

## Parotid Gland Carcinosarcoma with Osteosarcoma as a Sarcomatous Component: A Case Report with Fine Needle Aspiration Cytologic Findings

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Carcinosarcoma of the salivary glands is a rare malignant tumor showing both malignant epithelial and mesenchymal components. Herein, we present a carcinosarcoma of the parotid gland in a 67-year-old man consisting of osteosarcoma and adenocarcinoma components with fine needle aspiration cytological findings. The tumor was composed predominantly of osteosarcoma and small areas of adenocarcinomatous components and a hyalinized nodule reminiscent of pleomorphic adenoma. The tumor showed infiltrative growth features with perineural, lymphatic, and vascular invasion. Despite postoperative adjuvant radiation therapy, multiple metastatic lesions occurred in the both lungs 5 months after surgery. As salivary gland carcinosarcoma has been known to demonstrate highly aggressive behavior, an accurate pathological diagnosis is prerequisite for appropriate treatment.

**Key Words:** Carcinosarcoma; Osteosarcoma; Adenocarcinoma; Fine-needle aspiration cytology; Parotid gland

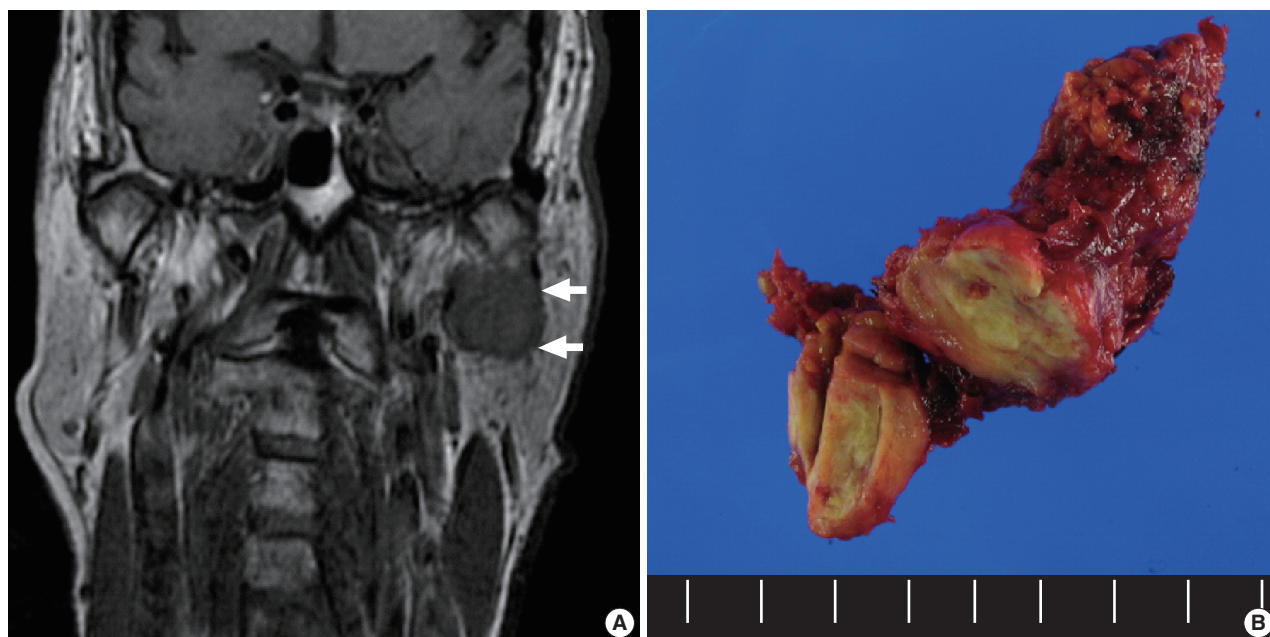
Carcinosarcoma of the salivary glands is an exceedingly rare malignant neoplasm composed of a mixture of carcinomatous and sarcomatous components.<sup>1,2</sup> It represents only 0.04-0.16% of salivary gland tumors and 0.4% of malignant salivary gland tumors.<sup>1</sup> Carcinosarcoma of the salivary glands was initially described by Kirklin *et al.* (Surg Gynecol Obstet, 1951), and fewer than 80 cases have been reported in the English literature.<sup>3-5</sup> The most common malignant epithelial component is ductal carcinoma (adenocarcinoma, not otherwise specified), and the most common malignant mesenchymal component is chondrosarcoma.<sup>6</sup> Osteosarcoma is a rare type of malignant mesenchymal component in carcinosarcomas of the salivary glands. To the best of our knowledge, only eight cases of carcinosarcomas with osteosarcoma as the sarcomatous element have been described.<sup>3</sup> Here, we report an additional case of carcinosarcoma with an osteosarcoma arising in the left parotid gland, together with the findings of fine needle aspiration cytology (FNAC).

### CASE REPORT

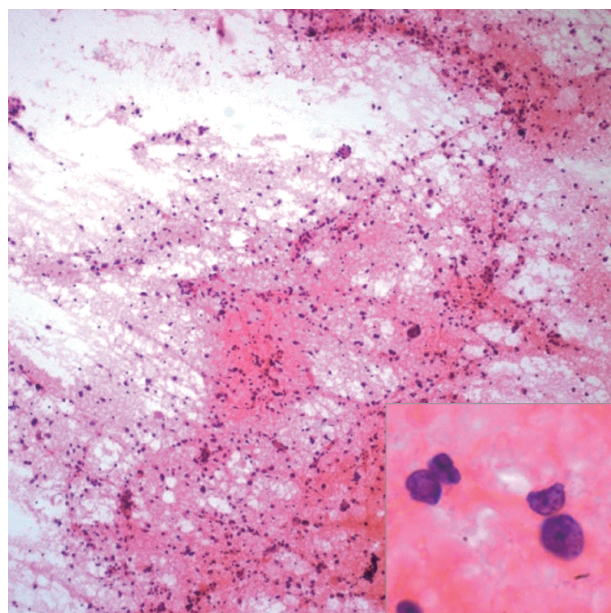
A 67-year-old man visited our hospital due to pain and swell-

ing in the left preauricular area for 1 month. He had a history of myocardial infarction 5 years previously. A neck magnetic resonance image revealed a 3 cm sized, well-demarcated heterogeneous mass in the deep lobe of the left parotid gland (Fig. 1A). Intratumoral calcification was recognized, and FNAC was performed. The cytological smear revealed a high number of atypical cells with nuclear pleomorphism. The tumor cells were markedly irregular in size and shape. Most tumor cells were non-cohesive and were scattered in a hemorrhagic background (Fig. 2). Some small clusters of tumor cells were occasionally evident. We also observed dense collagenous matrix material with peripheral atypical cells. The cytological findings were suggestive of the possibility of a mesenchymal malignancy.

A left parotidectomy was performed, and the cut section of the left parotid gland revealed an unencapsulated, infiltrative tumor with a grayish and fibrotic surface (Fig. 1B). Microscopically, the tumor was composed predominantly of an osteosarcomatous component consisting of highly anaplastic tumor cells and abundant intercellular osteoid material, frequent calcification and multinucleated tumor giant cells. Small areas of an adenocarcinomatous component were observed in a poorly differentiated pattern alongside the osteosarcomatous component



**Fig. 1.** Neck magnetic resonance imaging (MRI) and gross picture of the resected parotid gland. (A) Initial neck MRI reveals a well-demarcated tumor with heterogeneity in the deep lobe of the left parotid gland. (B) The cut section of the parotid gland reveals a non-encapsulated, infiltrative tumor with a grayish and fibrotic surface.



**Fig. 2.** Cytological findings. Fine needle aspiration cytology smear displays a high number of atypical cells with nuclear pleomorphism. Most tumor cells are non-cohesive and are scattered in a hemorrhagic background.

(Fig. 3). The tumor showed a highly infiltrative pattern with frequent perineural, lymphatic, and vascular invasion. Dissection of the periparotid lymph nodes revealed metastasis in one node. Immunohistochemical staining showed that the sarcoma-

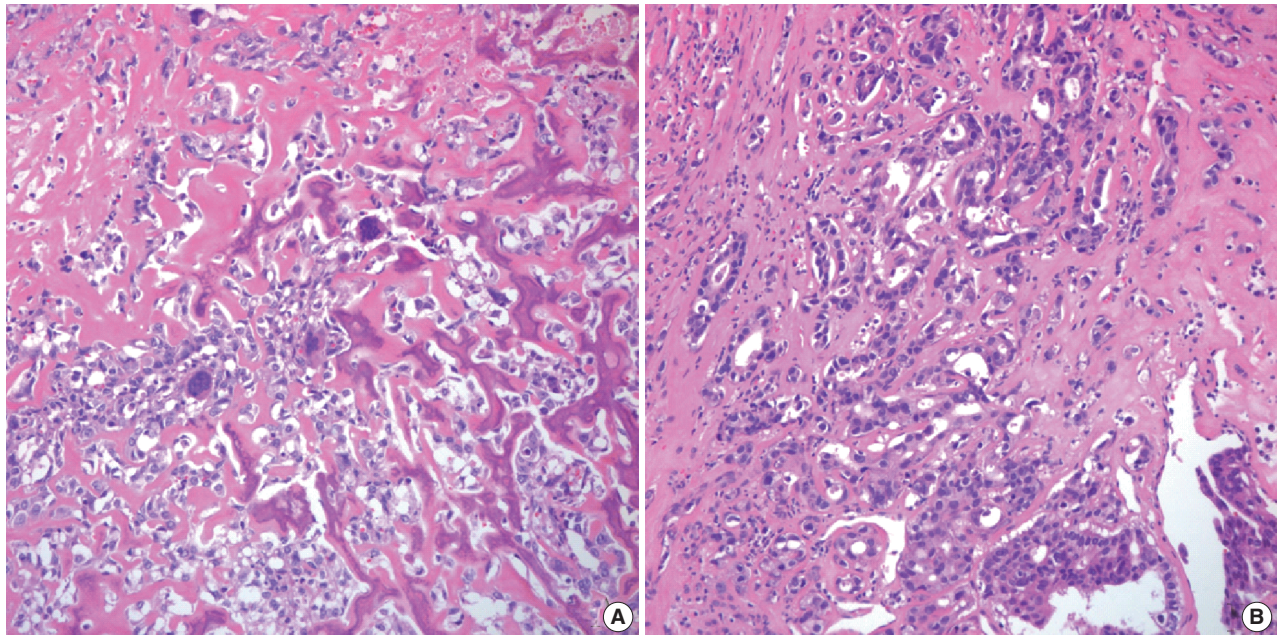
tous components were strongly positive for vimentin but negative for cytokeratin, whereas the carcinomatous components were strongly positive for cytokeratin but negative for vimentin. A small hyalinized fibrotic nodule suggestive of an old pleomorphic adenoma was observed in the periphery of the carcinosarcoma. After surgical treatment, the patient received radiotherapy. However, follow-up imaging 5 months postoperatively revealed multiple nodules in both lungs, and these proved to be metastatic osteosarcoma upon pathological examination (Fig. 4).

## DISCUSSION

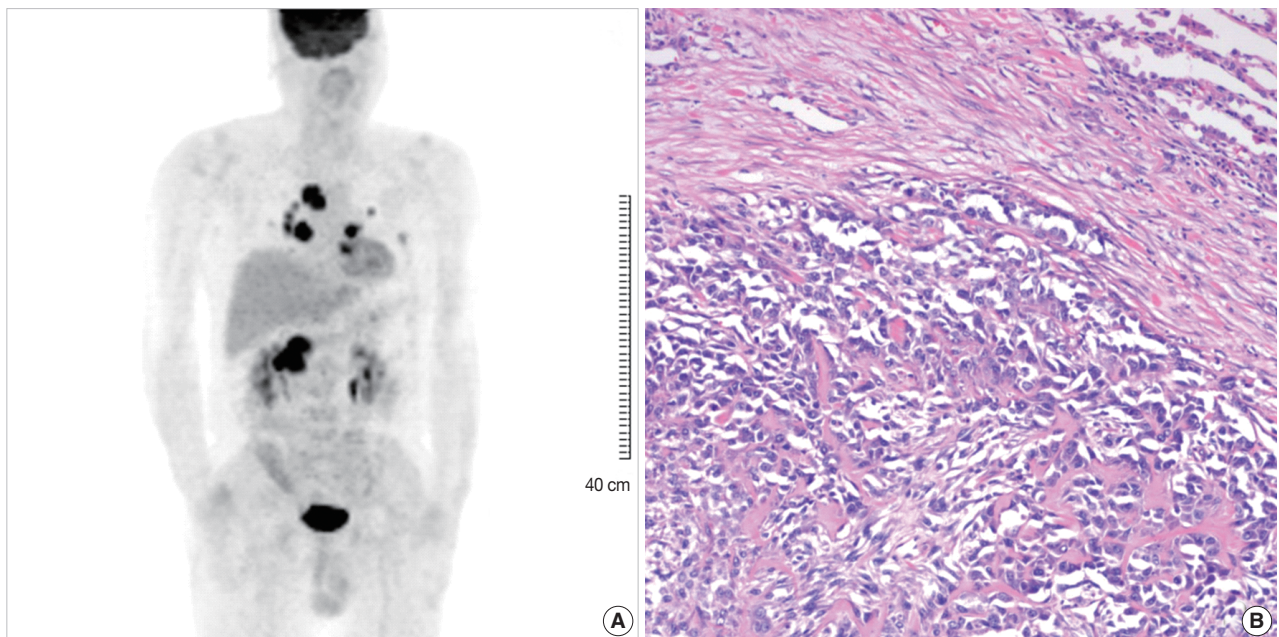
In this report, we documented an exceedingly rare case of parotid gland carcinosarcoma that was composed of malignant mesenchymal tissue exhibiting osteosarcomatous differentiation and malignant epithelial tissue that had undergone adenocarcinomatous differentiation. Osteosarcoma as a sarcomatous element is a rare finding in salivary gland carcinosarcomas. Staffieri *et al.*,<sup>3</sup> reviewing the English literature, found 71 reported cases of salivary gland carcinosarcoma of which only eight contained osteosarcoma as the sarcomatous component. The reported cases<sup>7-14</sup> of salivary gland carcinosarcoma containing osteosarcoma are summarized in Table 1.

The patients were five males and three females ranging in age





**Fig. 3.** Histopathological findings. (A) The tumor is composed of a sarcomatous element and a carcinomatous element. The sarcomatous area contains pleomorphic mesenchymal cells with abundant intercellular osteoid matrix. (B) The carcinomatous area displays features of an adenocarcinoma.



**Fig. 4.** Whole body positron emission tomography-computed tomography (PET-CT) scan and microscopic picture of the metastatic lung tumor. (A) A follow-up PET-CT image contains multiple hypermetabolic lung nodules suggestive of metastasis. (B) The nodules proved to be metastatic osteosarcoma.

from 51 to 83 years (mean, 65 years). All had an adenocarcinoma as the carcinomatous component, and two displayed squamous cell differentiation. The sarcomatous components were chondrosarcomas, rhabdomyosarcomas, and/or fibrosarcomas.

Five cases involved the parotid glands and three the submandibular glands. In the present case, the sarcomatous component was an osteosarcoma, and the carcinomatous component was an adenocarcinoma. The tumor involved the left parotid gland,

**Table 1.** Carcinosarcomas of the salivary glands with osteosarcoma components: a review of the literature

Author	Age (yr)/Sex	Type of carcinoma	Type of sarcoma	Location
Garner <i>et al.</i> (1989) <sup>7</sup>	57/F	Adenocarcinoma	Osteosarcoma, chondrosarcoma	Parotid gland
Yamashita <i>et al.</i> (1990) <sup>8</sup>	52/M	Poorly differentiated adenocarcinoma with squamous cell differentiation	Osteosarcoma chondrosarcoma, fibrosarcoma	Submandibular gland
Bleiweiss <i>et al.</i> (1992) <sup>9</sup>	64/M	Ductal adenocarcinoma	Osteosarcoma	Submandibular gland
de la Torre and Larsson (1995) <sup>10</sup>	83/F	Adenocarcinoma	Osteosarcoma, chondrosarcoma	Parotid gland
Carson <i>et al.</i> (1995) <sup>11</sup>	51/F	Adenocarcinoma	Osteosarcoma	Parotid gland
Gogas <i>et al.</i> (1999) <sup>12</sup>	77/M	Ductal adenocarcinoma	Osteosarcoma, chondrosarcoma, rhabdomyosarcoma	Submandibular gland
Sironi <i>et al.</i> (2000) <sup>13</sup>	77/M	Ductal adenocarcinoma squamous cell carcinoma	Osteosarcoma	Parotid gland
Mardi and Sharma (2004) <sup>14</sup>	59/M	Ductal adenocarcinoma	Osteosarcoma, chondrosarcoma	Parotid gland
Present case	67/M	Adenocarcinoma	Osteosarcoma	Parotid gland

F, female; M, male.

**Table 2.** Carcinosarcomas of the salivary glands in Korea: a review of the literature

Author	Age (yr)/Sex	Type of carcinoma	Type of sarcoma	Location
Koh <i>et al.</i> (1992) <sup>15</sup>	55/M	Undifferentiated carcinoma with focal areas of ductal differentiation	Pleomorphic sarcoma with chondrosarcomatous differentiation	Parotid gland
Park <i>et al.</i> (2003) <sup>16</sup>	27/M	Squamous cell carcinoma	Fibrosarcoma	Submandibular gland
Kim <i>et al.</i> (2008) <sup>17</sup>	83/F	Small cell carcinoma	Undifferentiated malignant mesenchymal features	Parotid gland

M, male; F, female.

and the patient was a 67-year-old man. Currently, only three cases<sup>15-17</sup> of salivary gland carcinosarcoma have been reported in Korea, and no case showing an osteosarcoma as a sarcomatous component has been reported (Table 2).

FNAC is cost-effective and has high sensitivity and specificity. It is increasingly critical for clinicians to obtain an immediate and accurate diagnosis of salivary gland neoplasms prior to planning surgical or radiological therapy. However, only four reports have described the FNA cytological findings of salivary gland carcinosarcomas.<sup>10,13,18,19</sup> In two cases, FNA revealed a chondrosarcomatous component together with a carcinomatous element. The epithelial components of carcinosarcomas do not present a diagnostic problem because most cytopathologists are familiar with the varying cytological presentations of carcinomas. However, the sarcomatous component is a diagnostic challenge, as it is difficult to recognize an undifferentiated sarcomatous element lacking a distinct pattern of growth. In our case, the cytological smear of the aspirate revealed an undifferentiated sarcomatous element composed of individual pleomorphic cells and atypical cell clusters, which suggested the possibility of mesenchymal malignancy. When we reviewed the cytology after histopathological confirmation of the carcinosarcoma, we noted a small acellular cluster with amorphous collagenous material, suggestive of osteoid.

The exact origin of salivary gland carcinosarcomas is contro-

versial. There are three hypotheses.<sup>2,9</sup> The first is a collision hypothesis according to which the carcinoma and the sarcoma form independently and then intermingle. The second hypothesis is that the carcinoma provokes a sarcoma-like reaction from the surrounding connective tissue. The third hypothesis and most widely accepted is that the tumor is derived from dedifferentiated cells, pluripotent cells, or undifferentiated multipotent cells that are capable of divergent differentiation, and, thus, is a true carcinosarcoma. Vékony *et al.*<sup>4</sup> reported that the extensively overlapping genomic profiles of the two cellular components strongly suggested that the epithelial and mesenchymal elements are derived from a single common precursor cell. Salivary gland carcinosarcomas could arise in pre-existing pleomorphic adenomas but may not contain any benign mixed tumor remnant.<sup>3</sup> In our case, there was a co-existing pleomorphic adenoma, which supports the hypothesis that carcinosarcomas of the salivary glands arise in pleomorphic adenomas.

Salivary gland carcinosarcoma is a highly aggressive malignant tumor. Local recurrence and metastasis via lymphatic and hematological pathways to both local and distant sites are seen in up to 50% of patients. Stephen *et al.*<sup>20</sup> reported that the mean survival time of patients was 3.6 years. In our patient, the tumor displayed highly infiltrative growth with perineural, lymphatic, and vascular tumor invasion, and the periparotid lymph nodes revealed metastasis of the sarcomatous component. Mul-



triple metastatic tumor nodules were evident in both lungs 5 months postoperatively and, interestingly, these metastatic nodules consisted entirely of the sarcomatous component with osteosarcomatous features.

Although a definitive treatment protocol has not been established, the routinely used treatment is surgery and radiotherapy, with the possible addition of chemotherapy. Because hematogenous metastasis is more common than lymphatic metastasis, radical neck dissection is appropriately reserved for patients with a lymphadenopathy. However, the survival rate for this tumor has been reported as 0% at 5 years.<sup>2</sup>

In summary, we described an extremely rare case of parotid gland carcinosarcoma that demonstrated osteosarcomatous differentiation as the sarcomatous component and adenocarcinomatous differentiation as the carcinomatous component. As salivary gland carcinosarcomas demonstrate highly aggressive behavior, an accurate pathologic diagnosis is prerequisite for appropriate treatment.

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