Clinical Case Report

Medicine®

OPEN

An unusual case of intraosseous mucoepidermoid carcinoma of the mandible

A case report and literature review

Xiang Li, MD[a,b], Feng Wang, MD[a], Yufan Wang, PhD[a], Shuai Sun, MD[a], Hongyu Yang, PhD[a,b,*]

Abstract

Rationale: Mucoepidermoid carcinoma (MEC) is the most common primary salivary gland malignancy. Ectopic MEC can occur in any part of the body, however, only 2% to 4% of MEC could be detected in the jaw, which is named intraosseous mucoepidermoid carcinoma (IMC). IMC is usually a low-grade carcinoma. Uni- or multilocular radiographic lesions should be differential diagnosed with ameloblastoma, odontogenic cysts, and glandular odontogenic cyst (GOC). Radical surgery may prefer for a favorable prognosis. Whereas IMC can recur long after the operation, a long-term follow-up system should be implemented. Owing to its rarity and controversial issues, we report a case report and review the literature to discuss its clinical features, treatments, radiological, and histological characteristics.

Patient concerns: The patient presented with a 2-month history of mild pain in the lower left posterior jaw without history of surgery or trauma to the mandible.

Diagnoses: Routine postoperative pathology showed that the mass was consistent with a mandibular mucoepidermoid carcinoma.

Intervention: Radical surgery and digital mandibular reconstruction were performed.

Outcome: Postoperative imaging showed that the height of the mandible and the symmetry of the mandible were satisfactory. The patient was also satisfied with her appearance. Follow-up has been established.

Lessons: Effective surgical treatment allows patients to have a favorable prognosis. A long-term follow-up system should be practiced, because local recurrences and regional metastasis could happen even after decades.

Abbreviations: CMC or CEMC = central mucoepidermoid carcinoma, CT = computed tomography, GOC = glandular odontogenic cyst, IMC = intraosseous mucoepidermoid carcinoma, MEC = mucoepidermoid carcinoma.

Keywords: digital mandibular reconstruction, intraosseous mucoepidermoid carcinoma, radical surgery

1. Introduction

Mucoepidermoid carcinoma (MEC) is the most common primary salivary gland malignancy and consists of mucous, intermediate cells, and epidermoid cells. This tumor accounts for about 30% of malignant salivary gland tumors and about 12% of all salivary gland tumors. MEC mainly occurs in the parotid glands and small salivary glands, whereas ectopic MEC can occur in any part of the body. Nevertheless, it is still rarely detected in the jaw, which only accounts for 2% to 4% of MEC.[1] Intraosseous MEC (IMC) is often located in the posterior part of the mandible and can cause swelling, pain, and numbness of the mandible. Because the imaging and clinical manifestations of IMC are very similar to those of ameloblastoma and odontogenic cysts, preoperative diagnosis is challenging.

In this paper, we review a case of a left IMC that was surgically managed by tumor resection and bone reconstruction along with special digitized techniques.

2. Case report

A 33-year-old woman presented with a 2-month history of mild pain in the lower left posterior jaw. She had no history of surgery or trauma to the mandible. Panoramic radiography at another hospital showed a large hypointense lesion with an irregular edge

Editor: N/A.

XL and FW have contributed equally to this work.

This work was supported by the National Natural Science Foundation of China (Grant No.81572654), the basic Research Program of Shenzhen Innovation Council of China (Grant No. JCYJ20150403091443303, JCYJ20150403091443286, JCYJ2016 0428173933559, and SZBC2017023) and Sanming Project of Medicine in Shenzhen (SZSM 201512036, Oral and Maxillofacial Surgery Team, Professor Yu Guangyan, Stomatology Hospital Peking University).

The authors declare that there is no conflict of interest regarding the publication of this article.

[a] Department of Oral and Maxillofacial Surgery, Peking University Shenzhen Hospital, Shenzhen, Guangdong Province, [b] Graduate Department, Anhui Medical University, Hefei, Anhui Province, P.R. China.

[*] Correspondence: Hongyu Yang, Department of Oral and Maxillofacial Surgery, Peking University, Shenzhen Hospital, Shenzhen, Guangdong Province, P.R. China (e-mail: hyyang192@hotmail.com).

Medicine (2018) 97:51(e13691)

Received: 27 August 2018 / Accepted: 22 November 2018

http://dx.doi.org/10.1097/MD.0000000000013691

in the lower left posterior jaw, and examination of a biopsy specimen indicated a low-grade MEC in the mandible.

Clinical examination revealed no swelling of the left mandible or difficulty chewing. The only abnormality was swollen gums in the left retromolar area and mandibular ramus. The superficial mucosa was intact with no obvious tenderness. Non-swollen lymph nodes were found in the submental and submandibular regions. Panoramic radiography in our hospital showed that the large hypointense lesion in the left retromolar area and mandibular ramus and the distal root of tooth 37 had been absorbed (Fig. 1). Computed tomography (CT) showed that the left mandibular bone was not dilated, and a $24 \times 17.5 \times 43$ mm cystic space-occupying lesion was present in the ascending branch of the left mandible (Fig. 2). The digital information of the CT examination was collected. A three-dimensional digital model was then established based on this information, and we planned partial mandibular resection with placement of a microvascular fibula myocutaneous flap to reconstruct the shape of the mandible and a free fibula flap to restore the height of the mandible. These flaps were used not only to restore the maxillofacial profile but also to provide a possibility for later dental implantation. The range of resection and the reconstruction of the length and angle of the fibula were pre-designed with reference to the three-dimensional model (Fig. 3).

The patient underwent radical tumor resection under the assistance of the digital design and ipsilateral functional neck dissection through a standard transcervical approach with lip splitting. Intraoperatively, the surgical margins were located at the distal part of the condyle and the left mandibular lateral incisors. No bone erosion or destruction was present at the margins. The shaped pedicled fibular myocutaneous flap and the free fibula flap were used to reconstruct the mandible with small plates and screws. The ipsilateral submandibular gland and cervical lymph nodes were completely excised, and the operation areas were closed eventually.

The main body of the lesion was located in the inflated part of the jaw. Routine postoperative pathological examination revealed that the specimen was cystic structure and lined by myxoid cells, high columnar cells, and squamous epithelial cells. The diagnosis of low-grade IMC was confirmed based on histopathology and imaging. The histopathological features showed only reactive hyperplasia of lymph nodes; no lymph node metastasis was found in the left cervical lymph node specimens. Therefore, the patient did not undergo postoperative adjuvant treatment. Meanwhile, immunohistochemistry results showed positive results for ck7, 18 and mucin (Fig. 4).

Postoperative imaging showed that the height of the mandible and the symmetry of the mandible were satisfactory (Fig. 5). The patient was also satisfied with her appearance. Healing of the microvascular and free fibula flaps during the long-term follow-up would allow for the performance of secondary operations. The patient has been on regular follow-up for >8 months without any evidence of recurrence. Ethics approval was not required for this paper as it is a case report. Informed consent was obtained from the patient for publication of this case report and accompanying images.

3. Discussion

IMC has mainly been reported through clinical cases. A review of these references indicates that IMC is also called central MEC (CMC or CMEC). IMC was first described by Lepp in 1939.[2] Roshan et al[3] reported that fewer than 110 cases of IMC had been reported to date. PubMed databases were searched up from January 1, 2000 to July 1, 2018 for relevant studies. Additionally, we reviewed reference lists from relevant articles to identify any pertinent studies. No language restrictions were imposed. Our literature search yielded 28 potentially relevant articles and 133 cases totally. The main characteristics of the 133 cases are summarized in Tables 1 and 2. IMC is, commonly, a rare low-grade malignant salivary gland tumor occurring in the jaws. However, the etiology of IMC remains ambiguous. Possible theories regarding the pathogenesis and origin of IMC include entrapment of retromolar mucous glands within the mandible with subsequent neoplastic transformation of these glands, developmentally included embryonic remnants of the subman-

Figure 1. Panoramic radiography delivered a large well-defined unilocular hypointense at the left retromolar area and mandibular ramus and the distal root of 37 had been absorbed.

Figure 2. Computed tomography showed that the left mandibular bone was not dilated, and a 24 mm × 17.5 mm × 43 mm unilocular lesion without cortical erosion in the left mandible.

dibular and sublingual glands within the mandible, neoplastic transformation of the mucous-secreting cells commonly found in the pluripotential epithelial lining of dentigerous cysts associated with impacted third molars, and neoplastic transformation and invasion from the lining of the maxillary sinus.[21] Zhou et al[20] considered that the most likely pathogenesis of IMC was neoplastic transformation of the epithelial lining of an odontogenic cyst whose conclusion was based on a study of 39 Chinese

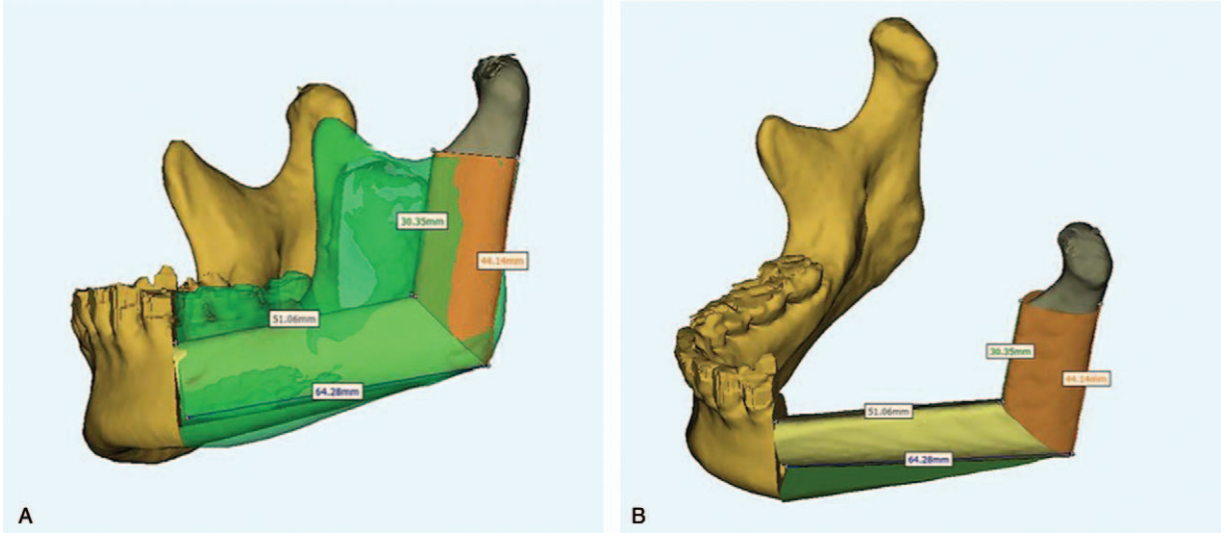

Figure 3. The three-dimensional digital model was designed to simulate the extent of tumor resection (A) and to simulate the fibular reconstruction of the mandible (B).

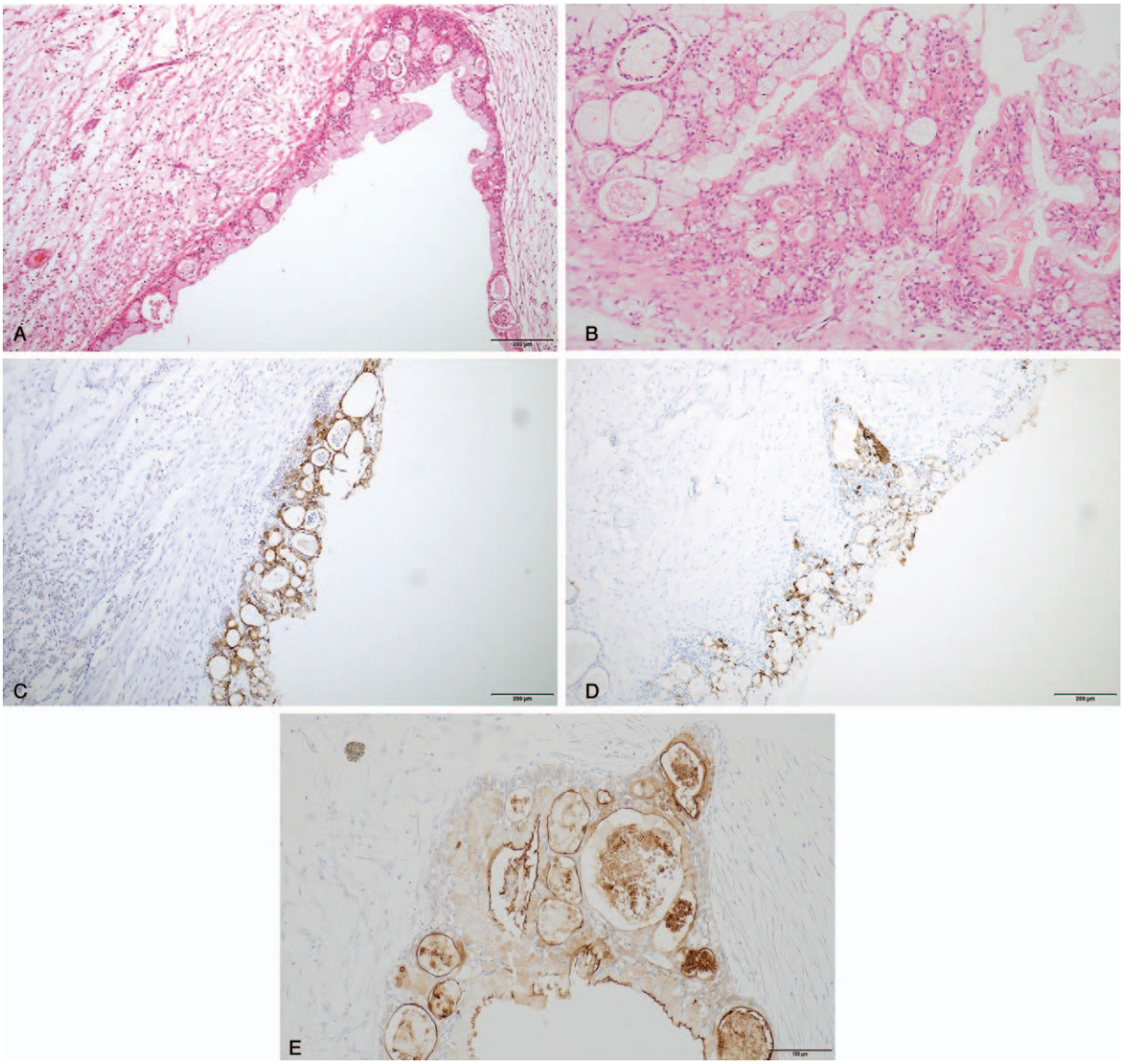

Figure 4. Histopathological features of IMC: cystic structure (A) and tumor tissue is composed of epithelial, mucous and columnar cells (B). Immunohistochemical staining of tumor tissue showed a strong positive reaction to cytokeratin 7 (C), cytokeratin 18 (D) (original magnification, 100), and mucin 1 (E) (original magnification, 200). IMC = intraosseous mucoepidermoid carcinoma.

IMC patients. IMC can occur at any age, but it predominantly occurs in the fourth and fifth decades. The morbidity rate of female patients is twice that of male patients. However, Lucas reported that the peak age of IMC ranged from 50 to 70 years and that the female:male ratio was only 1.07:1.00, which differs from the results of other researchers.[22] In these 133 cases, patients' age (median, 47 y) and female to male ratio (1.18:1.00) were in general agreement with those of previous reports.

Panoramic radiography is a cost-effective auxiliary diagnostic tool for evaluating the jaw bone mass. However, panoramic radiography does not allow assessment of the degree of destruction of bone lesions or their invasion into the surrounding tissues. However, CT could be a better choice among auxiliary diagnostic techniques. It offers a large amount of information on the size, location, and area of the tumor in the region. It also provides digital information that facilitates digitally designed treatments. Imaging examinations are also important for evaluation of IMC grades. A three-grade classification for IMC has been established: grade 1, lesions without expansion or rupture of the cortical plate; grade 2, lesions with expansion but without rupture of the cortical plate; and grade 3, lesions with rupture of the cortical plate or the presence of regional metastasis.[23] The present case was classified as grade 1.

Although panoramic radiography and CT can provide valuable information, the preoperative diagnosis of IMC is still challenging. Differential diagnoses include odontogenic keratocyst, ameloblastoma, dentigerous cyst, and glandular odontogenic cyst (GOC). Radiologically, IMC has features of a well-circumscribed unilocular or multilocular radiolucency affecting the molar and ramus regions. Unilocular lesions are similar to benign odontogenic keratocysts and dentigerous cysts. Multilocular lesions have an internal structure resembling a honeycomb and should be distinguished from an ameloblastoma. GOC is difficult to distinguish based on imaging findings; instead,

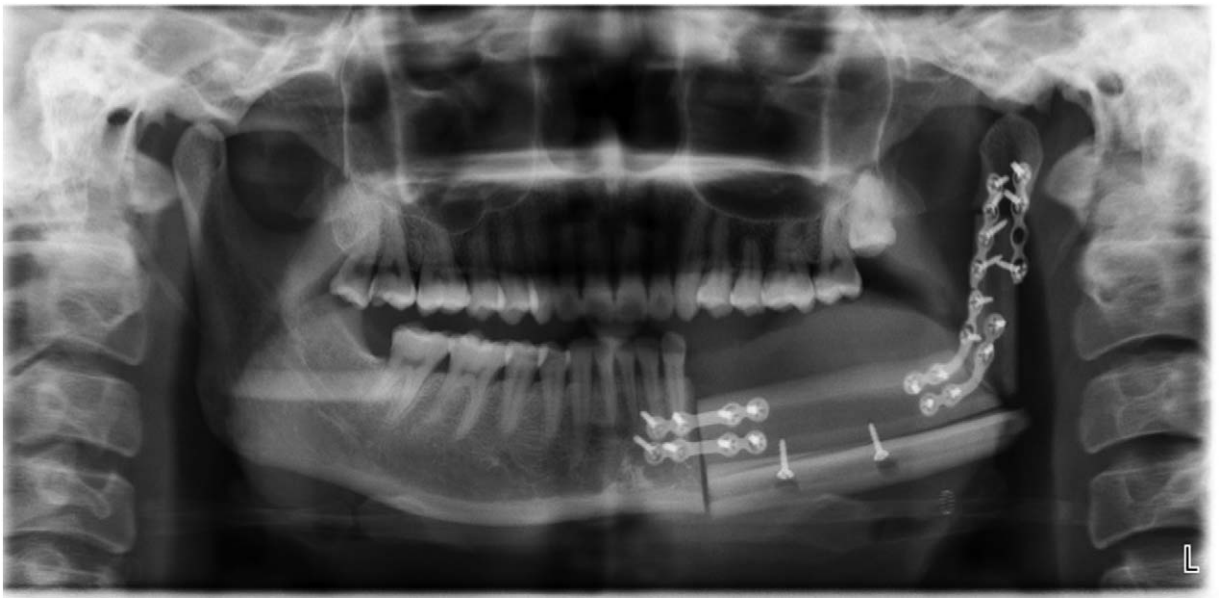

Figure 5. Postoperative panoramic radiography revealing the height of the mandible and the symmetry of the mandible.

Table 1

Reported cases of intraosseous mucoepidermoid carcinoma.

Study	Age/ Sex	Location	Size	Symptoms	Treatment	Pathology	Follow-up (y)	Recurrence
Basaran et al[4]	48/F	Maxilla	23 × 15 × 19 mm	NA	Surgery	MEC	2	No
Basaran et al[4]	54/M	Left mandible	NA	Pain	Surgery	MEC	3	No
Basaran et al[4]	49/F	Mandible	NA	Mass	Surgery	MEC	2	No
Merna et al[5]	35/M	Maxilla	65 mm (diameter)	Pain, congestion	Surgery	MEC	0	NA
Merna et al[5]	61/F	Hard palate	25 mm (diameter)	Mass	Surgery	MEC	15.3	No
Merna et al[5]	31/F	Hard palate	15 mm (diameter)	Mass	Surgery	MEC	NA	NA
Merna et al[5]	78/F	Maxilla	16 mm (diameter)	Otalgia	Surgery	MEC	2.1	No
Merna et al[5]	54/F	Hard palate	NA	NA	Surgery	MEC	NA	NA
Merna et al[5]	66/F	Sphenoid sinus	30 mm (diameter)	Headache, eye pain	Surgery + radiotherapy	MEC	0.1	NA
Merna et al[5]	47/F	Hard palate	NA	NA	NA	MEC	11.8	NA
Merna et al[5]	72/M	Maxilla	40 mm (diameter)	Headache, epistaxis	Surgery	MEC	7	No
Merna et al[5]	63/F	Mandible	NA	NA	NA	MEC	NA	NA
Merna et al[5]	48/F	Maxilla	30 mm (diameter)	Mass	Surgery	MEC	5	No
Merna et al[5]	36/F	Maxilla	20 mm (diameter)	Mass, pain	Surgery	MEC	0.6	No
Merna et al[5]	52/F	Maxilla	NA	NA	Surgery	MEC	NA	NA
Merna et al[5]	76/F	Maxilla	15 mm (diameter)	Mass	Surgery + radiotherapy	MEC	6.5	No
Merna et al[5]	61/F	Mandible	25 mm (diameter)	Pain, numbness, paresthesias	Surgery	MEC	3	No
Merna et al[5]	25/F	Mandible	10 mm (diameter)	Mass	Surgery	MEC	NA	NA
Merna et al[5]	31/F	Maxilla	22 mm (diameter)	Mass	Surgery	MEC	1.9	No
Merna et al[5]	60/F	Retromolar trigone	17 mm (diameter)	Pain	Surgery	MEC	NA	NA
Merna et al[5]	45/M	Maxilla	11 mm (diameter)	Bloody nasal, discharge	Surgery	MEC	0.9	No
Merna et al[5]	80/M	Mandible	57 mm (diameter)	Numbness, teeth loosening	Surgery + radiotherapy	MEC	4.5	No
Merna et al[5]	47/M	Mandible	18 mm (diameter)	Mass	Surgery + radiotherapy	MEC	6.7	No
Merna et al[5]	28/F	Maxilla	45 mm (diameter)	Mass	Surgery	MEC	2.6	No
Merna et al[5]	44/F	Maxilla	15 mm (diameter)	Ulcer	Surgery + radiotherapy	MEC	0.6	No
Merna et al[5]	65/F	Mandible	42 mm (diameter)	Mass	Surgery + radiotherapy	MEC	0.25	No
Purohit et al[6]	28/M	Maxilla	50 × 40 mm (mix variety)	Swelling	Surgery + further management	MEC (low grade)	1	No
Martins et al[7]	17/M	Hard palate	50 mm (diameter)	Swelling	Surgery	MEC (low grade)	1	No
Nallamilli et al[8]	36/M	Maxilla	50 × 30-mm	Swelling, pain	Biopsy	MEC (high grade)	NA	NA
Bell et al[9]	18/M	Mandibular body	NA	NA	Surgery	MEC (low grade)	2.2	No
Bell et al[9]	31/M	Maxilla	NA	NA	Surgery	MEC (intermediate grade)	3	No
Bell et al[9]	49/M	Mandibular body	NA	NA	Surgery	MEC (low grade)	1.8	No
Bell et al[9]	71/F	Mandible	NA	NA	Surgery	MEC (low grade)	3.1	No
Bell et al[9]	64/M	Maxilla	NA	NA	Surgery	MEC (intermediate grade)	2.8	Yes
Bell et al[9]	43/M	Mandible	NA	NA	Surgery	MEC (intermediate grade)	0.8	NA
Bell et al[9]	66/M	Mandible	NA	NA	Surgery	MEC (intermediate grade)	5.5	No
Bell et al[9]	62/M	Mandible	NA	NA	Surgery + radiotherapy	MEC (low grade)	4.3	No
Bell et al[9]	28/F	Maxilla	NA	NA	Surgery + radiotherapy	MEC (intermediate grade)	3	Yes
Bell et al[9]	66/M	Maxilla	NA	NA	Surgery + radiotherapy	MEC (low grade)	2	No
Bell et al[9]	35/M	Maxilla	NA	NA	Surgery	MEC (low grade)	2.1	No
Bell et al[9]	57/M	Mandible	NA	NA	Surgery	MEC (intermediate grade)	3.3	No
Bell et al[9]	55/F	Maxilla	NA	NA	Surgery + radiotherapy	MEC (high grade)	0	NA
Bell et al[9]	60/F	Mandible	NA	NA	Surgery + radiotherapy	MEC (intermediate grade)	1.8	Yes
Bell et al[9]	44/M	Mandible	NA	NA	Surgery	MEC (low grade)	1.7	No
Bell et al[9]	65/M	Mandible	NA	NA	Surgery + radiotherapy	MEC (intermediate grade)	0.4	No
Bell et al[9]	54/F	Maxilla	NA	NA	Surgery	MEC (low grade)	4.5	No
Bell et al[9]	17/F	Maxilla	NA	NA	Surgery + radiotherapy	MEC (intermediate grade)	3.7	No
Bell et al[9]	35/F	Maxilla	NA	NA	Surgery + radiotherapy	MEC (intermediate grade)	3.2	No
Bell et al[9]	69/M	Maxilla	NA	NA	Surgery + radiotherapy	MEC (intermediate grade)	2.2	No
Bell et al[9]	41/F	Maxilla	NA	NA	Surgery + radiotherapy	MEC (high grade)	1.6	No

(*continued*)

Table 1

(continued).

Study	Age/ Sex	Location	Size	Symptoms	Treatment	Pathology	Follow-up (y)	Recurrence
Bell et al[9]	79/F	Maxilla	NA	NA	Surgery + radiotherapy	MEC (intermediate grade)	1.5	No
Bell et al[9]	8/F	Maxilla	NA	NA	Surgery + radiotherapy	MEC (high grade)	0.7	No
Rathore et al[10]	18/M	Maxilla	30 × 20 mm	Swelling, pain	Surgery	MEC (low grade)	1	No
Atarbashi et al[11]	44/F	Mandible	NA	Swelling	Surgery	MEC (low grade)	NA	NA
Atarbashi et al[11]	56/F	Mandible	NA	Swelling	Biopsy + without further therapy	MEC (low grade)	NA	NA
Spoorthi et al[12]	80/F	Mandible	20 × 30 mm	Swelling, pain	Surgery	MEC (low grade)	NA	NA
da Silva et al[13]	28/M	Mandible	40 mm (diameter)	Pain	Surgery	MEC (low grade)	1.7	No
Lakouichmi et al[14]	42/F	Maxilla	26 × 22 mm	Pain	Surgery + radiotherapy	MEC	NA	NA
He et al[15]	46/F	Mandibular ramus	25 × 30 mm	Swelling	Surgery + radiotherapy	MEC (low grade)	14	No
He et al[15]	65/M	Mandibular body	20 × 30 mm	Swelling	Surgery + radiotherapy	MEC (low grade)	8	No
He et al[15]	43/M	Mandibular body	40 × 30 mm	Numbness, odontoseisis	Surgery + radiotherapy	MEC (intermediate grade)	7	No
He et al[15]	61/M	Maxilla	15 × 15 mm	Toothache	Surgery + radiotherapy	MEC (intermediate grade)	6	NA
He et al[15]	78/M	Mandibular body	20 × 20 mm	Pain	Surgery + radiotherapy	MEC (high grade)	1	NA
He et al[15]	56/F	Maxilla	50 × 30 mm	Toothache	Surgery + radiotherapy	MEC (intermediate grade)	7	No
He et al[15]	60/M	Mandibular body	80 × 80 mm	Numbness, restriction of mouth opening	Surgery + radiotherapy	MEC (high grade)	2.4	NA
He et al[15]	45/M	Maxilla	40 × 40 mm	Numbness	Surgery + radiotherapy	MEC (intermediate grade)	3	NA
He et al[15]	53/M	Maxilla	30 × 35 mm	Swelling	Surgery + radiotherapy	MEC (intermediate grade)	5.5	No
He et al[15]	26/M	Maxilla	60 × 60 mm	Swelling	Surgery + radiotherapy	MEC (intermediate grade)	5	No
He et al[15]	57/M	Maxilla	10 × 10 mm	Swelling	Surgery + radiotherapy	MEC (intermediate grade)	1	NA
He et al[15]	56/F	Maxilla	50 × 40 mm	Swelling	Surgery + radiotherapy	MEC (low grade)	4.6	No
He et al[15]	42/F	Mandibular body	25 × 20 mm	Swelling	Surgery + radiotherapy	MEC (low grade)	4	No
He et al[15]	34/M	Mandibular body	20 × 30 mm	Swelling	Surgery	MEC (low grade)	1.5	Yes
He et al[15]	34/M	Maxilla	30 × 40 mm	Pain	Surgery + radiotherapy	MEC (low grade)	3	Yes
He et al[15]	32/F	Maxilla	35 × 30 mm	Swelling	Surgery + radiotherapy	MEC (low grade)	3.8	No
He et al[15]	62/M	Maxilla	20 × 30 mm	Epistaxis	Surgery	MEC (low grade)	2	NA
He et al[15]	31/F	Maxilla	30 × 30 mm	Swelling	Surgery + radiotherapy	MEC (low grade)	3.2	No
He et al[15]	38/F	Maxilla	15 × 15 mm	Swelling, toothache	Surgery + radiotherapy	MEC (low grade)	3.1	No
He et al[15]	19/F	Maxilla	40 × 50 mm	Numbness, odontoseisis	Surgery + radiotherapy	MEC (intermediate grade)	2.3	No
He et al[15]	57/M	Mandibular body	30 × 60 mm	Toothache	Surgery + radiotherapy	MEC (high grade)	1.8	No
He et al[15]	45/F	Mandibular ramus	50 × 50 mm	Toothache	Surgery + radiotherapy + chemotherapy	MEC (low grade)	1	No
He et al[15]	52/M	Mandibular body	40 × 30 mm	Odontoseisis	Surgery + radiotherapy	MEC (intermediate grade)	0.4	No
He et al[15]	44/M	Mandibular body	40 × 50 mm	Pain	Surgery + radiotherapy	MEC (high grade)	0.4	No
Varma et al[16]	50/M	Mandibular ramus	40 × 60 mm	Swelling	Biopsy + without further therapy	MEC	NA	NA
Raut et al[1]	40/M	Maxilla	30 × 30 mm	Swelling	Surgery	MEC (low grade)	1.7	No
Namin et al[2]	11/F	Maxilla	50 × 40 × 40 mm	Swelling	Surgery	MEC (high grade)	NA	NA
Zaharopoulos[17]	62/F	Mandible	40 mm (diameter)	Mass, pain, swelling	Surgery	MEC (high grade)	NA	NA
Maremonti et al[18]	61/F	Mandible	40 mm (diameter)	Pain, ulcerated mass	Surgery	MEC (low grade)	2	No
Martínez-Madrigal et al[19]	49/F	Mandibular body	NA	NA	Surgery	MEC (low grade)	15	No
Martínez-Madrigal et al[19]	53/M	Mandibular angle	NA	NA	Surgery	MEC (low grade)	8	No
Martínez-Madrigal et al[19]	56/M	Mandibular body	NA	NA	Surgery	MEC (low grade)	6	No
Martínez-Madrigal et al[19]	65/M	Mandibular angle	NA	NA	Surgery	MEC (low grade)	7	No
Martínez-Madrigal et al[19]	58/F	Mandibular angle	NA	NA	Surgery	MEC (low grade)	10	No
Martínez-Madrigal F et al[19]	71/F	Mandibular angle	NA	NA	Surgery + radiotherapy	MEC (high grade)	3	NA
Martínez-Madrigal et al[19]	51/M	Mandibular body	NA	NA	Surgery + radiotherapy	MEC (high grade)	2	NA
Zhou et al[20]	38/M	Maxilla	NA	Swelling	Surgery	MEC (intermediate grade)	NA	NA
Zhou et al[20]	24/M	Mandibular body	NA	Swelling	Surgery	MEC (intermediate grade)	NA	NA
Zhou et al[20]	39/M	Mandibular ramus	NA	Swelling, pain	Surgery	MEC (low grade)	8	No
Zhou et al[20]	48/F	Mandibular ramus	NA	Swelling, pain	Surgery	MEC (low grade)	10	No
Zhou et al[20]	41/M	Mandibular ramus	NA	Swelling, pain, trismus	Surgery	MEC (high grade)	1	Yes
Zhou et al[20]	16/F	Mandibular body	NA	Swelling, pain	Surgery + radiotherapy	MEC (low grade)	2.5	Yes
Zhou et al[20]	21/F	Mandibular body	NA	Swelling	Surgery	MEC (low grade)	5	No
Zhou et al[20]	40/F	Mandibular body	NA	Swelling	Surgery	MEC (low grade)	5	No
Zhou et al[20]	47/M	Maxilla	NA	Swelling	Surgery	MEC (intermediate grade)	3.5	No
Zhou et al[20]	19/F	Mandibular body	NA	Swelling, fistula	Surgery	MEC (low grade)	3	No
Zhou et al[20]	20/M	Maxilla	NA	Swelling	Surgery	MEC (low grade)	3	No
Zhou et al[20]	55/F	Mandibular body	NA	Swelling, pain, numb	Surgery	MEC (intermediate grade)	1.1	No
Zhou et al[20]	47/M	Maxilla	NA	Swelling	Surgery	MEC (low grade)	0.5	Yes
Zhou et al[20]	46/F	Maxilla	NA	Swelling	Surgery	MEC (intermediate grade)	12	No
Zhou et al[20]	73/F	Mandibular body	NA	Swelling	Surgery	MEC (low grade)	3	Yes
Zhou et al[20]	43/M	Mandibular ramus	NA	Swelling	Surgery	MEC (low grade)	5.3	No
Zhou et al[20]	57/F	Maxilla	NA	Swelling, fistula	Surgery	MEC (intermediate grade)	3	No
Zhou et al[20]	64/F	Maxilla	NA	Swelling, pain, trismus	Surgery	MEC (intermediate grade)	1.1	No
Zhou et al[20]	53/M	Maxilla	NA	Swelling, pain	Surgery	MEC (low grade)	0.5	No
Zhou et al[20]	29/M	Mandibular body	NA	Swelling, fistula	Surgery	MEC (low grade)	3.8	Yes
Zhou et al[20]	25/M	Mandibular ramus	NA	Swelling, pain, trismus	Surgery	MEC (low grade)	1.8	No
Zhou et al[20]	26/M	Maxilla	NA	Swelling, fistula, pain	Surgery	MEC (low grade)	2.5	Yes
Zhou et al[20]	47/F	Maxilla	NA	Swelling, pain, trismus	Surgery	MEC (intermediate grade)	0.3	Yes
Zhou et al[20]	55/F	Mandibular body	NA	Swelling	Surgery	MEC (low grade)	1	No
Zhou et al[20]	62/M	Mandibular ramus	NA	Swelling	Surgery	MEC (low grade)	0.8	No
Zhou et al[20]	15/F	Maxillary palate	NA	Swelling, pain	Surgery	MEC (low grade)	5	Yes
Zhou et al[20]	23/F	Maxilla	NA	Swelling	Surgery	MEC (low grade)	0.5	No
Zhou et al[20]	55/F	Mandibular ramus	NA	Swelling	Surgery	MEC (intermediate grade)	4.6	No
Zhou et al[20]	49/F	Mandibular ramus	NA	Swelling	Surgery	MEC (low grade)	5	No
Zhou et al[20]	46/F	Mandibular ramus	NA	Swelling	Surgery	MEC (low grade)	2.4	No
Zhou et al[20]	38/F	Maxillary palate	NA	Swelling	Surgery	MEC (low grade)	12.8	No
Zhou et al[20]	65/M	Mandibular body	NA	Swelling, pain, numb	Surgery	MEC (high grade)	2	NA
Zhou et al[20]	36/F	Mandibular ramus	NA	Swelling, pain, trismus	Surgery	MEC (low grade)	NA	NA
Zhou et al[20]	58/F	Mandibular body	NA	Swelling	Surgery	MEC (low grade)	3.9	No
Zhou et al[20]	32/F	Maxillary palate	NA	Swelling, fistula, pain, trismus, numb	Surgery + radiotherapy	MEC (intermediate grade)	1.1	No
Zhou et al[20]	43/M	Maxilla	NA	Swelling, pain	Surgery	MEC (high grade)	NA	NA
Zhou et al[20]	29/F	Maxilla	NA	Swelling	Surgery	MEC (low grade)	0.8	No
Zhou et al[20]	55/M	Mandibular body	NA	Swelling	Surgery	MEC (low grade)	1.1	No
Zhou et al[20]	76/F	Mandibular body	NA	Swelling	Surgery	MEC (low grade)	5.8	No

F = female; M = male; MEC = mucoepidermoid carcinoma; NA = nonapplicable.

Table 2

Analysis of 133 reported cases.

Characteristics	No. of cases
Gender	
Male	61
Female	72
Age	
<40	42
40–60	57
>60	34
Location	
Mandible	67
Maxilla	66
Treatment	
Surgery	82
Surgery + RT	44
Surgery + RT + CT	1
Other	6
Histological grade	
Low	59
Intermediate	31
High	15
Other	28
Recurrence	
Yes	13
No	88
Other	32

CT = chemotherapy; RT = radiotherapy.

immunohistochemistry is needed. CKs7,8,18 are positive stained in IMCs, however, only a few part of GOCs are stained positively for these.

Diagnosis of IMC should be based on histopathology and imaging. Several diagnostic criteria have been established. Pathologically, primary MEC in the salivary glands and other tissues is excluded, no odontogenic tumor is present, the histological structure of MEC is confirmed and positive mucin staining is detected. And evidence of bony destruction and intact cortical plates is found on imaging examination.[24–27]

The main clinical symptoms of IMC are painless swelling and craniofacial asymmetry. IMC is usually characterized by invasion of local tissue, but metastasis is rare. Brookstone and Huvos[23] reported that only 9% of their patients with IMC had traces of metastatic disease. Metastases mainly occur in the local lymph nodes and are rarely found in the cervix, breast, lung, and skin. No affected lymph nodes were detected in the present case.

Treatment of IMC includes conservative and radical surgery. Although many articles have described IMC as a low-grade histologically malignant tumor, conservative treatments, including curettage and marsupialization, could favor recurrence at a rate of around 40%.[24] Therefore, radical surgery, wide local excision, and hemimandibulectomy or hemimaxillectomy should be considered as first-line treatment.[1] Neck dissection and adjunctive postoperative radiotherapy should be implemented with regional lymph involved.[28] However, the occurrence of regional lymph node metastasis is usually associated with a poor prognosis.

The prognosis of IMC is difficult to predict because various surgical approaches and biological specificities can produce different results. de Souza et al[22] recently reported several factors that may be associated with prognosis, such as sex, histological grade, surgical approach, and regional lymph node status, and the treatment approach is a significant prognostic factor. IMC is characterized by possible late recurrence and metastasis; therefore, we emphasize the need to establish a long-term follow-up system.

4. Conclusion

IMC is a rare malignant neoplasm of the jaw with single or multiple capsular spaces. The preoperative diagnosis of IMC is still a challenging task. IMC should be differentiated from ameloblastoma, odontogenic cysts, and GOC. The final diagnosis is usually based on histopathology and imaging. Statistically, a high proportion of IMC exhibits low-grade malignancy. Radical surgery should be conducted and could increase the chance of a favorable prognosis. Because IMC can recur long after the operation, a long-term follow-up system should be implemented. Furthermore, in view of its rarity and controversial issues, more studies need to be performed to fully elucidate the IMC.

Author contributions

Conceptualization: Feng Wang, Hongyu Yang.
Data curation: Xiang Li, Shuai Sun.
Investigation: Xiang Li, Feng Wang.
Resources: Hongyu Yang.
Software: Xiang Li.
Supervision: Yufan Wang, Hongyu Yang.
Validation: Feng Wang, Yufan Wang, Hongyu Yang.
Writing – original draft: Xiang Li.
Writing – review & editing: Xiang Li, Feng Wang, Yufan Wang, Hongyu Yang.
Xiang Li orcid: 0000-0002-9339-5456.

References

[1] Raut D, Khedkar S. Primary intraosseous mucoepidermoid carcinoma of the maxilla: a case report and review of literature. Dentomaxillofac Radiol 2009;38:163–8.
[2] Namin AK, Moshref M, Shahoon H, et al. Intraosseous mucoepidermoid carcinoma of the maxilla in a teenager: a case report and review of literature. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2005;100:e93–6.
[3] Verma RK, Sunku SK, Bal A, et al. Giant cystic primary mucoepidermoid carcinoma of mandible: a rare case and literature review. Otolaryngol Pol 2014;68:328–32.
[4] Basaran B, Doruk C, Yilmaz E, et al. Intraosseous mucoepidermoid carcinoma of the Jaw: report of three cases. Turk Arch Otorhinolaryngol 2018;56:42–6.
[5] Merna C, Kita A, Wester J, et al. Intraosseous mucoepidermoid carcinoma: outcome review. Laryngoscope 2018;128:1083–92.
[6] Purohit S, Manjunatha BS, Dagrus K, et al. Intraosseous mucoepidermoid carcinoma of maxilla: a rare entity. J Exp Ther Oncol 2016;11:207–11.
[7] Martins TH, Bonardi JP, Stabile GA, et al. Mucoepidermoid carcinoma of the hard palate in a young patient. J Craniofac Surg 2016;27:e598–9.
[8] Nallamilli SM, Tatapudi R, Reddy RS, et al. Primary intraosseous mucoepidermoid carcinoma of the maxilla. Ghana Med J 2015;49:120–3.
[9] Bell D, Lewis C, El-Naggar AK, et al. Primary intraosseous mucoepidermoid carcinoma of the jaw: reappraisal of the MD Anderson Cancer Center experience. Head Neck 2016;38(suppl):E1312–7.
[10] Rathore AS, Ahuja P, Chhina S, et al. Primary intraosseous mucoepidermoid carcinoma of maxilla. J Oral Maxillofac Pathol 2014;18:428–31.
[11] Atarbashi Moghadam S, Atarbashi Moghadam F. Intraosseous mucoepidermoid carcinoma: report of two cases. J Dent (Shiraz) 2014;15:86–90.
[12] Spoorthi BR, Rao RS, Rajashekaraiah PB, et al. Predominantly cystic central mucoepidermoid carcinoma developing from a previously diagnosed dentigerous cyst: case report and review of the literature. Clin Pract 2013;3:e19.

[13] da Silva LP, Serpa MS, da Silva LA, et al. Central mucoepidermoid carcinoma radiographically mimicking an odontogenic tumor: a case report and literature review. J Oral Maxillofac Pathol 2016;20:518–22.
[14] Lakouichmi M, Mliha Touati M, Zrara I, et al. [Primary intraosseous mucoepidermoid carcinoma of the jaws]. Rev Stomatol Chir Maxillofac Chir Orale 2013;114:334–7.
[15] He Y, Wang J, Fu HH, et al. Intraosseous mucoepidermoid carcinoma of jaws: report of 24 cases. Oral Surg Oral Med Oral Pathol Oral Radiol 2012;114:424–9.
[16] Varma S, Shameena P, Sudha S, et al. Clear cell variant of intraosseous mucoepidermoid carcinoma: report of a rare entity. J Oral Maxillofac Pathol 2012;16:141–4.
[17] Zaharopoulos P. Primary intraosseous (central) salivary gland neoplasms in jaw bones: report of a mucoepidermoid carcinoma of the mandible diagnosed by fine-needle aspiration cytology. Diagn Cytopathol 2004;31:271–5.
[18] Maremonti P, Califano L, Mangone GM, et al. Intraosseous mucoepidermoid carcinoma. Report of a long-term evolution case. Oral Oncol 2001;37:110–3.
[19] Martinez-Madrigal F, Pineda-Daboin K, Casiraghi O, et al. Salivary gland tumors of the mandible. Ann Diagn Pathol 2000;4:347–53.
[20] Zhou CX, Chen XM, Li TJ. Central mucoepidermoid carcinoma: a clinicopathologic and immunohistochemical study of 39 Chinese patients. Am J Surg Pathol 2012;36:18–26.
[21] Eversole LR, Sabes WR, Rovin S. Aggressive growth and neoplastic potential of odontogenic cysts: with special reference to central epidermoid and mucoepidermoid carcinomas. Cancer 1975;35:270–82.
[22] de Souza LL, Pontes FSC, Pontes HAR, et al. Central mucoepidermoid carcinoma: an up-to-date analysis of 147 cases and review of prognostic factors. J Craniomaxillofac Surg 2018;46:162–7.
[23] Brookstone MS, Huvos AG. Central salivary gland tumors of the maxilla and mandible: a clinicopathologic study of 11 cases with an analysis of the literature. J Oral Maxillofac Surg 1992;50:229–36.
[24] Simon D, Somanathan T, Ramdas K, et al. Central mucoepidermoid carcinoma of mandible - a case report and review of the literature. World J Surg Oncol 2003;1:1.
[25] Browand BC, Waldron CA. Central mucoepidermoid tumors of the jaws. Report of nine cases and review of the literature. Oral Surg Oral Med Oral Pathol 1975;40:631–43.
[26] Pincock JL, el-Mofty SK. Recurrence of cystic central mucoepidermoid tumor of the mandible. Report of a case with 3 recurrences in 7 years. Int J Oral Surg 1985;14:81–4.
[27] Tornes K, Bang G, Moller P. Central mucoepidermoid tumour of the mandible. Report of 2 cases. J Craniomaxillofac Surg 1987;15:38–41.
[28] Chiu GA, Woodwards RT, Benatar B, et al. Mandibular central mucoepidermoid carcinoma with distant metastasis. Int J Oral Maxillofac Surg 2012;41:361–3.