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Case report

RECONSTRUCTION OF MANDIBULAR SEGMENTAL DEFECTS WITH FREE SCAPULAR FLAP: TWO CASE REPORTS

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ABSTRACT

Objectives: *To describe the technique of mandibular reconstruction using a free scapular osteomyocutaneous flap in two clinical cases and evaluate the achieved functional and aesthetic outcomes.*

Methods: *We conducted a descriptive analysis of two male patients (ages 60 and 54) with advanced T4a oral cavity cancer involving the mandible, who underwent surgery at Hue Central Hospital in October 2023 and February 2024. Both patients received curative tumor resection (segmental mandibulectomy with adequate margins and selective neck dissection) followed by immediate reconstruction of the mandibular defect using a free scapular osteomyocutaneous flap, performed with a two-team simultaneous microsurgical approach.*

Results: *Both patients were successfully reconstructed with the scapular flap without any flap necrosis and were discharged at approximately 3 weeks post-operation. The mean operative time was ~9 hours (tumor resection and neck dissection ~4.5 hours; flap harvest and microsurgical anastomosis ~4 hours). All flaps had 100% survival, with bony union achieved by ~3 months and no evidence of bone resorption or non-union on X-ray. Masticatory function, swallowing, and speech improved markedly, and were nearly normal by 3 months post-op. Facial contour was restored with a harmonious mandibular border and no cervical soft-tissue depression. Both patients received adjuvant radiotherapy (56-60 Gy) as scheduled. At short-term follow-up (~6 months), no local recurrence was observed; one patient had two small pulmonary nodules under close surveillance with no progression noted.*

Conclusion: *The free scapular osteomyocutaneous flap is a feasible, safe, and effective option for reconstructing segmental mandibular defects after cancer resection. This single-stage microsurgical technique achieves immediate restoration of mandibular continuity with a high flap success rate, significantly improving mastication, swallowing, speech, and facial aesthetics. Moreover, immediate free-flap reconstruction enables earlier initiation of adjuvant therapy, thereby optimizing overall cancer treatment outcomes.*

Keywords: *Free scapular bone flap, mandibular reconstruction, oral cavity cancer reconstruction, microsurgical reconstruction.*

I. INTRODUCTION

Resection of malignant tumors in the maxillofacial region often results in massive mandibular defects, leading to severe facial deformity along with loss of masticatory function, swallowing, and speech. Since the late 20th century, advances in microsurgery have enabled the reconstruction of mandibular defects in a single stage using vascularized bone flaps, which has become the standard of care in modern head and neck surgery [1]. Commonly used osseous free flaps include the fibula, iliac crest (DCIA), scapula, and radial forearm flaps, each with its own advantages and drawbacks regarding pedicle length, bone size and quality, soft-tissue options, donor-site morbidity, number of bone segments achievable, and potential for dental implants [1].

The scapular osteocutaneous flap was first described by Fonseca dos Santos in 1980 (published

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1984) for maxillofacial reconstruction. In 1986, Swartz et al. reported 26 cases of one-stage oromandibular reconstruction using the scapular flap with 100% flap survival, confirming the reliability of this donor site [2]. The scapular flap provides a segment of dense cortical bone approximately 10-14 cm in length along the lateral border of the scapula [2]. Its main blood supply is the circumflex scapular artery (a branch of the subscapular artery), which allows the flap to be harvested as a composite of bone with attached skin and muscle, or split into multiple bone segments, or combined with adjacent soft-tissue flaps (parascapular skin, latissimus dorsi muscle, teres major muscle, etc.) on the same pedicle. Owing to its rich vascularity, the scapular flap has a very high success rate (~97-99%), comparable to or even higher than other osseous free flaps [3]. Notably, the subscapular vascular system is less affected by atherosclerosis, allowing safe use of scapular flaps in older patients or those with peripheral vascular disease for whom fibula flaps may be contraindicated. Additionally, the scapular tip flap provides a triangular bone segment resembling the natural mandibular angle, with an extremely long pedicle (up to 18-20 cm) and virtually no significant donor-site shoulder morbidity [4]. These advantages of pedicle length, multi-tissue versatility, and reliability have led to increasing utilization of the scapular flap in complex craniofacial reconstructions [4].

In Vietnam, the scapular flap has seen limited use, but initial outcomes have been favorable. Tran et al. (2020) reported two cases of extensive oromaxillofacial reconstruction with the free scapular flap, both successful with no flap loss; functional and aesthetic recovery was good, and only one case had superficial skin graft necrosis that healed uneventfully [5]. To contribute additional local experience, we present two clinical cases of segmental mandibular defect reconstruction using the free scapular osteomyocutaneous flap at Hue Central Hospital, with an evaluation of surgical outcomes and a discussion of the indications, technique, and functional results of this method.

II. CASE REPORTS

Two male patients (aged 60 and 54) were diagnosed with advanced oral cavity carcinoma (T4a, AJCC 8th Edition) involving the mandible. Both patients underwent curative surgery consisting of wide excision of the primary tumor with segmental mandibulectomy and selective neck dissection, according to the extent of nodal spread. In the same operation, the mandibular defect was immediately reconstructed with a free scapular osteomyocutaneous flap. A two-team approach was employed simultaneously - one team performed tumor resection and neck dissection while the other harvested the scapular flap and performed microvascular anastomoses. The baseline characteristics of the two patients are shown in Table 1. The detailed surgical resection and reconstruction parameters for both patients are presented in Table 2

Table 1: Clinical and pathological characteristics of the two patients

Characteristic	Case 1	Case 2
Age / Sex	60 / Male	54 / Male
Primary tumor site	Right mandibular gingiva (retromolar trigone region)	Right retromolar trigone region
Tumor size (CT/MRI)	~25 × 20 × 20 mm	~25 × 20 × 20 mm
Mandibular bone invasion	Yes - body and horizontal ramus (right side)	Yes - body and horizontal ramus (right side)
Lymph nodes on imaging	Level II (right), ~10 × 13 mm, central necrosis	Level II (right), ~10 × 13 mm, central necrosis
Distant metastasis	None; bone scan uptake only at right mandible	Suspicious lung metastasis (two nodules 10 mm and 5 mm in lung bases)

Characteristic	Case 1	Case 2
Histopathology	Squamous cell carcinoma (moderately diff.)	Low-grade mucoepidermoid carcinoma
Stage (AJCC 8)	T4a N1 M0	cT4a N1 M1 (lung)

Case 1: A 60-year-old male (30-pack-year smoking history, quit 5 years prior) presented with a 2-month history of pain in the right lower gum, accompanied by difficulty chewing and swallowing. Examination revealed an ulcerative exophytic lesion on the right mandibular gingival mucosa in the region of teeth #7-8, about 2 cm in diameter, with indurated base and easy bleeding. A right submandibular lymph node ~1.5 cm was palpable. Biopsy of the lesion confirmed moderately differentiated squamous cell carcinoma. CT and MRI showed the tumor invading the right mandibular body and ramus, with a necrotic right level II cervical node (~1 cm); no distant metastases were detected on bone scan and chest CT. The patient underwent surgery as described: a segmental mandibulectomy (~6 cm segment of the right mandible carrying the tumor) and right neck dissection of levels I-III, concurrently with harvest of a free scapular osteomyocutaneous flap for immediate reconstruction. The scapular flap consisted of a 7 cm segment of lateral scapular border bone with an 8 × 12 cm skin paddle to reconstruct the floor of mouth. The flap pedicle (scapular circumflex vessels) measured ~12 cm and was anastomosed end-to-end to the right facial artery and external jugular vein in the neck. Total operative time was 9 hours (two teams), including ~1 hour for microvascular anastomosis. At 7 days post-op, the flap skin was warm and pink with brisk capillary refill and no signs of necrosis. The bone graft was rigidly fixed and a 3-month postoperative X-ray confirmed good bony union. The patient was able to begin oral intake of porridge by the 3rd postoperative week, and speech became progressively clearer. At the 3-month follow-up, the interincisal mouth opening was 3.5 cm; the patient could chew soft rice and swallow normally, and speech was intelligible. The chin and lower lip had mild residual numbness. The facial appearance was nearly normal in both frontal and lateral views; the neck and scapular donor site scars were well-healed and inconspicuous. By the criteria of Moscoso et al., this case achieved a good outcome in terms of both "flap viability" and "functional–aesthetic restoration." The patient received adjuvant radiotherapy of 60 Gy to the right mandible and neck, completed 2 months post-surgery. At 6 months after surgery, the patient remained disease-free with no evidence of local recurrence or distant metastasis. Preoperative, intraoperative, and postoperative images of Case 1 are shown in Figure 1.

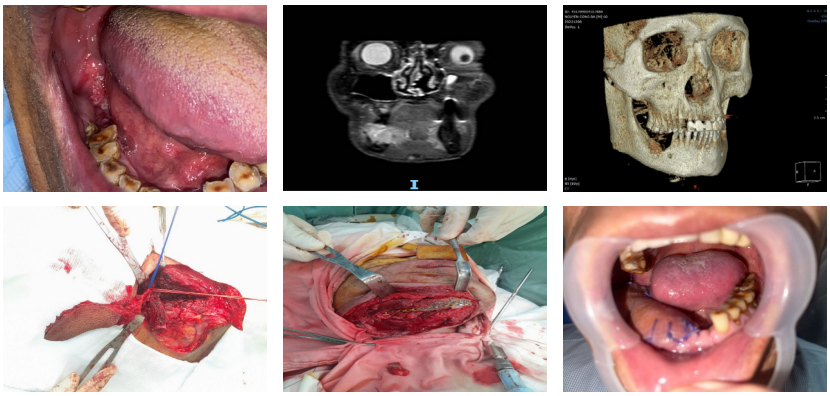

Figure 1: Preoperative, intraoperative, and postoperative images of Case 1.

Case 2: A 54-year-old male with no significant medical history presented with a painless swelling in the right jaw region for several months that did not respond to antibiotics, eventually ulcerating through the skin. Examination found a fungating mass (~3 cm) in the right retromolar trigone extending to the overlying skin at the right jaw angle; intraorally, the lesion extended into the posterior floor of mouth. A ~1 cm right cervical lymph node was palpable along the jugular chain (level II). Biopsy revealed a low-grade mucoepidermoid carcinoma. MRI showed a 25 × 20 × 20 mm solid tumor in the right retromolar trigone, eroding the outer cortex of the mandible; a necrotic right level II node 10 × 13 mm; and two incidental small lung nodules (10 mm and 5 mm) suspicious for metastases. The patient underwent curative surgery consisting of a right hemimandibulectomy (resection of the entire right mandibular ramus and angle up to the condyle) and a right neck dissection of levels II-IV. A free scapular flap was harvested, focusing on the inferior (tip) of the scapula: a triangular bone piece ~4 × 5 cm (supplied by the angular branch, pedicle length ~18 cm) together with a soft-tissue flap of skin and muscle (~10 × 15 cm) to reconstruct the mandibular angle/ramus and resurface the external skin defect. The flap's scapular artery was anastomosed to the thyrocervical trunk and the subscapular vein to the external jugular vein. The total surgery time was 10 hours (prolonged due to the need to reposition the patient for resecting the tumor extending to the neck skin). Postoperatively, the flap was fully viable with no complications. The patient resumed oral feeding after 1 month and achieved clear speech. At 3 months post-op, a temporary removable dental prosthesis replacing five lower incisors was provided, helping his speech approach normal; the patient's weight increased by 3 kg compared to pre-surgery. The lateral profile showed a well-defined, full right mandibular angle region, nearly symmetric with the opposite side; the neck skin scar was supple with no contracture. By the previously mentioned criteria, the functional and aesthetic recovery was graded as good. The patient received adjuvant radiotherapy of 56 Gy to the right jaw, completed 7 weeks post-surgery. Regarding the two small lung nodules, given the indolent nature of salivary gland carcinoma, the multidisciplinary tumor board opted for close observation rather than immediate intervention. At 5 months post-op, the lung nodules remained stable with no increase in size or number. At the 5-month follow-up, the patient showed no evidence of recurrence at the primary site, and daily functions were nearly normal.

After completion of surgery and adjuvant radiotherapy, both patients were satisfied with the aesthetic outcomes and more confident in social interactions. Preoperative, intraoperative, and postoperative images of Case 2 are shown in Figure 2. The short-term postoperative outcomes and functional recovery of both patients are summarized in Table 3.

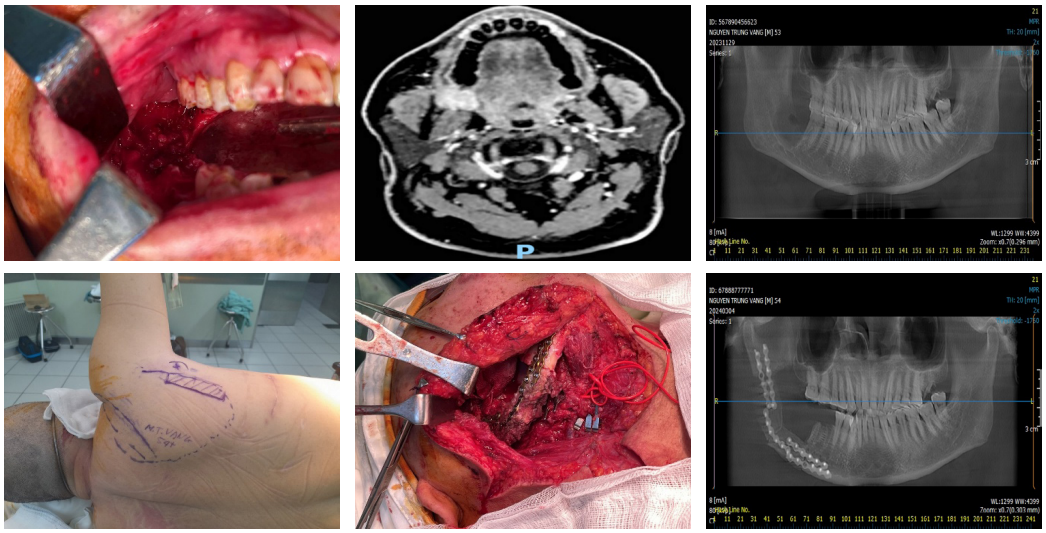

Figure 2: Preoperative, intraoperative, and postoperative images of Case 2.

Table 2: Definitive resection and reconstruction details in the two cases

Item	Case 1	Case 2
Primary tumor resection	Wide excision of oral tumor with involved right mandible	Wide excision of oral tumor with involved right mandible
Extent of mandibulectomy	Segmental resection ~6-7 cm (right side) along lesion length	Segmental resection (right side) including mandibular angle and ramus (up to condyle)
Neck dissection	Selective neck dissection levels I-III (right)	Selective neck dissection levels II-IV (right)
Flap type for reconstruction	Free scapular osteomyocutaneous flap	Free scapular flap (scapular tip variant) with soft tissue
Flap components	Lateral border scapular bone + attached skin/muscle	Scapular tip bone + attached skin and muscle
Flap pedicle	Scapular circumflex vessels (subscapular system)	Scapular circumflex vessels (subscapular system; long pedicle)
Recipient vessels in neck	Facial artery / External jugular vein	Thyrocervical trunk / External jugular vein
Bone fixation	Titanium plate and screws spanning mandibular body defect	Titanium plate and screws reconstructing angle and ramus
Technical notes	Single-stage reconstruction; skin paddle inset to line the mouth floor	Used triangular scapular tip bone to recreate natural gonial angle

Table 3: Postoperative and short-term follow-up outcomes:

Outcome parameter	Case 1	Case 2
Flap status	Fully viable, well perfused	Fully viable, well perfused
Early complications (0-30 days)	None observed	None observed
Postoperative care	Flap perfusion monitoring; enteral feeding via nasogastric tube; antibiotics, low-dose steroids, prophylactic heparin, etc.	Same as Case 1
Function at 1 month	Improved chewing and swallowing; speech becoming clearer	Improved chewing and swallowing; speech becoming clearer
Function at 3 months	Almost normal	Almost normal
Facial aesthetics	Mandibular contour restored, natural symmetry	Reconstructed angle/ramus full, naturally symmetric
Adjuvant therapy	Radiotherapy 60 Gy to jaw/neck	Radiotherapy 56 Gy to jaw; close monitoring of lung nodules
Recurrence/metastasis (short-term)	No recurrence (6 months follow-up)	No progression (6 months follow-up)

III. DISCUSSION

3.1. Choice of osseous flap for mandibular reconstruction

The fibula free flap is currently considered the "gold standard" for mandibular reconstruction, as it provides a long segment of bone (up to ~20-25 cm) that can be osteotomized to recreate the curvature of the mandible and offers excellent load-bearing capacity for eventual dental implants. However, the fibula flap has some limitations: a relatively short pedicle (~3-5 cm), a long straight bone that often requires multiple cuts to mimic the mandibular curve, and donor-site risks such as lower limb ischemia or gait disturbance due to ankle weakness. The iliac crest (DCIA) flap provides a large volume of cancellous bone but is more challenging to harvest (requiring an abdominal approach) and is associated with higher complication and flap loss rates [6]. In contrast, the scapular flap is highly safe and versatile, with an average flap survival rate of around 97%, comparable to the fibula flap [3]. In a network meta-analysis by Mashrah et al. (2021), the scapular flap even showed the highest flap survival (~97%) compared to fibula (94.5%), iliac crest (93.1%), and radial forearm (96%), although the differences were not statistically significant [3]. Operative time and blood loss for scapular flap procedures can be greater than for fibula due to patient repositioning or the need for two surgical teams; however, this is being mitigated by techniques such as harvesting the scapula in a supine position or employing simultaneous two-team surgery as we did. Miyamoto et al. (2024) described an improved technique of harvesting the scapula with the patient in the supine position (arm abducted 90°), allowing two surgical teams to operate concurrently without the need to reposition the patient [7]. A retrospective study from Helsinki (Wilkman et al., 2019) comparing 163 cases (92 iliac crest, 42 scapula, 29 fibula flaps) found that fibula flaps had the shortest average operative time, but early and late complication rates were similar among all three flaps; notably, the iliac crest had the highest flap loss rate and more severe donor-site morbidity [6]. These data underscore that the scapular flap is a reliable option-especially for complex defects requiring the simultaneous transfer of multiple tissue components.

3.2. Advantages of the scapular flap

Multiple tissue components on a single pedicle: The subscapular vascular system gives rise to numerous branches (scapular circumflex for bone, a cutaneous branch for parascapular skin, thoracodorsal artery for latissimus dorsi muscle, angular branch for scapular tip region, etc.), enabling harvest of bone, skin, and muscle together as needed with only one microvascular anastomosis [1]. In our Case 1, a single scapular osteomyocutaneous flap was sufficient to reconstruct the segmental mandibular defect as well as the resected floor-of-mouth lining, obviating the need for a second free flap; by contrast, using a fibula flap for such a composite defect might have required an additional free muscle or skin flap.

Long, large-caliber pedicle: The scapular circumflex artery pedicle averages 8-12 cm in length and can exceed 14 cm when dissected to the subscapular origin. The scapular tip flap, in particular, can provide a pedicle length of 18-20 cm. In Case 2, the very long pedicle allowed us to anastomose the flap artery to the thyrocervical trunk instead of the facial artery (since an extensive neck dissection was performed and avoiding the facial vessels helped reduce edema). The vascular anastomoses were straight and tension-free, with excellent flow and no need for vein grafts; this is in line with the report of Cariati et al. (2020), in which all 13 scapular tip flap cases were anastomosed directly without any interposition grafts [4]. Moreover, the scapular artery diameter (~2.0-2.5 mm) closely matches that of the facial artery, which facilitates the microvascular suturing.

Good bone quality and adaptable shape: The lateral scapular border provides cortical bone about 6-8 mm thick, strong enough to bear masticatory forces and easily drilled for screw fixation. Although the maximum bone length (~14 cm) is shorter than that of the fibula, it adequately reconstructs most small-to-midsize defects (< 10 cm). In cases of very long anterior defects, two scapular bone

segments can be joined in tandem on the same pedicle (the "double-barrel" technique). For angle/ramus defects, the scapular tip yields a triangular bone piece that replicates the natural gonial angle, allowing a more anatomically contoured mandibular angle reconstruction as compared to the straight fibula (which requires an osteotomy to create an angle).

Minimal donor-site morbidity: After scapular flap harvest, shoulder range of motion typically returns to near normal within a few weeks, since most shoulder girdle muscles remain intact and the shoulder joint is not directly violated. Numerous reports have found no significant shoulder movement restriction or impact on daily activities after scapular flap harvest, whereas fibula harvest can noticeably weaken ankle strength and risk a limping gait. Indeed, neither of our patients reported any shoulder dysfunction post-operatively; notably, for the older patient (Case 1), a fibula flap would have entailed higher risk of lower-extremity arterial disease or delayed wound healing due to poor leg circulation, whereas the scapular flap was a safer choice in this context.

3.3. Limitations and challenges

First, the conventional technique requires repositioning the patient laterally to harvest the scapular flap, which complicates a parallel two-team approach. Solutions include technical modifications to allow flap harvest in the supine position with the arm abducted 90° (as described by Miyamoto et al., 2024) or prioritizing the scapular tip flap (located more inferiorly, accessible with only slight lateral tilt in supine) [7]. In the series by Cariati et al. (2020), 11 of 13 cases employed scapular tip flaps harvested concurrently with tumor resection by adjusting patient positioning, significantly reducing overall operative time [4]. Our experience with two cases likewise demonstrates that orchestrating simultaneous two-team surgery is feasible, and the total operative time was acceptable (~9 hours). Second, the vertical height of scapular bone is limited (~2-3 cm), making it challenging to fully restore the original alveolar ridge height and potentially complicating dental rehabilitation. However, Sheehan et al. (2021) showed that with virtual surgical planning and orienting the scapular tip flap horizontally, the reconstructed height can nearly match the native mandible, preserving occlusion and facial aesthetics [8]. Moreover, the feasibility of dental implants in scapular bone has been demonstrated. Di Giorgio et al. (2024) reviewed 9 studies (83 cases) utilizing scapular flaps for jaw reconstruction with implant restoration, and concluded that the success rate of implants in scapular bone is comparable to those in fibula and iliac crest flaps, especially with appropriate digital planning; although scapular bone is thinner, optimizing implant placement or using short subperiosteal implants can enhance stability [9]. After radiation therapy, scapular bone can undergo volume loss similar to fibula, so dental rehabilitation should be delayed at least 12 months and carefully monitored. Another drawback is that the scapular flap is not ideal for extremely large defects involving most or all of the mandible (> 15 cm); such cases are better reconstructed with bilateral fibula flaps or a free femur (distal femur) flap. Nonetheless, segmental defects over 15 cm are very rare, and an extended scapular flap harvest (including the superior scapular angle up to the glenoid, incorporating the transverse scapular branch) has been described to increase the length of well-vascularized bone for exceptionally large defects.

3.4. Functional outcomes and quality of life

After mandibular reconstruction, outcome evaluation should not stop at flap survival, but more importantly assess whether the patient's quality of life is truly improved. The criteria set by Moscoso, Urken, and Polonovski (1994) were developed to comprehensively evaluate these aspects [10]. Both of our patients regained the ability to eat orally, speak clearly, and confidently engage socially within 1-3 months of recovery. This is a profoundly meaningful result, because without mandibular reconstruction, the patient would suffer a gaping facial defect causing severe disfigurement, malnutrition from inability to chew or swallow, and a high risk of depression and social isolation. Numerous studies worldwide have also confirmed that oromandibular reconstruction using microvascular flaps significantly improves

masticatory function and quality of life compared to patients who do not receive bony reconstruction [11]. For cancer patients, immediate reconstruction during the primary surgery additionally helps accelerate multidisciplinary treatment. A well-vascularized flap that heals quickly permits earlier initiation of adjuvant radiotherapy or chemotherapy, thereby improving disease control outcomes. Both of our patients were able to commence postoperative radiotherapy around 6-7 weeks after surgery, within the acceptable timeframe (generally recommended < 8 weeks). Thus, the use of microvascular bone flaps has opened the opportunity for more definitive treatment, enabling the surgeon to perform an extensive tumor resection while still assuring immediate reconstruction for the patient.

From these two cases, we consider the scapular flap to be an excellent option in complex maxillofacial reconstructions. The choice of flap should be tailored to the defect characteristics and the patient's condition. For mandibular defects with substantial soft-tissue loss, the scapular flap is advantageous due to its "3-in-1" reconstruction of bone, skin, and muscle on a single pedicle. If the bony defect is < 10 cm or involves the mandibular angle region, the scapular flap may be more suitable than the fibula. Conversely, for long anterior defects (symphysis area), a fibula flap (sometimes two fibulas in sequence) might be more appropriate. Global experience suggests that flap selection should be individualized rather than a one-flap-fits-all approach. Therefore, reconstructive surgeons should be well-versed in the pros and cons of each flap type to devise the optimal plan for each patient.

IV. CONCLUSION

The free scapular osteomyocutaneous flap is a feasible, safe, and effective method for reconstructing complex mandibular defects after oncologic resection. This technique provides immediate restoration of mandibular continuity and significantly improves the patient's mastication, swallowing, speech, and facial aesthetics. Our two case reports illustrate the benefits of one-stage reconstruction, which facilitates early adjuvant therapy and shortens the overall treatment time. Although the number of cases is limited, these results support the scapular flap as a reliable option in maxillofacial reconstructive surgery. Further studies with larger sample sizes and long-term follow-up are needed to fully assess the outcomes of this technique.

Ethical Statement

This study was conducted in accordance with the principles of the Declaration of Helsinki. All diagnostic and therapeutic procedures were part of routine clinical practice. Written informed consent was obtained from both patients for surgery. All identifying information has been removed to ensure patient confidentiality.

Conflict of Interest

The authors declare that they have no conflicts of interest related to this publication. No funding was received for the preparation of this manuscript or for the clinical management of the reported cases.

REFERENCES

1. Bansal AP, Buchakjian MR. Subscapular system free flaps for oromandibular reconstruction. Plastic Aesthetic Research. 2021; 8: 59.
2. Swartz WM, Banis JC, Newton ED, Ramasastry SS, Jones NF, Acland R. The osteocutaneous scapular flap for mandibular and maxillary reconstruction. Plast Reconstr Surg. 1986; 77(4): 530-45.
3. Mashrah MA, Aldhohrah T, Abdelrehem A, Sakran KA, Ahmad H, Mahran H, et al. Survival of vascularized osseous flaps in mandibular reconstruction: A network meta-analysis. PLoS One. 2021; 16(10): e0257457.
4. Cariati P ZP, Tosi AL, et al. Tip scapular free flap for complex head and neck reconstruction. Front Oral Maxillofac Med. 2020; 2:1-6
5. Trần Thanh Phương, Nguyễn Việt Dũng, Phạm Duy Hoàng, Lê Văn Cường. Ứng dụng vạt cơ xương vai tái tạo tổn khuyết vùng hàm mặt: Báo cáo hai ca lâm sàng. Tạp chí ung thư học Việt Nam. 2020: 11- 12.
6. Wilkman T, Husso A, Lassus P. Clinical Comparison of Scapular, Fibular, and Iliac Crest Osseal Free Flaps in Maxillofacial Reconstructions. Scand J Surg. 2019; 108(1): 76-82.

7. Miyamoto S, Arikawa M, Kagaya Y, Fukunaga Y. Scapula harvest in the supine position for immediate mandibular reconstruction. Oral Maxillofac Surg. 2024; 28(3): 1181-1188.
8. Sheehan CC, Haskins AD, Huang AT, Hernandez DJ. Cephalometric and Functional Mandibular Reconstructive Outcomes Using a Horizontal Scapular Tip Free Flap. Otolaryngol Head Neck Surg. 2021; 165(3): 414-418.
9. Di Giorgio D, Nocini R, Di Bartolomeo M, Fatiga M, Della Monaca M, Priore P, et al. Jaw Reconstruction with Scapular Bone Flap and Prosthetic Implant Rehabilitation: A Comprehensive Systematic Review. 2024; 14(17): 7890.
10. Moscoso JF, Keller J, Genden E, Weinberg H, Biller HF, Buchbinder D, et al. Vascularized bone flaps in oromandibular reconstruction. A comparative anatomic study of bone stock from various donor sites to assess suitability for enosseous dental implants. Arch Otolaryngol Head Neck Surg. 1994; 120(1): 36-43.
11. Urken ML, Buchbinder D, Costantino PD, Sinha U, Okay D, Lawson W, et al. Oromandibular reconstruction using microvascular composite flaps: report of 210 cases. Arch Otolaryngol Head Neck Surg. 1998; 124(1): 46-55.