differentiated squamous cell carcinoma of the supraglottis, following failed chemotherapy and radiotherapy six months previously.

On the 7th post-operative day flap necrosis with a pharyngo-cutaneous fistula developed. This was treated initially conservatively, however, on the 30th post-operative day she underwent a failed attempt at fistula closure using a pectoralis major-myocutaneous flap.

On the 37th day post-operatively she developed a dramatic haemorrhage on the right side of her neck, and at exploration a necrotic internal jugular vein was found. This was ligated and divided, the wound debrided and packed. Further surgery, including bilateral delto-pectoral flap elevation was required before fistula closure and discharge.

The patient died of recurrent disease two years after her discharge.

Discussion

The last 25 years have seen a greater acceptance of internal jugular vein preservation during neck dissection for head and neck cancers. As with any new procedure, specific complications related to these modified and functional neck dissections are to be expected. The four patients described in this paper add to the previously published four cases (Wurster *et al.*, 1985), of internal jugular venous haemorrhage following its preservation during neck dissection.

The venous bleeding in all eight cases published has followed the development of a pharyngo-cutaneous fistula after surgery for advanced laryngeal and hypopharyngeal cancers. Table I tabulates the more important clinical features of all eight patients. Unlike the typical catastrophic carotid blowout bleed, jugular venous bleeding tends to be less severe, characterized by

multiple episodes, and may be aggravated by coughing. Nevertheless, severe life-threatening haemorrhage can occur, as was the case in two of our patients, and this may make the bleeding difficult to distinguish clinically from an arterial source.

As in other complications of head and neck surgery the best treatment of jugular vein rupture is its prevention. In this regard, adequate pre-operative preparation, pre-operative antibiotics, and good surgical technique are important. In particular skin flaps should not be allowed to dry, vein injury and flaps and pharyngeal anastomotic tension avoided and drains carefully placed.

If skin necrosis and a fistula do occur, good local wound care, debridement of the necrotic tissue, intravenous antibiotics, nutritional support and culture of purulent material are all important. In addition, the salivary leak should be diverted away from the vascular bundle, and exposed vessels should be kept moist. When it occurs, treatment of jugular vein haemorrhage, unlike carotid artery rupture, is relatively straightforward. After initial stabilization, the neck is explored and the involved internal jugular vein segment is resected with suture ligation of both venous stumps. Ligation should be as distant as possible from the fistula and an attempt should be made to protect the ligated venous end by burying it in a muscular bed. One of the four patients described with jugular vein erosion, in this paper, subsequently developed a carotid artery blowout, which is not surprising since the predisposing features for the two conditions are similar. At surgery, therefore, the carotid artery system should be inspected and protected if compromised as suggested by Hillerman and Kennedy (1982).

Factors impairing the tissue healing ability after major head and neck surgery can be assumed to predispose towards jugular vein rupture. Although, five out of the total eight patients with jugular vein haemorrhage, so far described, had failed initial radiotherapy (Table I), its contribution to the development of jugular vein haemorrhage is questioned by Wurster *et al.* (1985). At odds with Wurster *et al.* (1985), we feel that radiotherapy predisposed towards jugular vein erosion in our patients by interfering with wound healing and fistula formation (Joseph and Shumrick, 1973). Preservation of the sternomastoid muscle during a classical functional neck dissection would be expected to protect the jugular venous system to a certain extent. However, this was not the case in two of the four patients with jugular vein rupture in this study.

In one case in this series, the jugular vein specimen removed at exploration was histologically analysed. This showed features of abscess formation in close proximity to the vein, with resulting inflammation secondarily involving the vein. The vein was found to be dilated and contained a recent thrombosis, and the vein wall was disrupted over a large area. Overall, the appearance was of acute phlebitis leading to the disruption of the venous wall and haemorrhage.

This is only the second report in the literature of jugular vein rupture to our knowledge, indicating that it is a rare complica-

TABLE I
SHOWING CHARACTERISTICS OF PATIENTS WHO DEVELOPED POST-OPERATIVE JUGULAR VEIN HAEMORRHAGE. ALL PATIENTS UNDERWENT PARTIAL OR TOTAL LARYNGECTOMY

Case No.	Previous radiotherapy (months)	Site of tumour	Post-operative day	Sentinel bleed	Fistula	Neck dissection
Cases in this paper						
1	Yes (9)	Larynx	21st	Yes	Yes	Modified
2	No	Larynx	5th	Yes	Yes	Modified bilateral
3	Yes (9)	Pyiform fossa	21st	Yes	Yes	Bilateral functional
4	Yes (6)	Larynx	37th	No	Yes	Bilateral functional
Cases from Wurster <i>et al.</i> (1985)						
5	No	Larynx	11th	Yes	Yes	Modified
6	Yes (9)	Tongue base	16th	Yes	Yes	Bilateral
7	Yes (?)	Larynx	15th	Yes	Yes	Bilateral modified
8	No	Larynx	7th	Yes	Yes	Modified

tion. In our Institute, on average between 38 to 45 cases of modified or functional neck dissection, together with either laryngectomy or pharyngectomy per year have taken place over the last eight years giving an incidence of four per 320 cases, or less than 1.3 per cent of susceptible cases resulting in detectable jugular vein haemorrhage.

Conclusions

Internal jugular venous rupture should be considered in patients undergoing primary tumour excision with modified or functional neck dissection complicated by pharyngocutaneous fistula. Typically, bleeding is venous and occurs repeatedly. However, haemorrhage may be substantial and life threatening. Treatment requires exploration and ligation of the venous system. The carotid artery should be assessed and protected at surgery, since there is a likelihood of carotid blowout as the conditions have a common aetiology. It is important to distinguish jugular vein haemorrhage from carotid arterial rupture, since the former has a far better outcome if treated properly.

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