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# A comparison between free gracilis muscle flap and pedicled pectoralis major flap reconstructions following salvage laryngectomy<sup>☆</sup>

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## KEYWORDS

Fistula;  
Pectoralis major;  
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Gracilis

**Summary** *Introduction:* Muscle flaps are often used in the prevention and treatment of pharyngocutaneous fistula following total salvage laryngectomy in the setting of chemo-radiated neck for laryngeal carcinomas. We report our experience with the gracilis free muscle flap compared to the pedicled pectoralis major for the prophylaxis of fistula formation.

*Methods:* Forty-nine patients with radio-recurrent laryngeal carcinoma over ten years who underwent salvage laryngectomy and either immediate free gracilis (22 patients) or pedicled pectoralis major muscle flap (27 patients) reconstruction were reviewed.

*Results:* There were 12 complications in pectoralis major flap group and eight in gracilis flap group. Most of these occurred early in the post-operative period. These were related to poor wound healing with the pectoralis major flap reconstructions. Fistulation rates were similar in the two groups (Pectoralis major: 6/27, gracilis: 5/22).

*Conclusions:* In our experience, the gracilis free muscle flap is a good reconstructive option in the prevention of pharyngocutaneous fistula formation following salvage laryngectomies. It is at least equivalent to a pectoralis muscle flap in the prevention of fistulae, but we prefer the gracilis for many reasons, including ease of harvest and preservation of the pectoralis major flap for future reconstructions.

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## Introduction

The development of a pharyngocutaneous fistula (PCF) remains the most common and challenging complication following total laryngectomies. It leads to delays of the adjuvant treatments and prolonged hospitalization. The incidence of fistula reported in the literature is variable, ranging from 5% to 65%.<sup>1,2</sup> Causative factors associated with its formation have been extensively studied. These include the age and sex of the patients, medical comorbidities, patients' smoking status, tumour site and stage, pre-operative tracheostomy, concurrent neck dissections, surgical closure techniques, and the peri-operative haemoglobin level.<sup>1,2</sup> However, the significance of these factors remains controversial.

In the recent years, the treatment of laryngeal cancers has moved away from primary laryngectomy towards organ preservation, with the use of initial chemoradiation followed by salvage laryngectomy for subsequent disease recurrence.<sup>3</sup> This change in practice has led to a significant increase in the incidence and severity of fistula development.<sup>2-4</sup> PCF following radiotherapy and laryngectomy occurs 2.6 times more frequently than compared to primary laryngectomy alone.<sup>5</sup> The additional use of chemotherapy is associated with a further 2 fold increase in the fistula rate.<sup>3,6</sup> The timing of chemoradiotherapy to surgery and the dosage adds further implications.<sup>3,7</sup> As a result, some authors have advocated for flap reconstruction at the time of laryngectomy in an effort to reinforce the primary pharyngeal suture line with vascularized tissue to prevent fistula formation.<sup>3,8,9</sup> Repair of an established fistula is associated with more complications and poorer outcomes.<sup>10</sup>

First popularized by Ariyan (1979), the pedicled pectoralis major muscle flap (PMMF) has been the workhorse flap for this indication.<sup>11</sup> It is robust and locally available, but can carry a reasonably high complication rate (36.1%).<sup>4,12,13</sup>

Microvascular free flaps such as the radial forearm flaps and anterolateral thigh flaps have also used.<sup>9,14</sup> The outcome of the pedicled and free muscle flap has not been formally reported.

Gracilis free muscle flap (GFMF) is not widely used in head and neck reconstructions, but it has the potential to give excellent results. It is a vascularized tissue with a reliable pedicle anatomy, good plasticity and low donor site morbidities. [Table 1](#) illustrates its advantages.

This study reports our experience of using the GFMF reconstruction compared to the PMMF in buttressing the pharyngeal suture line to prevent fistula formation at the time of salvage laryngectomy for radiorecurrent laryngeal carcinomas.

## Patients and methods

Between May 1999 and March 2011, 49 salvage total laryngectomies without concurrent pharyngectomy and immediate GFMF or PMMF flap reconstructions for radiorecurrent laryngeal squamous cell carcinomas following failed primary chemoradiotherapy at a single tertiary unit were reviewed. The reconstructions were performed by experienced surgeons using a similar laryngectomy closure technique.

## Surgical technique

### Pedicled pectoralis major muscle flap reconstruction

With the patient lying supine, the pedicled pectoralis major muscle flap was raised through an oblique incision on the anterior chest wall in a defensive approach preserving the detopectoral flap. The skin was raised above the pectoralis major muscle fascia. The muscle was then released from its lateral and inferior attachments and dissected off the chest wall from lateral to medially in the submuscular plane until it was islanded around a pedicle which coursed on its under

**Table 1** Advantages and disadvantages of pedicled pectoralis major muscle flap compared to the free gracilis muscle flap for the reinforcement of primary laryngectomy closure following salvage total laryngectomy.

Features	Pectoralis major muscle flap	Gracilis free muscle flap
Advantages	Reliable Robust  Good volume for buttressing laryngectomy closure Can be harvested with skin paddle	Reliable Good volume and size for buttressing laryngectomy closure Can be harvested with skin paddle Lower donor site morbidity Better aesthetic outcome than pedicled pectoralis major muscle flap Allows the flap to be raised simultaneously to the laryngectomy
Disadvantages	Potential respiratory compromise Poor aesthetic outcome – scar on chest, muscle bulge over clavicle, potential distortion of breast in female patients, split thickness skin graft may be required. Reduced neck movement Can not be raised simultaneously to laryngectomy Limited arc or rotation and transposition	Microsurgery required Postoperative monitoring is difficult as it is a buried flap.

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