Int J Clin Exp Physiol. 2025;12(1):19-25.
https://www.ijcep.org

Case Report

Mandible Reconstruction Following Resection of Gingival Squamous Cell Carcinoma with Peroneal Artery Perforator Based Fibular Osteocutaneous Free Flap

Sang Bong Ri[1,*], Song Hyon Kim[1], Jun Song Ryu[1], Hyon Il So[2], Chang Gol Rim[1]

[1]Department of Plastic Surgery, Pyongyang General Hospital, NORTH KOREA.
[2]Department of Maxillofacial Surgery, Pyongyang General Hospital, NORTH KOREA.

ABSTRACT
Reconstructing soft tissue defect resulting from resection of malignant tumor in face is crucial in esthetic and functional point of view. In order to solve this problem, several flaps such as free vascularized osteocutaneous flap. We reconstruct osseous and mucosal defect resulting from resection of lesion in a patient with gingival squamous cell carcinoma invading mandible and cervical lymph node with free fibular osteocutaneous flap.

Keywords: Gingival carcinoma, Peroneal artery perforator, Osteocutaneous flap.

***Correspondence:**
Sang Bong Ri
Department of Plastic Surgery, Pyongyang General Hospital, NORTH KOREA.
Email: Shypinguo2022515@126.com

Received: 18-01-2025;
Revised: 23-02-2025;
Accepted: 03-03-2025.

INTRODUCTION

Reconstruction of soft tissue and bone defects following the resection of malignant tumors in the head and neck region is essential for both functional recovery and aesthetic restoration. Among these malignancies, Gingival Squamous Cell Carcinoma (GSCC) is a particularly aggressive tumor that frequently invades the mandible and regional lymph nodes, requiring extensive surgical intervention. The challenge lies not only in achieving complete tumor removal but also in restoring mastication, speech, and facial symmetry, which are significantly affected by mandibular defects.

To address these challenges, various reconstructive techniques have been developed, including vascularized free flaps. The free fibular osteocutaneous flap has emerged as a preferred option for mandibular reconstruction due to its ample bone stock, robust vascularity, and adaptability.[1,2] This flap allows simultaneous reconstruction of both osseous and soft tissue defects, making it an excellent choice for extensive composite defects.

In this report, we present the case of a 60-year-old male patient diagnosed with stage IV (T4aN1M0) gingival squamous cell carcinoma, where the tumor had extensively invaded the left mandible and cervical lymph nodes. The patient underwent radical tumor resection and neck dissection, followed by reconstruction using a free fibular osteocutaneous flap. This article describes the surgical approach, technical considerations, and postoperative outcomes, emphasizing the effectiveness of this technique in restoring both form and function in advanced GSCC cases.

SURGICAL PROCEDURE

We are describing the procedure in a 60-year-old male patient with stage IV (T4aN1M0) gingival squamous cell carcinoma. On inspection, left mandibular region is slightly protruded (Figure 1) and tumor invaded left mandible on 3D CT scan and MRI (Figures 2 and 3).

The operation was performed by 2 teams in order to resect lesion and harvest fibular osteocutaneous flap based on peroneal artery perforator simultaneously. Under general anesthesia, oral mucosa, mandible and masseter suspected tumor invasion were resected en bloc with size 12×6×6cm and lymph nodes of neck were totally resected to prevent metastasis of tumor through lymph node (Figure 4) followed by cervical lymphadenectomy (Figure 5). Thorough hemostasis was done by ligation of vessels and facial artery, it's concomitant vein and external jugular vein were prepped for recipient vessels.

We harvested fibular osteocutaneous flap in right leg (Figures 6 and 7). The posterior margin of skin island was incised first and extended down with sharp dissection identifying perforator vessels and preserving it. Dissection then proceeded from lower part of fibular in an anterior direction leaving cuff of muscle attached to surface of fibula. The peroneal artery and two vena comitantes were dissected all the way to their origin from the posterior tibial artery and vein. The skin island was harvested

DOI: 10.5530/ijcep.2025.12.1.5

with size 5×20 cm in the middle third of lower leg and fibula was harvested 25 cm long while preserving fibula 10 cm proximally and 10 cm distally. The vascular pedicle length was 10cm. After elevating osteocutaneous flap completely sutured skin island *in situ* temporarily and deflated tourniquet. Circulation to skin island was good.

After preparation of recipient site, separated osteocutaneous flap and bone graft was fixed to recipient mandible by means of reconstruction plate (Figure 8). Peroneal artery was anastomosed to facial artery and it's two vena comitantes were anastomosed to facial vein and extra jugular vein respectively with end-to-end fashion. Skin island was sutured to oral mucosa. Donor site was closed with skin graft (Figures 9 and 10). Postoperative radiographs and 3D CT images confirmed proper alignment and integration of the graft (Figures 11 and 12).

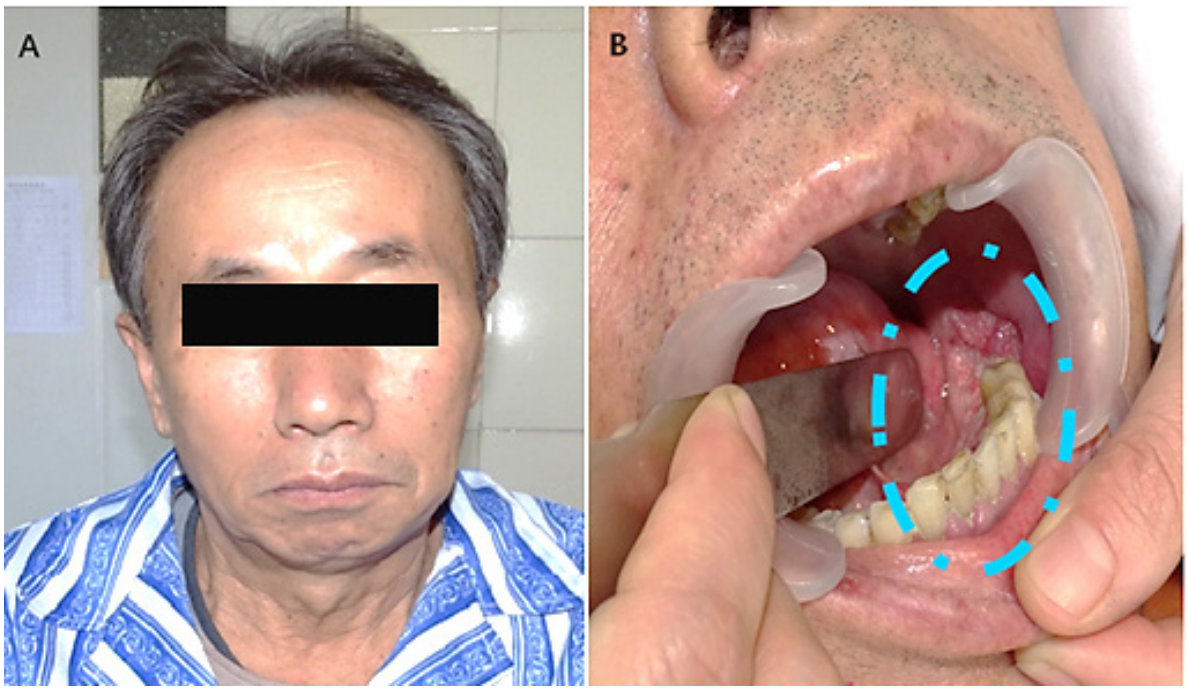

Figure 1: Preoperative photograph. A:On inspection left mandible is slightly protruded. B:Gingival lesion (blue dashed line).

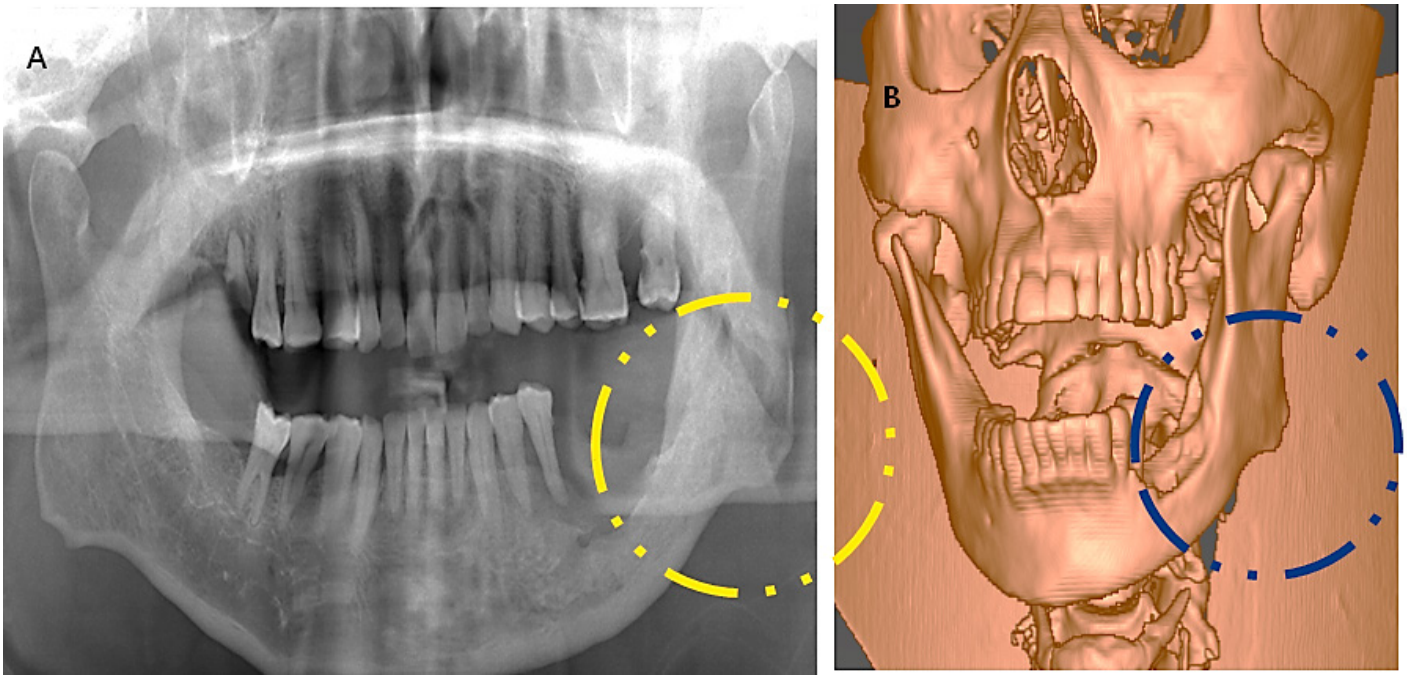

Figure 2: Preoperative X-ray(A) and 3D CT image(B) (yellow and blue dashed lines: tumor lesion).

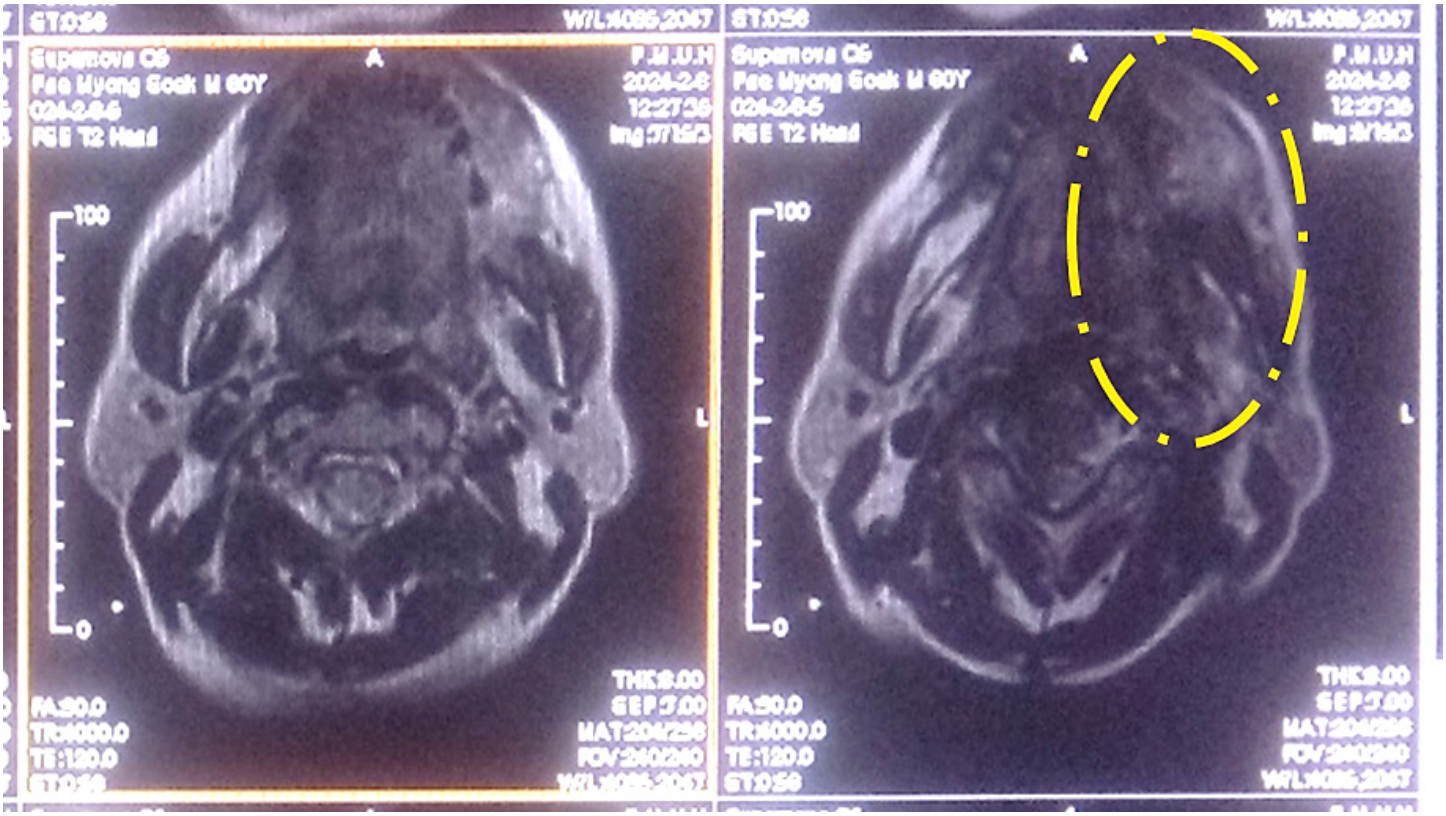

Figure 3: Preoperative MRI (yellow dashed line:tumor lesion).

Figure 4: Specimen after surgical resection.

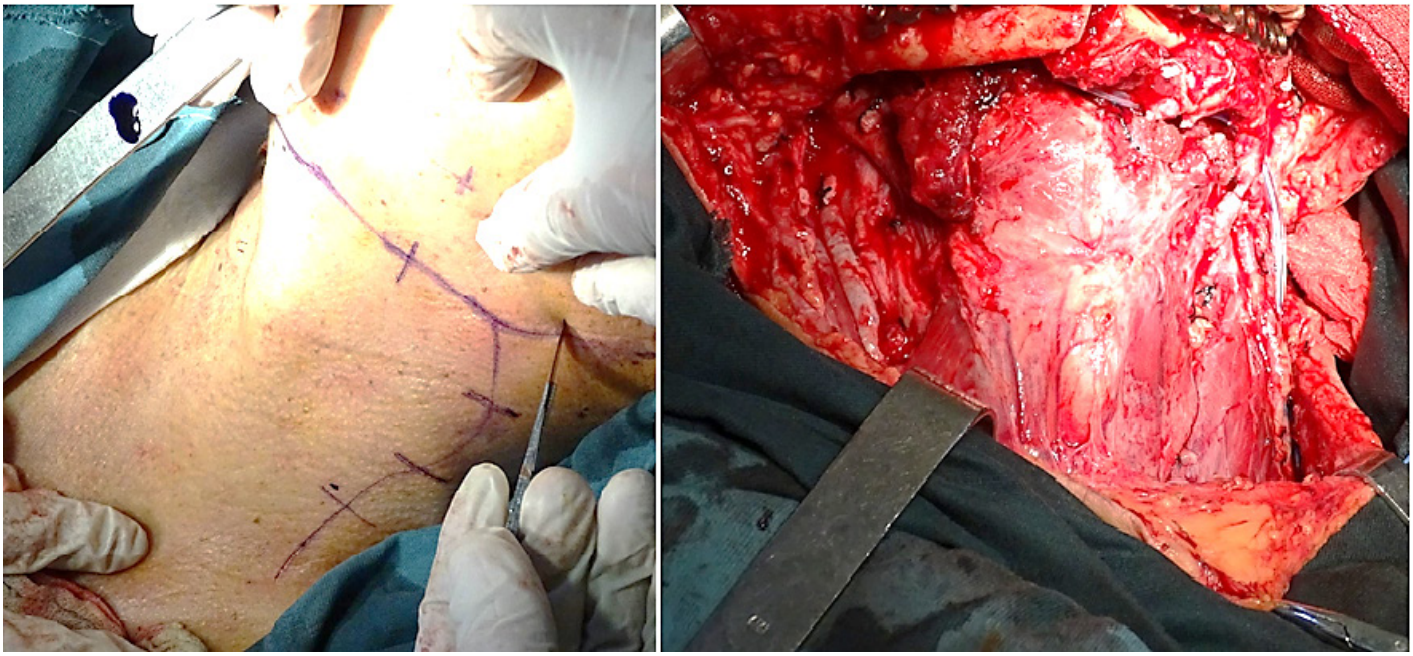

Figure 5: Lymphadenectomy on both sides of neck.

Figure 6: Fibular osteocutaneous flap design.

DISCUSSION

In the treatment of malignant tumor of face, radically resecting lesion and reconstructing soft tissue defect as well as chemotherapy and radiation therapy are very important in elongating life and improving quality of life.[3,4] In the mandible, large bone defects may lead to functional impairment affecting swallowing or speech and causing esthetic deformities. With the development of microsurgical techniques to harvest vascularized bone grafts, many researchers consider the fibula flap the workhorse for reconstructing large segmental mandible defects.[1,5] The potential advantages of the fibula flap are as follows: its straight shape and high mechanical resistance to pressure and torsion; rapid incorporation and healing of the highly vital flap due to the excellent perfusion; its composition, with a high content of cortical bone; its great length, which allows the bridging of large defects; the possibility of osteotomizing it at various points allowing adaptation; the relatively simple harvesting of the flap with conveniently sized blood vessels for anastomoses; and the low morbidity of the donor region. Moreover, it can be elevated with skin and muscle as an osteomyocutaneous flap.[6-8]

Figure 7: Fibula osteocutaneous flap.

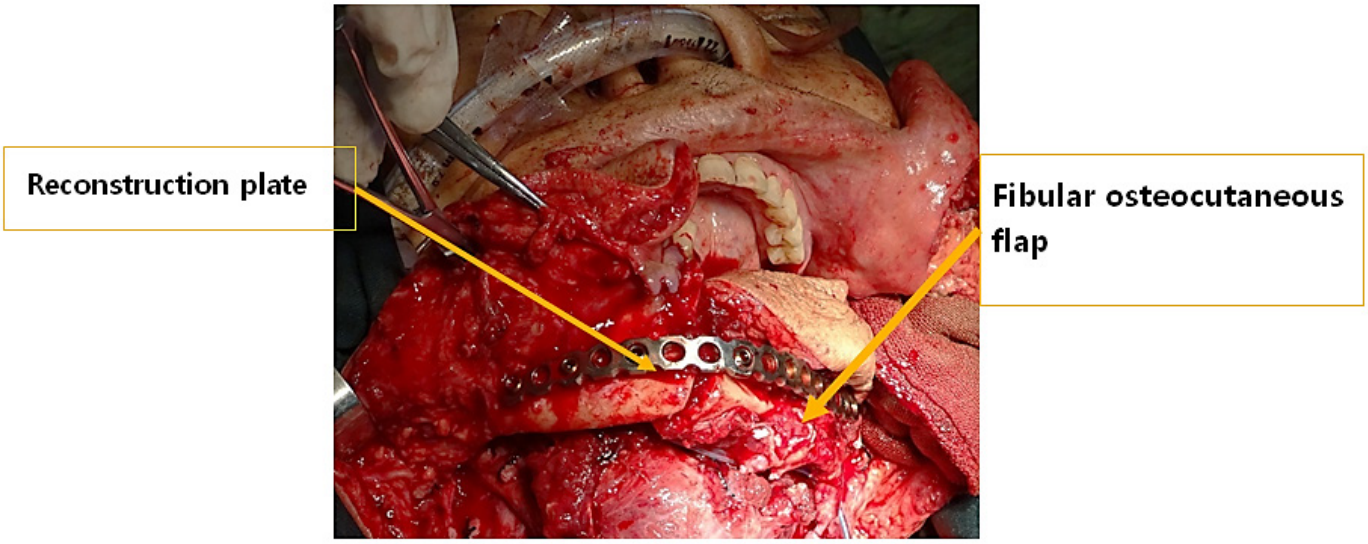

Figure 8: Fixation of fibula by reconstruction plate.

Figure 9: Intraoperative photograph showing inset of flap.

Figure 10: Intraoperative photograph showing donor site closure with skin graft.

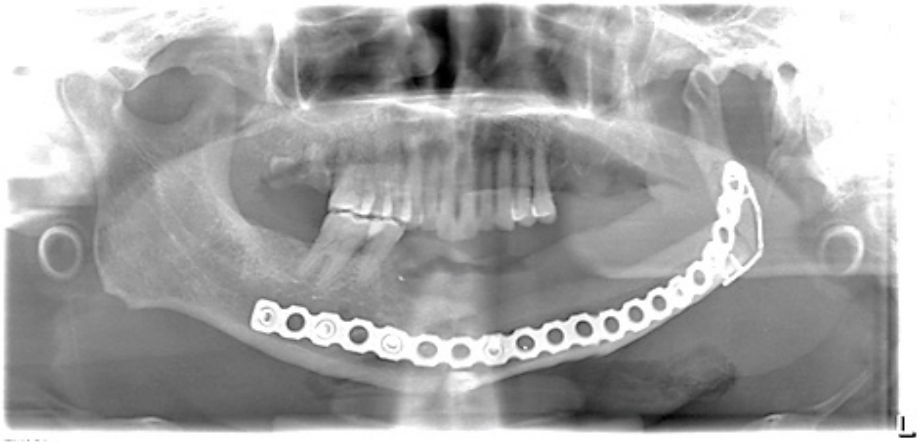

Figure 11: Postoperative X-ray(30th postoperative day).

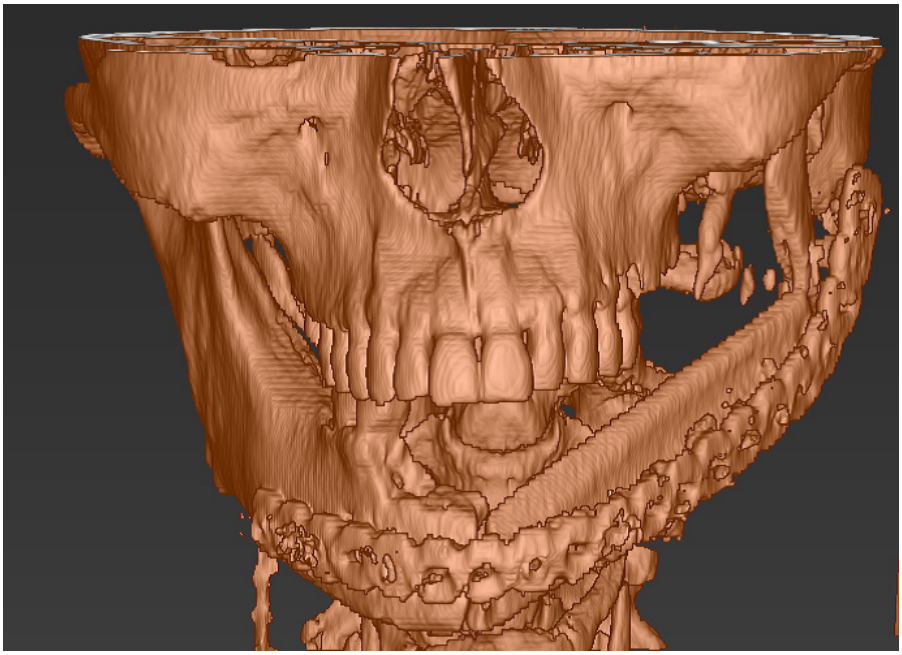

Figure 12: Postoperative 3D CT view(2 months postoperative day).

Adequate chemotherapy and radiation therapy combined by thorough resection and delicate microsurgical reconstruction by free vascularized fibular osteocutaneous flap can make treatment possible for end stage cancer.

CONCLUSION

We treated patient with end stage gingival squamous cell carcinoma with thorough resection of lesion and reconstruction by free fibular osteocutaneous flap.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

GSCC: Gingival Squamous Cell Carcinoma; **CT:** Computed Tomography; **MRI:** Magnetic Resonance Imaging; **3D:** Three-Dimensional; **cm:** Centimeter; **mm:** Millimeter; **DPR Korea:** Democratic People's Republic of Kore**a; X-ray:** Radiograph; **AN:** Anastomosis**; T4aN1M0:** Tumor-Node-Metastasis Staging.

REFERENCES

1. López-Arcas JM, Arias JH, Navarro CU, Alonso PC, Burgueño M. The fibula osteomyocutaneous flap for mandible reconstruction: A 15-year experience. J Oral Maxillofac Surg. 2010; 68(10): 2377-84.
2. Kessler P, Neukam FW, Wiltfang J. The role of angiography in the lower extremity using free vascularized fibular transplants for mandibular reconstruction. J Craniomaxillofac Surg. 2001; 29(6): 332-6.
3. Robey AB, Spann ML, McAuliff TM, Rosenthal EL, Wax MK. Comparison of miniplates and reconstruction plates in fibular flap reconstruction of the mandible. Plast Reconstr Surg. 2008; 122(6): 1733-8.
4. Hölzle F, Kesting M, Rohleder NH, Stoeckelhuber M, Wolff KD. Clinical outcome and patient satisfaction after mandibular reconstruction with free fibula flaps. Int J Oral Maxillofac Surg. 2007; 36(9): 805-10.
5. Rogers SN, Lakshmiah SR, Narayan B, Brown JS, Vaughan ED. A comparison of the long-term morbidity following deep iliac and fibula free flaps for reconstruction following head cancer. Plast Reconstr Surg. 2003; 112(6): 1517-25.
6. Shaw RJ, Kanatas AN, Lowe D, Brown JS, Rogers SN, Vaughan ED. Comparison of miniplates and reconstruction plates in mandibular reconstruction. Head Neck. 2004; 26(6): 456-63.
7. Hidalgo DA, Pusic AL. Free-flap mandibular reconstruction: A 10-year follow-up study. Plast Reconstr Surg. 2002; 110(2): 438-49.
8. Farwell DG, Kezirian EJ, Heydt JL, Yueh B, Futran ND. Efficacy of small reconstruction plates in vascularized bone graft mandibular reconstruction. Head Neck. 2006; 28(6): 573-9.

Cite this article: Ri SB, Kim SH, Ryu JS, So HI, Rim CG. Mandible Reconstruction Following Resection of Gingival Squamous Cell Carcinoma with Peroneal Artery Perforator Based Fibular Osteocutaneous Free Flap. Int J Clin Exp Physiol. 2025;12(1):19-25.