



# Ghost cell odontogenic carcinoma on right mandible and its respective surgical reconstruction: a case report

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**Abstract** (J Korean Assoc Oral Maxillofac Surg 2017;43:415-422)

Calcifying cystic odontogenic tumor (CCOT) is defined as an odontogenic cyst-like benign neoplasm that characteristically contains several ghost cells, ameloblastoma-like epithelium, and occasional calcification. Ghost cell odontogenic carcinoma (GCOC), a malignant form of CCOT, is an exceptionally rare malignant tumor. In this report, we present a case of a 53-year-old man whose chief complaint was a solitary mass on the right mandible area. The mass was completely removed through an extraoral surgical approach and reconstructive surgery was performed in two phases.

**Key words:** Ghost cell odontogenic carcinoma, Calcifying odontogenic cyst, Latissimus dorsi myocutaneous free flap

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## I. Introduction

The World Health Organization (WHO) published a histological classification of odontogenic tumors in 2005. This publication outlined the name system for calcifying odontogenic cysts (COC) because classification of calcifying cystic odontogenic tumors (CCOT) was not previously defined. Ghost cell odontogenic carcinoma (GCOC) is an exceptionally rare and malignant odontogenic epithelial tumor, and has similar features to CCOT. GCOC represents between 0.37% to 2.1% of all odontogenic tumors, and GCOC is more common in the maxilla, in the fourth decade and predominantly occurs in males.

GCOC has a similar phenotype to a typical malignant tumor, including prominent mitotic activity, nuclear atypia,

and cellular pleomorphism. However, GCOC has a very conspicuous malignant entity because it contains groups of ghost epithelial cells. It also exhibits necrosis, mineralized or dentin-like material, and an infiltrative growth pattern. The most common symptom of GCOC is painful swelling with local paresthesia. Bone destruction and expansion with irregularly-shaped calcified regions inside the lesion are observed on radiographs. GCOC usually appears as a hyperintense mass on magnetic resonance imaging. On histopathological examination, an acystic or solid appearance with prominent features, such as the presence of several ghost cells, dysplastic uncalcified dentin, and osteodentin can be observed. This article reports a case of GCOC in the right mandible of a 53-year-old man and describes the clinicopathological features, radiological imaging and the treatment approaches.

## II. Case Report

In 2016, a 53-year-old man was referred to the Department of Oral Maxillofacial Surgery at Seoul National University Dental Hospital (Seoul, Korea). He reported a slowly growing but painless swelling and bleeding from the right mandibular area that had persisted for several years. The swelling extended from the anterior mandibular area to the right subcondylar area. Pus discharge on the right submandibular area

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was observed.(Fig. 1)

The initial workup included a complete blood cell count, electrolyte panel, and imaging studies, including a panoramic

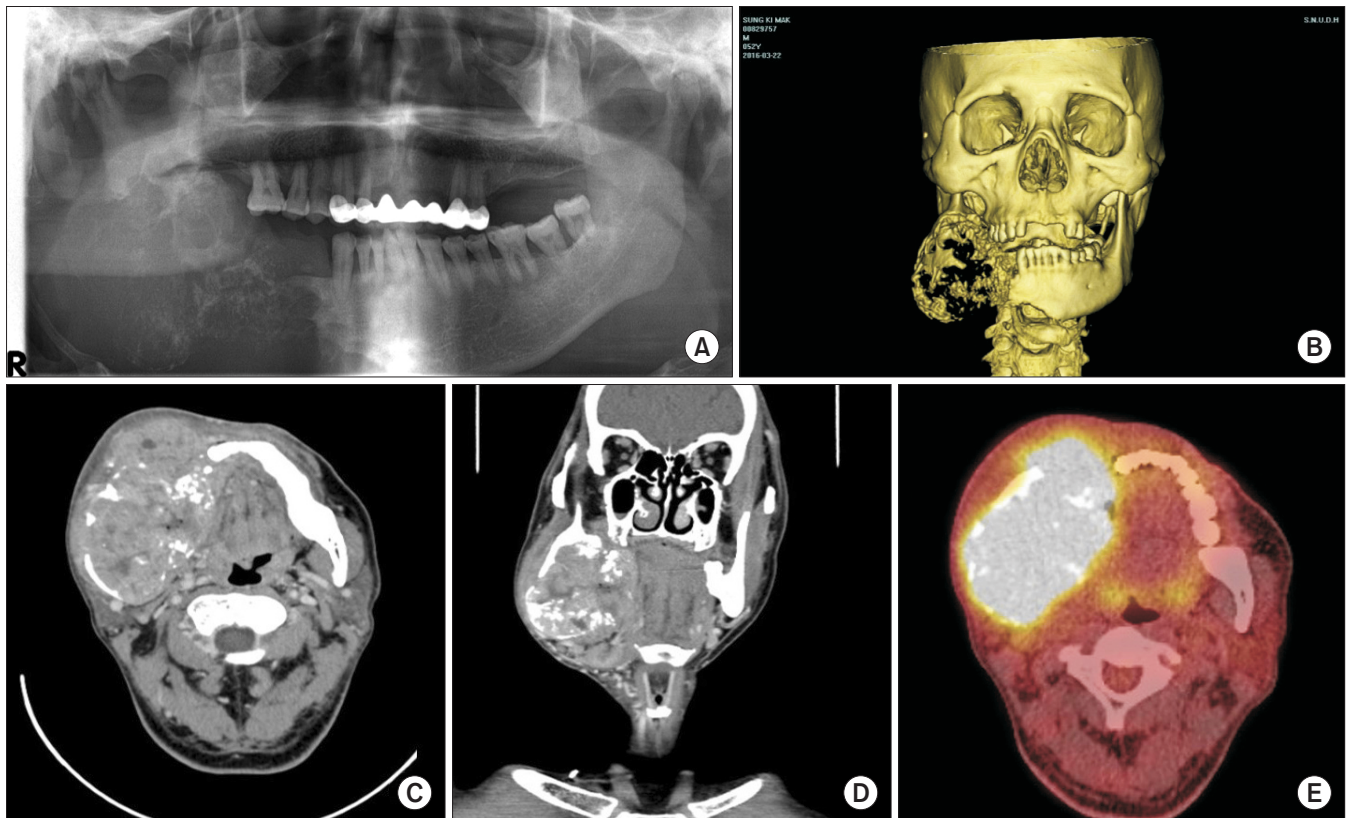


**Fig. 1.** Preoperative extraoral clinical photo.  
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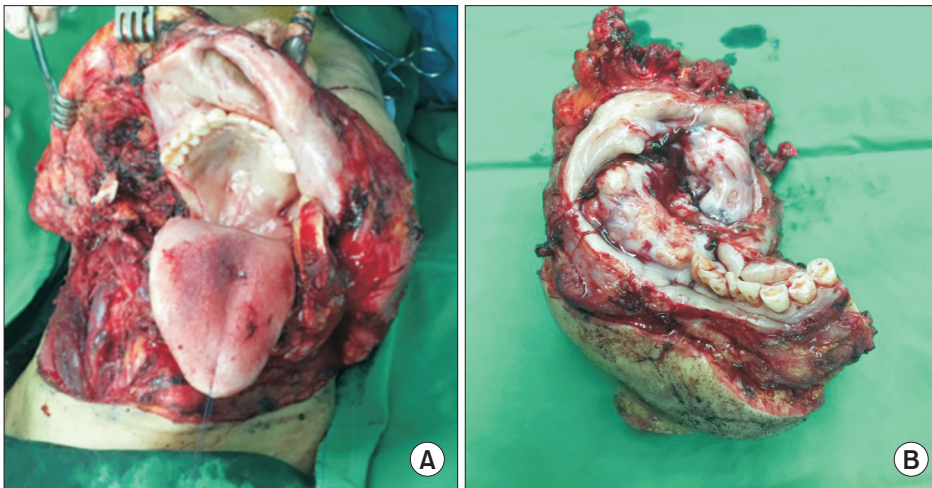
view, neck sonography, enhanced computed tomography (CT), abdomen sonography, and positron emission tomography-computed tomography (PET-CT). The patient's medical history indicated that he was taking insulin injections as medication for diabetes mellitus and had hypertension. After admission, the patient was referred to the Department of



**Fig. 2.** Preoperative intraoral clinical photo.  
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**Fig. 3.** Clinical and radiologic findings. A. Panoramic view. B. Preoperative three-dimensional computed tomography (CT) view. C. Preoperative enhanced CT view (axial cut). D. Preoperative enhanced CT view (coronal cut). E. Preoperative positron emission tomography-computed tomography (PET-CT).  
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**Fig. 4.** A. Post mass resection. B. Main mass.

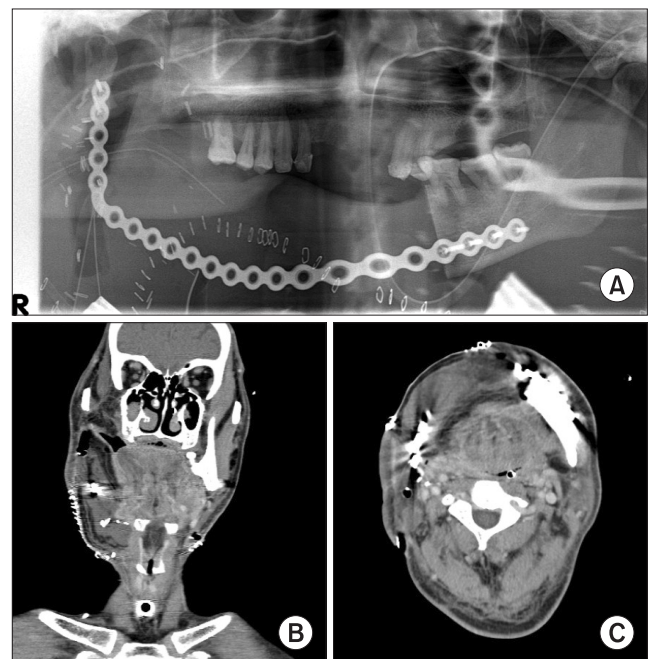
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Nephrology at Seoul National University Hospital (SNUH; Seoul, Korea) because of renal disease.

Clinical examination showed a large massive extraoral swelling of the right submandibular area, bleeding, pus discharge (Fig. 1), and intraoral swelling of the right buccal cheek and gingiva.(Fig. 2) A biopsy was performed on the day after admission and revealed a GCOC. A panoramic radiograph revealed a large radiolucent area on the right mandible.(Fig. 3. A) CT scans demonstrated an expansive, contrast-enhancing mass with bony destruction of the right mandibular body and ramus. The mass extended from tooth #33 to the right sigmoid notch underline and erosion of the maxillary tuberosity was observed. Inside the mass, multiple fluid components were spreading and tiny septa or high attenuation foci, similar to areas of calcification, were visible. (Fig. 3. B-D) A PET-CT scan image revealed hypermetabolic lesion in the patient's right mandible.(Fig. 3. E)

Preoperative laboratory results revealed the following values: hemoglobin, 5.3 g/dL; erythrocyte sedimentation rate, 59; and the urine test showed albumin, 4+ and blood, 2+. Surgical resection was initially recommended based on consultation with the Department of Hemato-Oncology and Department of Radiation Oncology at SNUH. The patient entered the hospital for surgery on April 1st, 2016, after the initial workup.

To ensure a safe surgery, the patient was given a blood transfusion and his hemoglobin increased from 5.3 to 8.3 g/dL. A coagulation panel subsequently showed normal results. On April 4th, the first surgery was performed under general anesthesia. The mass resection with partial mandibulectomy was performed first (Fig. 4), and selective neck dissection (level I and II), reconstruction with the R-plate, latissimus dorsi myocutaneous free flap, and tracheostomy were also performed.



**Fig. 5.** Radiographic findings after first surgery. A. Panoramic view after first surgery. B. Enhanced computed tomography (CT) view (axial view) after first surgery. C. Enhanced CT view (coronal view) after first surgery.

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Operation was completed via the subplatysmal approach and with blunt dissection posterior to the sternocleidomastoid muscle. The intraoral defect was reconstructed with the latissimus dorsi myocutaneous free flap. The donor site was dressed with Mediform and sutured. End-to-end and end-to-side anastomoses were made between the thoracodorsal vein and branch of the internal jugular vein. A tracheostomy was performed after the surgical wound was sutured with 3/0 to 5/0 Vicryl. Fig. 5 shows the post-first surgery radiologic con-



dition.

The size of main mass was 6.4×6.1×5.9 cm.(Fig. 6) Biopsy of the resected tumor revealed malignant epithelial cells with ghost cells (Fig. 7. A), atypical cells with prominent pleomorphism (Fig. 7. B), long strands of odontogenic epithelium with clear cells (Fig. 7. C), and dysplastic dentin with con-

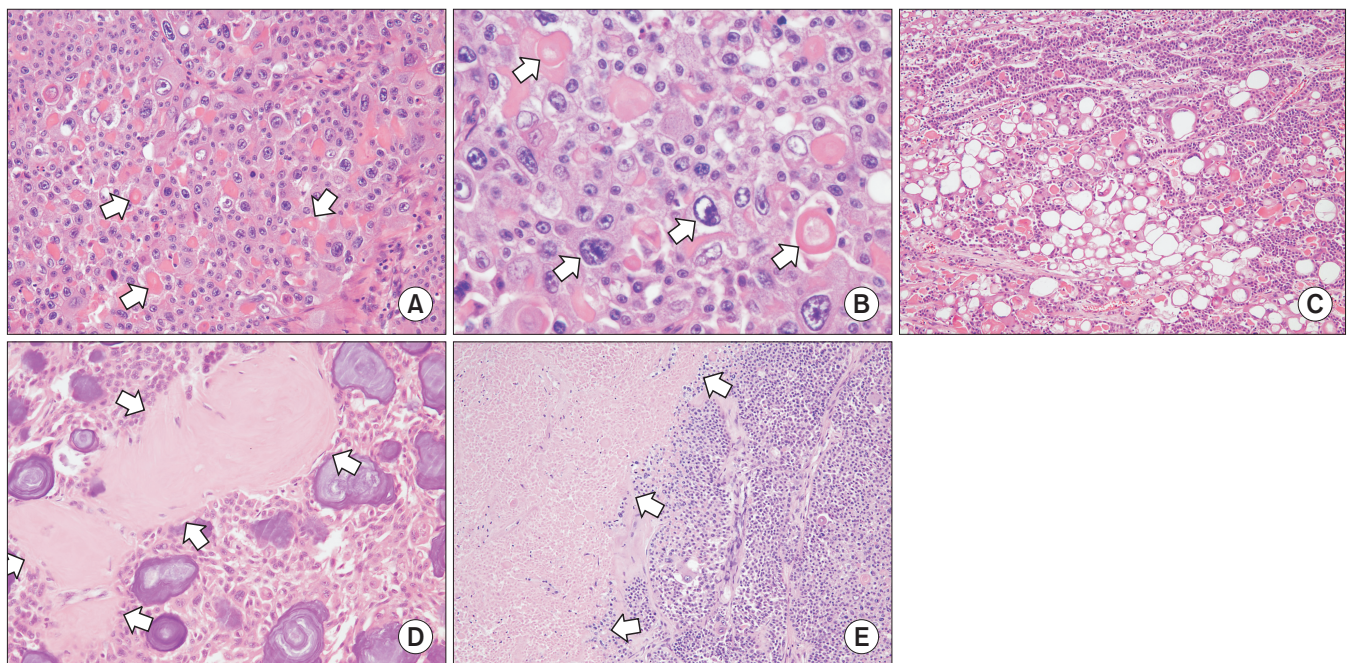


**Fig. 6.** Main mass.  
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centric calcifications (Fig. 7. D), and focal necrosis (Fig. 7. E), which were characteristic features of GCOC. Typical carcinoma characteristics were seen in the immunohistochemical staining.(Fig. 8)

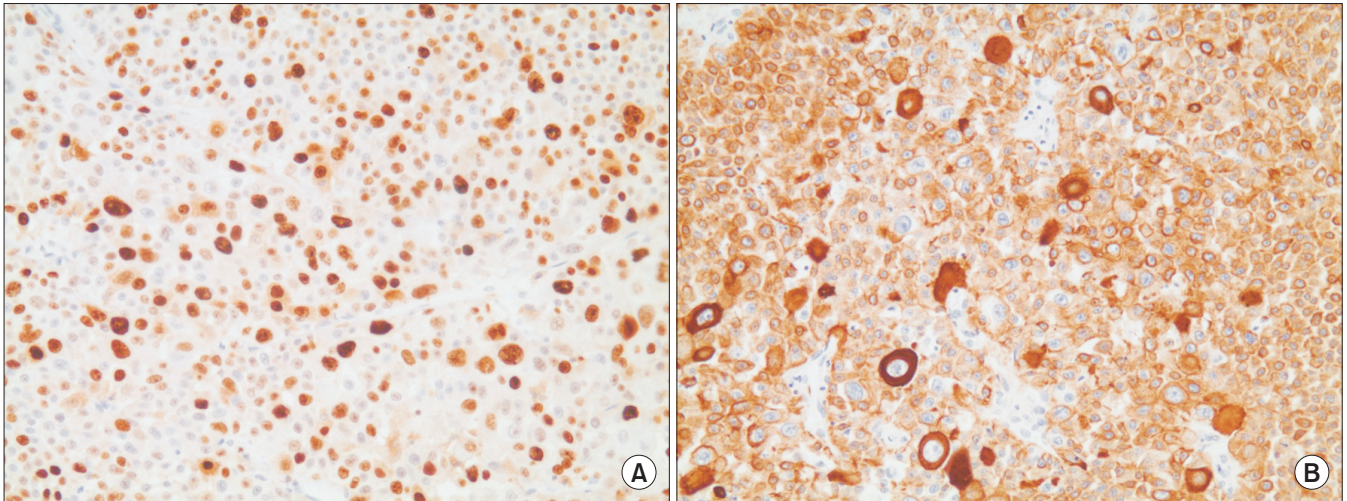
In the evening on postoperative day 3, active bleeding in the neck drain was observed; hence, hemostasis and re-microanastomosis under emergency general anesthesia was performed. The procedural approach was hemostasis and involved a pedicle artery repair. Subsequently, the flap color turned brownish and flap necrosis ensued. Supportive care continued through May 5th.

On May 6th, previous flap removal and resetting with double flap was performed under general anesthesia and included surgical debridement of the flap, reconstruction with an anterolateral thigh free flap (left), reconstruction with a latissimus dorsi free flap, vessel preparation, split-thickness skin graft, tracheostomy, and Z-plasty. The pre-existing necrotic flap was removed by blunt dissection. A large intraoral defect (7×19 cm) was reconstructed with a left anterolateral thigh myocutaneous free flap. An end-to-end anastomosis of the lateral circumflex femoral artery and superior thyroid artery was performed with 10-0 nylon. Two vena comitans were anastomosed with the internal jugular vein in the end-to-side mode using 10-0 nylon. The Doppler sound was checked in the operating room. An incision was made on the right

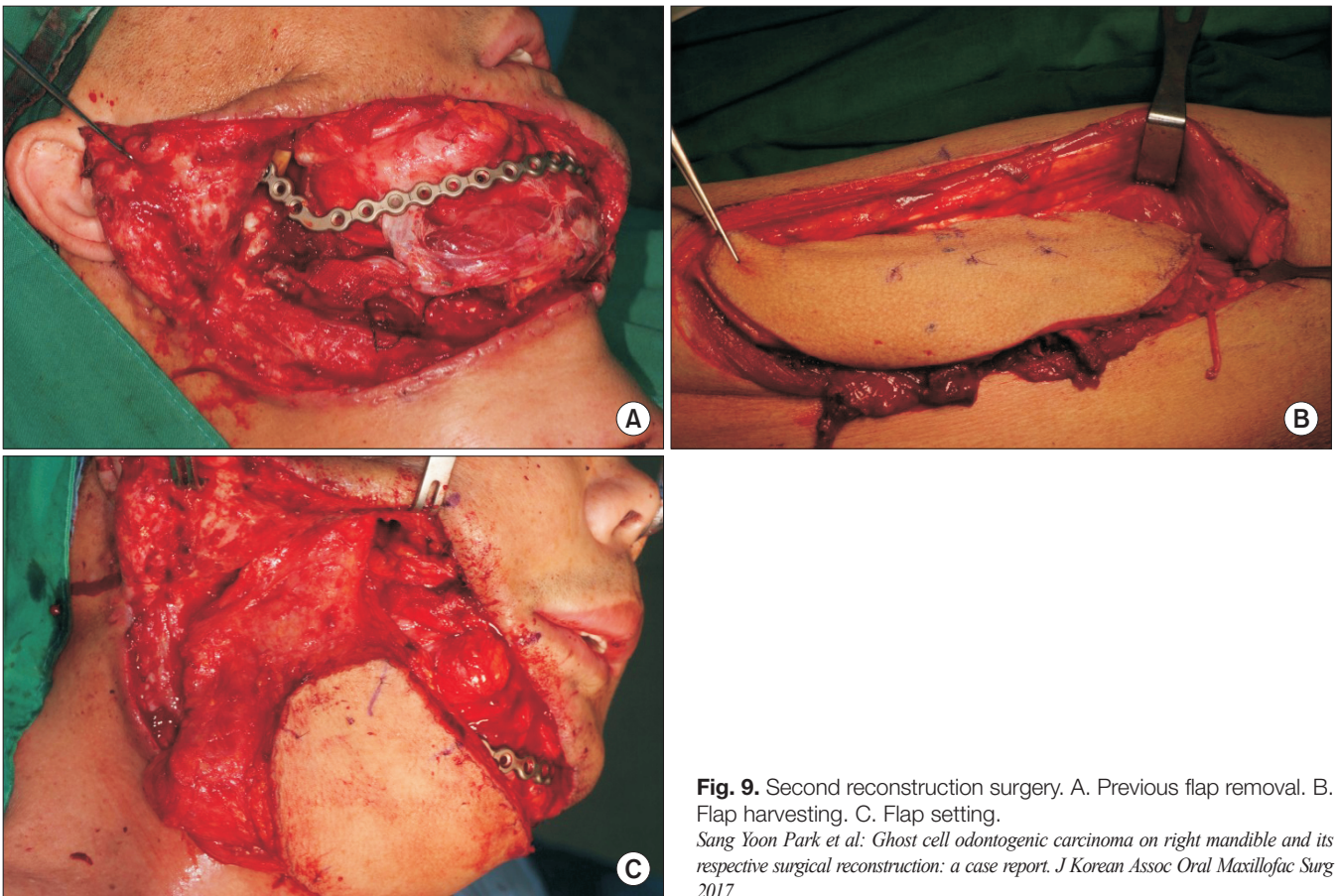


**Fig. 7.** Histologic findings. A. Malignant epithelial cells with ghost cells (arrows; H&E staining, ×200). B. Atypical cells with prominent pleomorphism (arrows; H&E staining, ×400). C. Long odontogenic epithelial strands with focal clear cell clusters (H&E staining, ×100). D. Dysplastic dentin with concentric calcifications (arrows; H&E staining, ×200). E. Focal necrosis (arrows; H&E staining, ×100).  
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**Fig. 8.** Histologic findings. A. Immunohistochemical staining (Ki-67). B. Immunohistochemical staining (pan-cytokeratin).  
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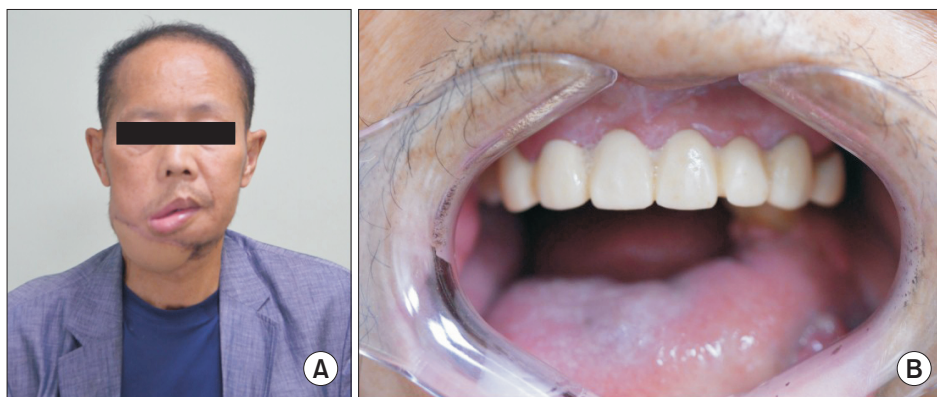


**Fig. 9.** Second reconstruction surgery. A. Previous flap removal. B. Flap harvesting. C. Flap setting.  
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supraclavicular area to prepare for the extraoral defect reconstruction anastomosis of transverse cervical vessels. After the right latissimus dorsi myocutaneous free flap was harvested (8.5×14 cm), a pedicle that contained the thoracodorsal artery and thoracodorsal veins was anastomosed. The thoracodorsal

artery and transverse cervical artery were anastomosed in the end-to-end mode with 10-0 nylon. The Y-shaped thoracodorsal vein was anastomosed with the transverse cervical vein in the end-to-end mode.

The Doppler sound was checked on the extraoral area and



**Fig. 10.** Six month postoperative follow-up. A. Extraoral clinical photo. B. Intraoral clinical photo.  
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Z-plasty was performed to minimize the left latissimus dorsi flap donor site defect. The defect (9×10 cm) was reconstructed with split thickness skin graft from the right thigh area, which was harvested at a 5.1×10 cm size. Thus, we used a tissue expander (1:2), and each donor site was sutured layer by layer.(Fig. 9) Thirty-one days after the initial surgery, the patient showed no complications at the recipient and donor sites. The patient was discharged from the hospital without complications. The patient is currently under close observation for signs and symptoms of recurrence through regular follow-up visits and imaging studies.(Fig. 10)

### III. Discussion

In 1962, Gorlin et al.<sup>1</sup> first reported that COC had a cystic nature. Recently, the WHO reclassified COC into three subgroups: CCOT, dentinogenic ghost cell tumor (DGCT), and GCOC. GCOC is a very rare, malignant form of COC. Because GCOC is extremely rare, clinicopathological data about GCOC is only available in case reports<sup>2</sup>.

A study by Tarakji et al.<sup>3</sup> reviewed 30 cases of GCOC and showed an average patient age of 40 years with a male predominance; the tumor occurs more frequently in Asian nationals than in other ethnicities. The tumor involves the maxilla more frequently than the mandible. In the mandible, it can cross the midline, as seen in this case. The most common clinical feature is a painful swelling and expansion of the mandible or maxilla. On radiographs, a mixed radiolucent and radiopaque pattern with bone destruction is seen. Metastasis to distant organs is very rare<sup>4</sup>.

The 2005 WHO guidelines recommended that GCOC be diagnosed on the basis of atypical histological features, several ghost cells, necrosis, prominent mitotic activity, infiltrative growth, and strong Ki-67 and p53 expressions<sup>4,5</sup>. Ghost cells are epithelial cells with a homogenous eosinophilic cy-

toplasm without nuclei<sup>6</sup>. Characteristically, GCOCs are painful, hard swellings of the maxilla or mandible that destroy the osseous structure and cause expansion of the mandible and maxilla, as observed in this case<sup>7</sup>. In the study by Arashiyama et al.<sup>8</sup>, which included 27 cases of GCOC, 20 were managed with only surgical excision; six cases required surgery and radiotherapy and the remaining case required surgery with chemoradiotherapy. The treatment plan for GCOC is wide excision of the tumor with a clean margin with/without radiotherapy or chemotherapy<sup>2,6,8</sup>.

The patient had an emergent bleeding event on the 3rd postoperative day, which resulted in flap necrosis progression. The flap was removed and a second surgical procedure was performed. Bianchi et al.<sup>9</sup> reported that total flap loss occurred in 4% of GCOC patients, which was a common complication that involved major flaps and venous and arterial thromboses were the primary causes of flap loss. Thirty-six hours after onset of bleeding the probability of surgical flap salvage is low<sup>9,10</sup>. Many factors can cause flap necrosis, such as surgical procedures, postoperative complications, underlying disease, and flap size.

If flap size is the primary concern, a latissimus dorsi myocutaneous flap and anterolateral thigh flap are recommended for a large defect reconstruction<sup>10,11</sup>. Similarly, Ozkan et al.<sup>12</sup> suggested that an anterolateral thigh free flap has many advantages for reconstruction of large palatal defects. However, in the reconstruction of large mandibular defects, Leclère et al.<sup>13</sup> recommended a double-skin paddle fibula free flap. Myers and Ahn<sup>14</sup> studied the effects of free flap size on clinical outcomes. In 121 head and neck reconstruction cases, a very large flap size did not negatively affect clinical outcomes. The number and duration of intensive care unit stays in patients undergoing repair with very large flaps were significantly longer than in those that underwent large flap repair. This article concluded that reconstruction with very large



flaps was as safe as an approach with large flaps<sup>14</sup>.

In a study in 1992, Cooley et al.<sup>15,16</sup> evaluated the effects of underlying diseases on flap repair and reported that diabetes was not a causative factor in free flap failure. In their study, survival rates of the flaps were not significantly different between the normal and the diabetic flap group. Thus, reconstruction surgery in diabetic patients is as safe as that in normal patients. However, diabetes may decrease the rate of re-endothelialization of the vascular repair site. Liu et al.<sup>17</sup> studied the risk of flap complications in elderly oral cancer patients. When tumor removal was followed by oral reconstruction, the risk of complication increased in elderly patients. Recently, Rosado et al.<sup>18</sup> did a systematic review and meta-analysis on underlying disease and flap repair. They demonstrated that the risk of free flap complication is 1.76 times higher in a diabetic patient and the risk of flap failure is 2.3 times higher than in patients without diabetes. Genden et al.<sup>19</sup> suggested that a patient's age, tobacco usage, surgical time, and underlying disease severity were complicating factors in microvascular surgery. Therefore, to prevent vessel thrombosis, antithrombotic therapy using heparin, aspirin, or dextran could be used. The physician should closely monitor the flap's perfusion, infection, and inappropriate movement, which can lead to flap failure<sup>15,18,19,20</sup>.

In conclusion, early diagnosis of GCOC is very important because GCOC treatment options are necessary for wide massive excision. Clinicians should be conscientious about GCOC's clinicopathological features which have been discussed in some of the literature and in case reports, even though GCOC cases are very rare.

### Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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The written informed consent was obtained from the patient.

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