

Unplanned Immediate Total Mandibular Reconstruction Using a Fibular Osteocutaneous Free Flap after Giant Ameloblastoma Eradication: A Case Report

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Ameloblastomas are the most common benign tumors that arise from odontogenic origins, and they are most often found at the jaw. Giant ameloblastomas require aggressive treatment that results in a large defect that requires reconstruction. Here, the authors report the case of a 41-year-old Thai woman with a giant ameloblastoma at her jaw that was managed in a single-stage procedure. The operation was scheduled urgently due to rapid tumor progression and the development of a bleeding ulcer at the tumor site. After the tumor was removed by total mandibulectomy, immediate mandibular reconstruction with a fibular osteocutaneous free flap was performed without prefabricated model. Previously reported proportions of the human mandible were used to guide the design of the fibular free flap for the neo-mandible. Masseter muscles and floor of mouth muscles were reattached at alternative locations. The final histopathologic examination revealed giant ameloblastoma (size 22×21×15 cm) with negative surgical margin, and no malignant change within the tumor was noted. The patient recovered with satisfactory appearance and function after the surgery. The present case highlights the challenges associated with unplanned immediate total mandibular reconstruction. The surgical steps highlighted in the present report may be of benefit to surgeons in limited resource settings that need to perform the present procedure urgently.

Keywords: Immediate total mandibular reconstruction, Fibular osteocutaneous free flap, Giant ameloblastoma eradication, Case report

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Ameloblastomas are benign tumors that arise from odontogenic origins. They account for approximately 10% of all odontogenic tumors. Ameloblastomas are most commonly found in the mandible or lower jaw⁽¹⁾. These tumors are classified into the following 3 types according to the World Health Organization (WHO) 2017 classification: unicystic, extraosseous/peripheral, and metastatic⁽²⁾. Treatment for these tumors ranges from minimally invasive treatments

to radical resection. Giant ameloblastomas require aggressive treatment that results in a large defect that requires reconstruction⁽³⁾. Mandibular reconstruction in cases with large defects is performed using a vascularized fibular osseous free flap⁽³⁻⁵⁾.

Case Report

A 41-year-old Thai woman presented at our center with a huge mandibular mass (Figure 1) that developed 10 years earlier. Her occupation is farmer. She reported having difficulty chewing and swallowing food for 10 months prior to her first visit to our clinic. She underwent incisional biopsy, and the histopathologic examination revealed ameloblastoma. She was scheduled for tumor removal with immediate mandibular reconstruction. The mandibular reconstruction strategy was determined among the surgical team, and a rapid prototype of a

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Figure 1. Preoperative patient photo.

neo-mandible was ordered. During the interim period, the tumor rapidly progressed and a bleeding ulcer developed at the tumor site. In response, an urgent operation was scheduled prior to the arrival of the ordered neo-mandible prototype. Plain radiography demonstrated a huge sun-ray-like mass involving nearly the entire mandible (Figure 2).

Under general anesthesia, the patient was operated on by two teams that worked simultaneously to perform a total mandibulectomy and a right fibular free flap harvest. After tumor removal, both condyles were cut and preserved (Figure 3). In situ prefabrication of fibular bone was performed leaving 3 cm proximal and distal segments to maintain joint stability. The total length of the harvested fibula was 24 cm. The harvested fibula was osteotomized in 3 places to produce 4 pieces of bone. Two pieces were used to construct the mandible body (length of each piece; 6 cm), and the other two pieces were used to fabricate ramuses (length of each piece; 5 cm). The neo-mandible was constructed using plates and screws (Figure 4). The preserved condylar heads were then affixed to the distal end of the neo-ramuses (Figure 5). The fibular flap was inset ensuring that both condyles were appropriately connected and aligned. Masseter muscles and floor of mouth muscles were reinserted in alternative locations (Figure 6). Microvascular anastomoses were performed.

The final histopathologic examination revealed

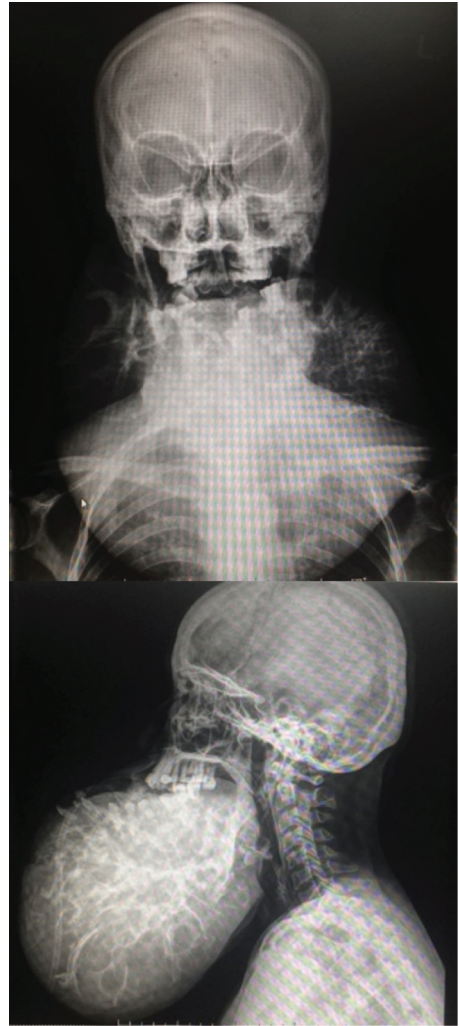


Figure 2. Preoperative X-ray.



Figure 3. Specimen after tumor removal.

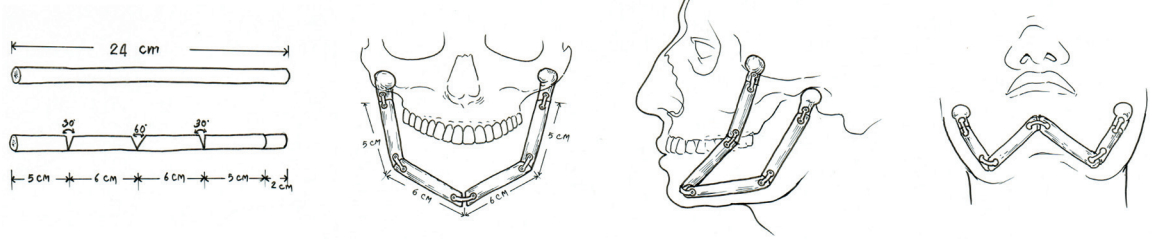


Figure 4. The pictures show how to prefabricate the fibular into neo-mandible.

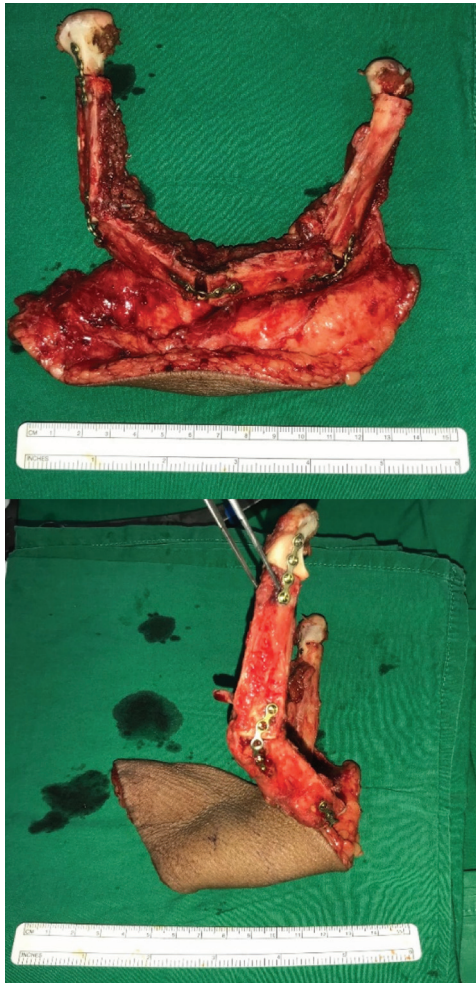


Figure 5. Prefabrication of fibular osteocutaneous free flap.

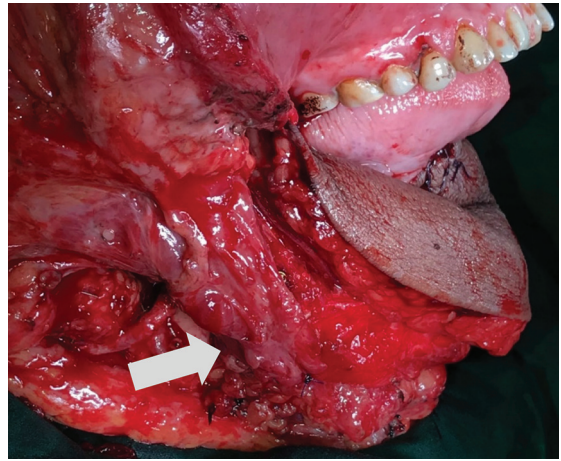


Figure 6. Masseter muscles were reinserted into angle of neo-mandible.



Figure 7. The patient at 6 months after the operation.

ameloblastoma (size 22×21×15 cm) with negative surgical margin, and no malignant change within the tumor was noted. The patient's appearance and function were restored postoperatively (Figure 7). The patient was regularly followed for 6 months. Annual follow-up revealed no evidence of complication or recurrence. She is now able to eat and swallow regular

diet with no difficulty.

Discussion

Ameloblastomas are benign, but aggressive tumors. Associated features include local invasion and a high rate of recurrence. Tumor eradication with complete margin is the mainstay treatment in

large tumors. Challenges associated with the present procedure have been reported from low-resource countries that lack the support, facilities, equipment, and expertise needed to successfully manage urgent and/or complicated cases⁽⁶⁾.

The aims of reconstruction are to improve function (swallowing and speech) and aesthetics (facial contour). Immediate total mandibular reconstruction, whether urgent or scheduled, requires appropriate planning or readiness and an experienced surgical team.

Fibular free flap is still widely used for large mandibular defect. In cases requiring total mandibular reconstruction that can be scheduled, preoperative reference inset planning should be performed. In contrast, urgent cases need to be managed to the best of the treatment team's capability on a case-by-case basis.

The urgent nature of the case profiled here disallowed pre-operative reconstruction planning, including 3D modeling and fabrication of a dental splint. A study of post-mortem computed tomography (CT) of the mandible by Kano et al revealed the gnathion-condylar angle and gonial angle to be 62.3 degrees and 129.8 degrees, respectively. That same study reported the distance between the gonials and the distance between the condyles to be 95.8 mm and 121.7 mm, respectively⁽⁷⁾. Therefore, the authors used these parameters as guidance for the flap modifications.

Salgado et al recommended leaving at least a 6 cm segment of proximal and at least a 4 cm distal portion of fibular bone in order to maintain joint stability⁽⁸⁾. However, in the present case, the authors left only 3 cm at each end in order to satisfy the length of bone required for construction of the neo-mandible. Our orthopedic team was consulted to inquire about the likelihood of joint instability developing after the operation. Fortunately, the present patient had a stable joint and normal gait without any type of support.

Gravvanis et al suggested inserting the masseter muscle into the fibula flap after inset of the neo-mandible to achieve acceptable function after condyle-mandibulectomy defect⁽⁹⁾. In the present case, the authors inserted the masseter muscle at the neo-mandibular angle, and the floor of mouth muscles into the neo-gnathion. The patient described in the present report realized significant postoperative improvement in swallowing, speech, and aesthetic appearance with no evidence of recurrence.

To conclude, giant ameloblastomas are commonly managed with a single-stage procedure to facilitate

rapid restoration of normal aesthetics and function. The present case highlights the challenges associated with unplanned immediate mandibular reconstruction. The surgical steps highlighted in the present report may be of benefit to surgeons in limited resource settings that need to urgently perform the present procedure.

What is already known on this topic?

Giant ameloblastomas require aggressive and radical treatments that result in large defects which require reconstruction. Moreover, fibular free flaps have been widely used for the large mandibular defects reconstruction.

What this study adds?

This case report revealed the steps for tumor eradication along with total mandibular reconstruction with a fibular free flap. The authors showed the easy and understandable prefabrication ways for total mandibular reconstruction and flap inset which will be beneficial for surgeons in limited resources who need to perform these procedures. Moreover, leaving the remnant fibular bones less than 4 cm. causes no gait disturbance to the patient.

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Conflicts of interest

All authors declare no personal or professional conflicts of interest relating to any aspect of this case report.

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