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1           **Refining the indications for scapular tip in mandibular reconstruction.**

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24

25 **Abstract**

26 Mandibular reconstruction in osteoradionecrosis or salvage surgery can often be  
27 complicated by the lack of suitable recipient vessels in the ipsilateral neck and associated  
28 requirement for significant extra-oral skin reconstruction. The scapula tip with its long  
29 vascular pedicle and option of a chimeric soft tissue component offers a versatile  
30 reconstructive solution in such cases.

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32 Four consecutive cases of mandibular reconstruction with poor ipsilateral vascular options  
33 and additional soft tissue requirements are presented when the scapula tip is justified and  
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36 The blood supply to the lateral scapula through the circumflex scapular system has been  
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41 **Keywords:** Mandible reconstruction; Vessel depleted neck; Scapula free flap; Scapula angle;

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44 **Introduction**

45 The angular branch of the thoracodorsal artery which supplies the scapula tip was first  
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67 were identified from the surgical database of the authors. Data collection: age, sex,  
68 diagnosis, previous treatment, class and size of defect, harvest side, vessels used for  
69 anastomosis (recipients), complications and other outcome (e.g. implants or oral  
70 rehabilitation considered).

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73 **Results**

74 Four consecutive patients (2014-16) were identified and included in this case series. The  
75 indications for reconstruction with the scapula tip were: class 1(4) mandibular defects  
76 where the ipsilateral neck was unsuitable for recipient vessel selection due to previous  
77 treatment for head and neck cancer or recurrent disease, necessitating vascular access to  
78 the contralateral neck (Table 1). All four patients had successful reconstruction without any  
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82 The similarities between these cases are:

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145 **Legends**

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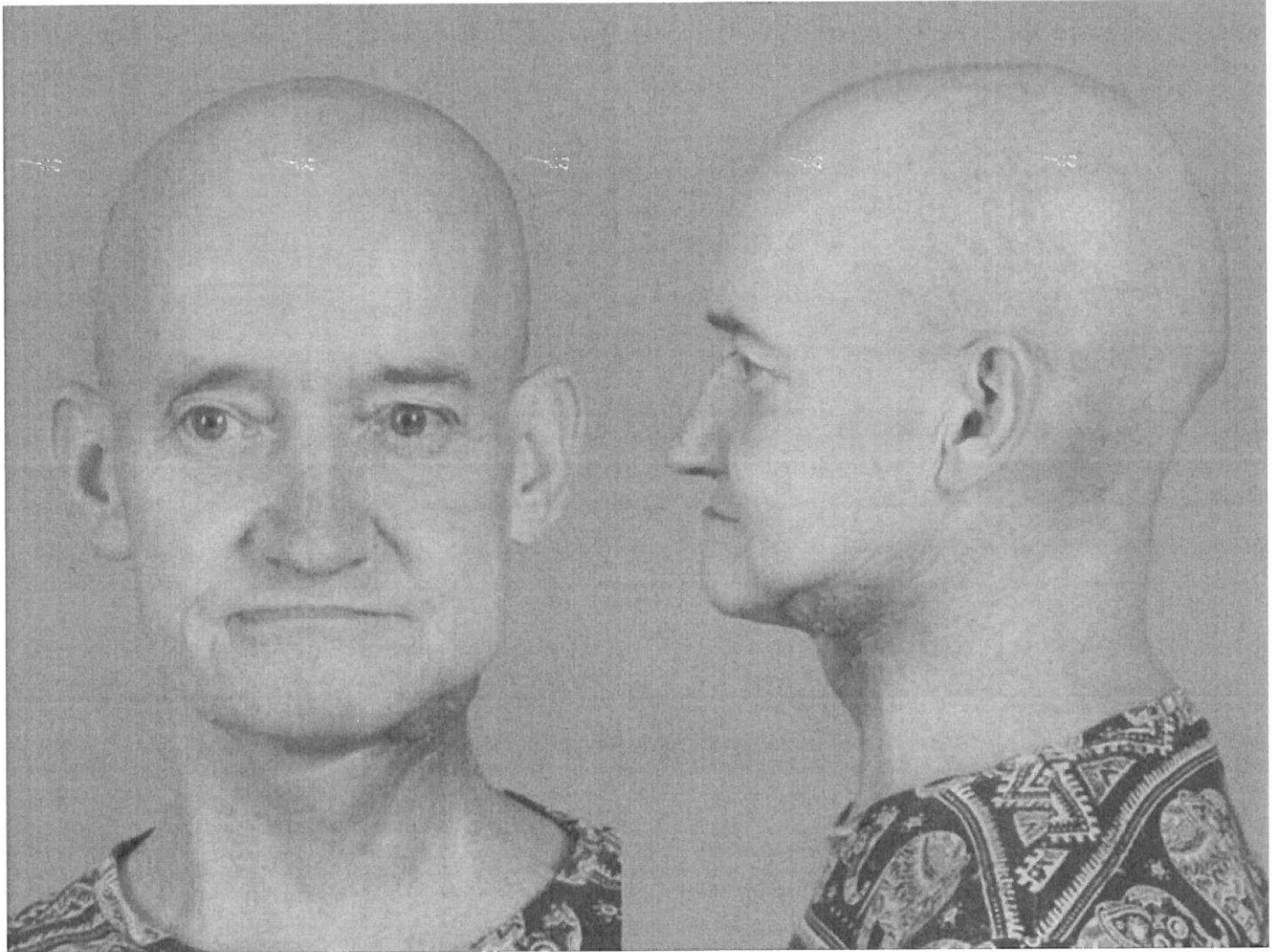
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**Figure 1**  
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**Figure 2**  
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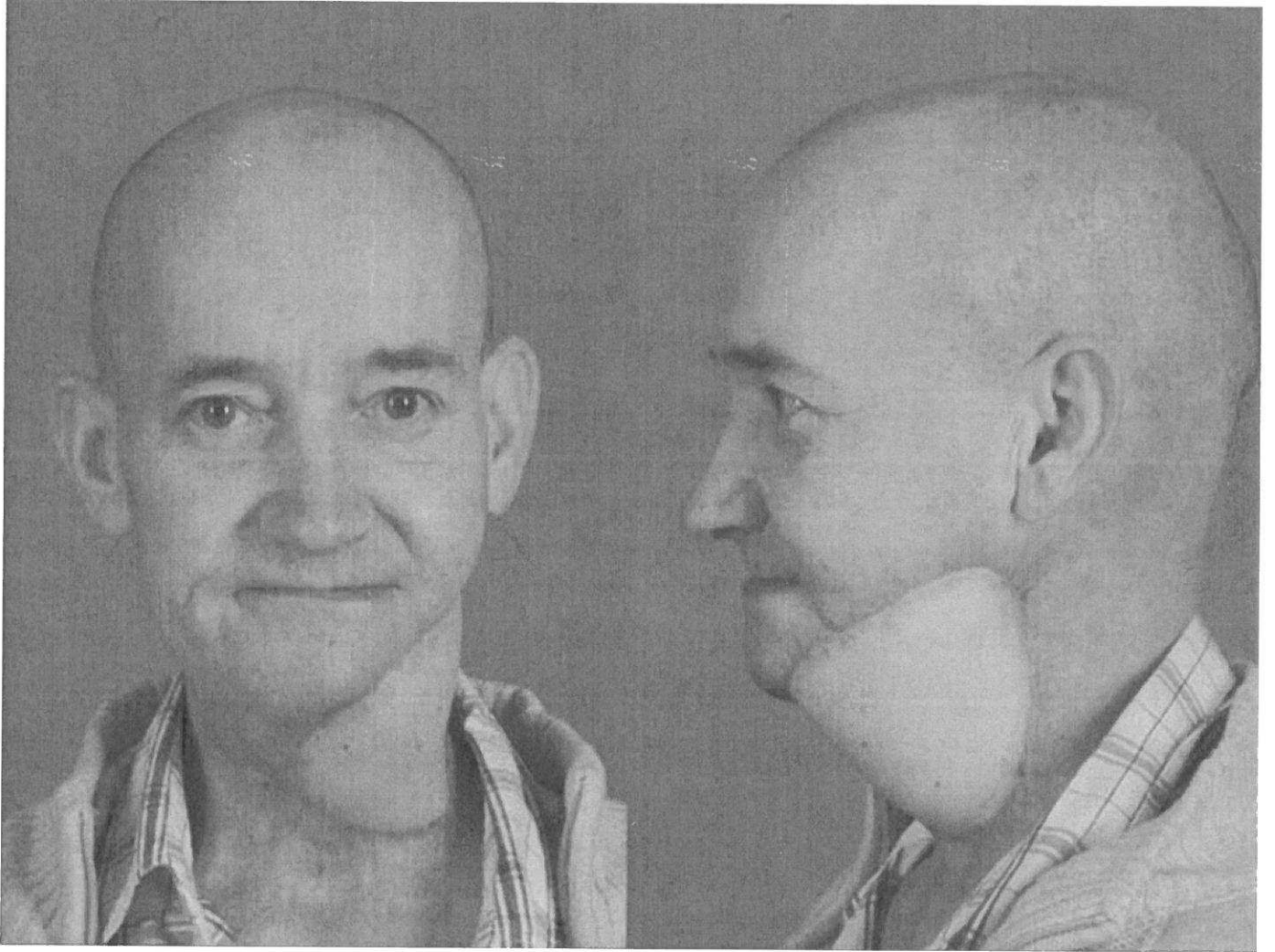


Figure 3

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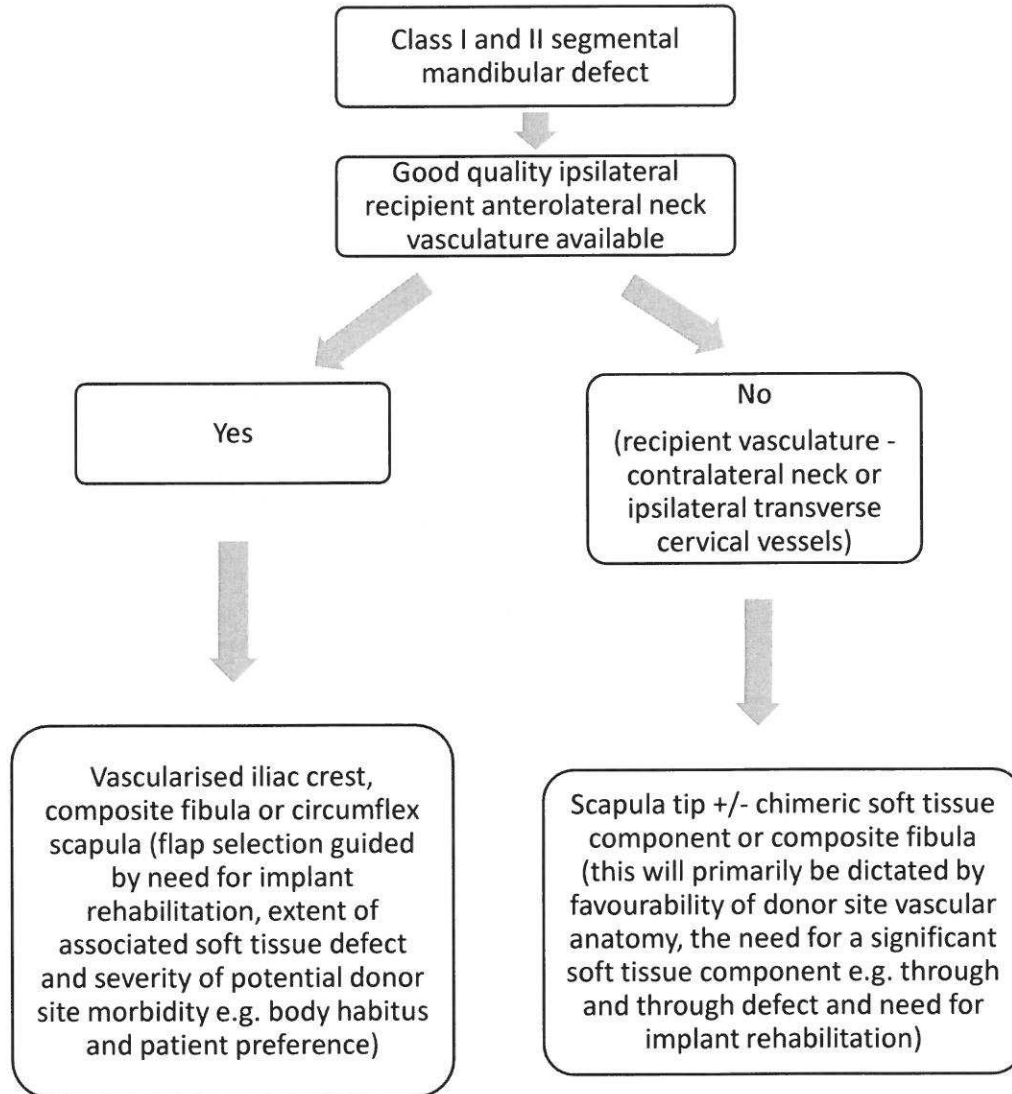


Table 1

ID	Age (gender)	Diagnosis	Previous treatment	Defect (Size – cm)	Side of harvest	Reconstruction	Recipient vessels
1	72 (M)	Osteoradionecrosis mandible (Notani Grade 3)	Prior OPSCC Surgery, ALT + PORT	Class 1 right mandible with 4 x6cm overlying cutaneous defect	ipsilateral	Scapula tip and musculocutaneous LD	Contralateral facial artery and IJV
2	51 (M)	Recurrent adenocarcinoma in face overlying right angle/body of mandible	3 <sup>rd</sup> recurrence over 5 years. Prior ipsilateral neck surgery x 2, and adjuvant radiotherapy	Class 1 right mandible with overlying cutaneous defect 6 x8 cm	ipsilateral	Scapula tip and musculocutaneous LD	Contralateral facial artery and common facial vein
3	59 (M)	Osteoradionecrosis mandible (Notani Grade 3)	Referred from another centre. Alloplastic bridging recon plate - prior OSCC surgery, with failed fibula flap, POCRT without reconstruction. Contralateral fibula compromised peroneal vessels.	Class 1 left mandible with cutaneous defect 10 x 6cm	ipsilateral	Scapula tip and musculocutaneous LD	Contralateral facial artery and common facial vein
4	55 (M)	Ipsilateral (left) regional recurrence of left T2N2bM0 OPSCC (mandibular involvement)	Primary chemoradiotherapy	Left mandible class 1 (7 cm) with 8 x 10 cm cutaneous defect	ipsilateral	Scapula tip and musculocutaneous LD	Right external carotid artery and common facial vein

Query	
[Au?1]	Table 1: defect size is only included for patient 4. Is this correct?
[Au?2]	Table 1: abbreviations footnote has been added. Please check that all abbreviations have been correctly identified.

Running heads:

Recto: Scapula tip in mandibular reconstruction

Verso: Ho et al.

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[ARTICLE TYPE – CASE REPORT, RECONSTRUCTIVE SURGERY]

## **Refining the indications for scapula tip in mandibular reconstruction**

**M. W. Ho<sup>1</sup>, J. S. Brown<sup>2</sup>, R. J. Shaw<sup>2,3</sup>**

<sup>1</sup>*Oral and Maxillofacial Surgery, Leeds Teaching Hospitals NHS Trust, Leeds Dental Institute, Leeds, UK*

<sup>2</sup>*Regional Maxillofacial Unit, Aintree University Hospital NHS Foundation Trust, Liverpool, UK*

<sup>3</sup>*Department of Molecular and Clinical Cancer Medicine, The University of Liverpool Cancer Research Centre, Liverpool, UK*

## **Abstract**

Mandibular reconstruction in osteoradionecrosis or salvage surgery can often be complicated by the lack of suitable recipient vessels in the ipsilateral neck and the associated requirement for significant extraoral skin reconstruction. The scapula tip with its long vascular pedicle and option of a chimeric soft tissue component offers a versatile reconstructive solution in such cases. This article reports four consecutive cases of mandibular reconstruction with poor ipsilateral vascular options and additional soft tissue requirements in which the scapula tip was justified and preferred. The blood supply to the lateral scapula through the circumflex scapular system is well established in the literature and this would be the preferred reconstruction in class I mandibular defects associated with a significant soft tissue requirement. The scapula tip would suit cases where the ipsilateral recipient vessels are compromised, and so justify the potential for mandibular reconstruction with inferior bone stock.

**Key words:** mandible reconstruction, vessel depleted neck, scapula free flap, scapula angle, scapula tip

## **Introduction**

The angular branch of the thoracodorsal artery that supplies the scapula tip was first described by Deraemaeker et al.<sup>1</sup>. Coleman and Sultan subsequently described harvest of the scapula tip with the latissimus dorsi muscle as a single free flap<sup>2</sup>. The advantages of the scapula tip are a long vascular pedicle and a flexible soft tissue paddle ideal for extensive soft tissue loss, as well as oral reconstruction from the same pedicle. Drawbacks include the relatively limited bone stock: by maximum length and by unsuitability for implants. The reconstructive advantages overall have been summarized by Chepeha et al. as avoiding the need for two flaps or interpositional vein grafts<sup>3</sup>.

The scapula tip has been described in the reconstruction of short posterior mandible defects, including those of the angle, using ipsilateral neck vessels (class I defects according to Brown et al.<sup>4,5,6</sup>). In most similar cases, the authors' practice would be to use the standard circumflex scapular option, or other donor sites, as pedicle length is not such an important factor. Although the use of, and indications for, the scapula flap in head and neck reconstruction has been described previously by this research group<sup>7</sup>, only the use of the lateral border of the scapula based on the circumflex scapular artery is described in this series of cases involving the mandible.

The purpose of this report is to describe four cases in which the scapula tip was the most appropriate donor site option, not only compared to the circumflex scapular option but also fibula, radial, and iliac crest.

## **Patients and methods**

All patients who had segmental mandibular defects reconstructed with a scapula tip flap were identified from the surgical database. Data collected included age, sex, diagnosis, previous treatment, class and size of the defect, harvest side, vessels used for anastomosis (recipients), complications, and other outcomes (e.g., implants or oral rehabilitation considered).

## **Results**

Four consecutive patients treated during the years 2014–2016 were identified and included in this case series. The indications for reconstruction with the scapula tip were the following: class I mandibular defect<sup>4</sup>, where the ipsilateral neck was unsuitable for recipient vessel selection due to previous treatment for head and neck cancer or recurrent disease, necessitating vascular access to the contralateral neck (Table 1). All four patients had successful reconstruction without any return to theatre.

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## **Discussion**

There were similarities between these cases. First was the presence of a heavily pre-treated or diseased ipsilateral neck. Ipsilateral recipient vessels were unsuitable or unavailable by combination of either prior neck dissection and/or prior irradiation to

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[Figures 1 and 2 here]

Reconstruction with a composite fibula flap could be considered in patients where there is no cutaneous defect involved or when the cutaneous defect is not significant. This donor site may be unsuitable due to peripheral vascular disease affecting the peroneal vessels (as in patient 3).

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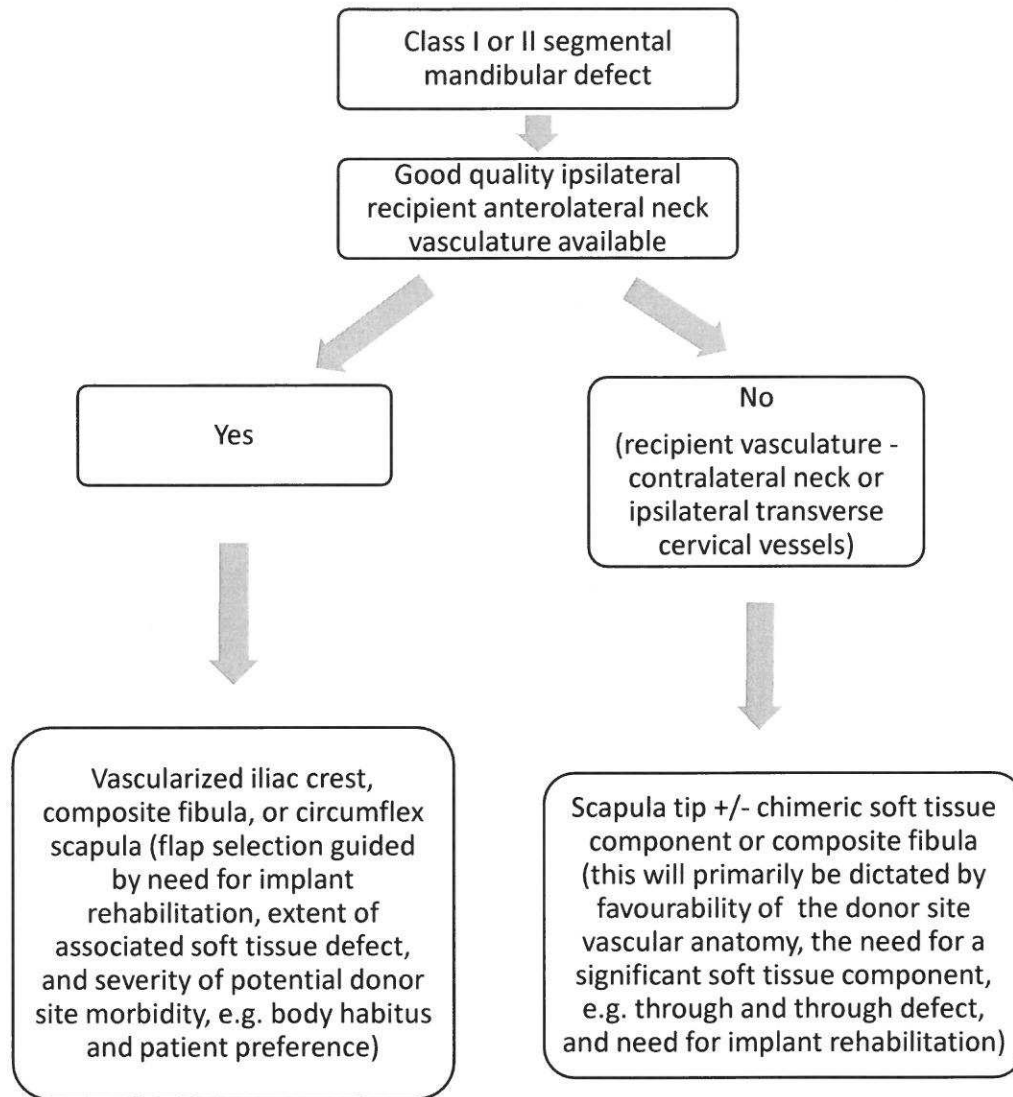
### **Figure captions**

Fig. 1. Preoperative views of patient 4: ipsilateral regional recurrence involving the left angle of the mandible and overlying skin, 2 years following primary chemoradiotherapy for stage 4 left oropharyngeal squamous cell carcinoma.

Fig. 2. Postoperative views of patient 4: the extent of the soft tissue volume reconstruction required in the context of salvage surgery and maintenance of the mandibular projection made possible by restoration of arch continuity with the scapula tip bone.

Fig. 3. Algorithm to aid the selection of a composite free flap in mandibular class I and II defects, and the role of the scapula tip composite free flap.

Figure 3



Table(s)

Table 1. Characteristics of four consecutive patients reconstructed with a scapula tip flap (2014–2016).<sup>a</sup>

Patient	Age (sex)	Diagnosis	Previous treatment	Defect (size) [Au?1]	Side of harvest	Reconstruction	Recipient vessels
1	72 (M)	Osteoradionecrosis of the mandible (Notani grade 3)	Prior OPSCC surgery, ALT + PORT	Class I, right mandible, with 4 × 6 cm overlying cutaneous defect	Ipsilateral	Scapula tip and musculocutaneous LD	Contralateral facial artery and IJV
2	51 (M)	Recurrent adenocarcinoma of the face overlying the right angle/body of the mandible	Third recurrence over 5 years; prior ipsilateral neck surgery ×2, and adjuvant radiotherapy	Class I, right mandible, with overlying 6 × 8 cm cutaneous defect	Ipsilateral	Scapula tip and musculocutaneous LD	Contralateral facial artery and common facial vein
3	59 (M)	Osteoradionecrosis of the mandible (Notani grade 3)	Referred from another centre; alloplastic bridging reconstruction plate – prior OSCC surgery, with failed fibula flap, POCRT without reconstruction; contralateral fibula	Class I, left mandible, with 10 × 6 cm cutaneous defect	Ipsilateral	Scapula tip and musculocutaneous LD	Contralateral facial artery and common facial vein

			with compromised peroneal vessels				
4	55 (M)	Ipsilateral (left) regional recurrence of left T2N2bM0 OPSCC (mandibular involvement)	Primary chemoradiotherapy	Class I (7 cm), left mandible, with 8 × 10 cm cutaneous defect	Ipsilateral	Scapula tip and musculocutaneous LD	Right external carotid artery and common facial vein

ALT, anterolateral thigh; IJV, internal jugular vein; LD, latissimus dorsi ; M, male; OPSCC, oropharyngeal squamous cell carcinoma; OSCC, oral squamous cell carcinoma; POCRT, postoperative concurrent chemoradiotherapy; PORT, postoperative radiotherapy. [Au?2]

<sup>a</sup>The patients had undergone previous treatment for OPSCC/OSCC with recurrence or late treatment-related toxicity.

