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CT and MR images of pleomorphic adenoma in major and minor salivary glands

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Abstract

Purpose: To investigate the CT and MR imaging features of pleomorphic adenoma in the head and neck area.

Materials and methods: Our materials of this study consisted of 50 pleomorphic adenomas from 50 patients which were all histopathologically diagnosed. The CT and MR images were retrospectively evaluated. The following features were evaluated: the detectability of the lesion, the tumor margin, the border of the lesion, the aspect of the lesion, the contrast between the lesion and surrounding tissue, the signal intensity of the lesion, the enhancement of contrast medium, the aspect of the lesion after the injection of contrast medium, the detectability of the capsule, and the detectability of bone resorption of the lesion.

Results: The tumor detectabilities were 77% on axial plain CT images and 90% on axial CE CT images, respectively. On CT images, pleomorphic adenoma tended to show a well-defined margin, a smooth border, an inhomogeneous aspect, a low or high contrast, and intermediate or high signal intensity. After contrast medium administration, pleomorphic adenoma tended to show a slightly high enhancement and either an inhomogeneous or a periphery enhancement on the CE CT images. The capsule could be hardly detected on CT images. The tumor detectabilities were 86% on axial T1-weighted MR images, 88% on axial T2-weighted MR images, and 85% on axial CE T1-weighted MR images, respectively. On MR images, pleomorphic adenomas tended to show well-defined margin, a lobulate border, an inhomogeneous aspect, a high contrast, and intermediate or high signal intensity. After contrast medium administration, pleomorphic adenoma tended to show a high enhancement and either an inhomogeneous or a periphery enhancement on MR images. The capsule could be detected in many cases on MR images.

Conclusions: It was possible to detect the capsule in pleomorphic adenoma using MR images. The pleomorphic adenomas in head and neck area should be evaluated with MR images.

Keywords: Pleomorphic adenoma; CT; MR; Head and neck

1. Introduction

Pleomorphic adenoma is the most common salivary gland tumor in both the major and minor salivary glands. It represents from 60% to 80% of all benign tumors in major salivary glands and 40–70% of minor salivary glands [1,2]. Generally, pleomorphic adenoma is treated by a surgical excision with wide margins [2]. Therefore, preoperative imaging examinations play an important role in surgical planning.

Diagnostic imaging of salivary glands has been revolutionized with the advent of cross-sectional imaging modalities such as CT and MR imaging [3]. Although the MR imaging findings of pleomorphic adenoma have been well described in many papers [4–12], there have been few reports on the CT appearance of pleomorphic adenoma [6,13–15]. Numerous reports have been published on the CT and/or MR imaging features for pleomorphic adenoma of the parotid gland [4–12]. However, only a few papers have so far been reported about the CT and/or MR imaging features of pleomorphic adenoma of the submandibular

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gland [13,16] or minor salivary gland [17] because of the rarity of the disease.

Pleomorphic adenoma in head and neck area is treated in medical and dental hospital. At dental hospital, numerous lesions in oral cavity are treated in a large number of cases including pleomorphic adenoma.

The purpose of this study was therefore to investigate the CT and MRI features of 50 pleomorphic adenomas in the major and minor salivary glands during a period of 18 years at our institution.

2. Materials and methods

Our materials of this study consisted of 50 primary benign pleomorphic adenomas from 50 patients which were histopathologically diagnosed at Osaka University Dental Hospital between March 1985 and September 2003. The histopathological diagnoses of all tumors were proved by surgical operation and the location of the tumors were confirmed by surgeon. The subjects included 15 males and 35 females, ranging in age from 17 to 78 years of age (median 46 years of age). Table 1 summarizes the patients' characteristics, tumor site, and the imaging modality used. The CT and MR images of these patients were retrospectively evaluated.

CT images were obtained with CT scanners (CT9200, YOKOGAWA, Japan or Light Speed QX/i, General Electric, Milwaukee, WI) at 120 kV and 160–250 mA in 44 patients. On CT, the tumors were studied using the axial plane with the X-ray beam parallel to the occlusal plane or mandibular plane and sometimes using the direct coronal plane. After a multi-detector CT became available, we also made coronal reformatted images. The field of view was 24×24 cm. The matrix size was 256×256 or 512×512, and the slice thickness was 2.5–5 mm with no inter-slice spacing. The contrast medium iohexol (Omnipaque 300, Daiichi Pharmaceuticals Co. Ltd., Tokyo, Japan or Iopamiron 300, Nihon Schering Co., Osaka, Japan) at a dose of 100 ml was intravenously administered in 41 patients. We did not obtain contrast enhanced (CE) CT images from the remaining three patients. Although the precise timing varied minimally from patient to patient, our typical scanning sequence consisted of an initial IV bolus injection of 70 ml at 0.6 ml/s, followed by dynamic injection of 30 ml at 0.3 ml/s and scanned simultaneously.

Table 1
Patient and examination characteristics

Case	50
Gender	
Male	15
Female	35
Age	
Median	46
Minimum	17
Maximum	78
Site	
Palate	23
Parotid gland	12
Submandibular gland	11
Sublingual gland	1
Oral floor	1
Maxilla	1
Cheek	1
Examinations	
CT only	22
MR only	6
CT and MR	22

MR images were obtained with a 0.5 T superconducting magnet scanner (VISTA E50, Fuji Electric, Japan) or 1.5 T superconducting magnet scanners (Signa Horizon or Signa LX, General Electric, Milwaukee, WI) equipped with a head coil in 28 patients. The scan protocol included T1-weighted (400–670/9–25/1–2; TR (ms)/TE (ms)/NEX) spin–echo (SE) sequences and T2-weighted (2000–4500/98–161/1–2) SE sequences with or without a fat suppression (FS) technique in at least one orthogonal plane. In 26 patients, gadopentetate dimeglumine (Gd-DTPA) (Magnevist, Nihon Schering Co., Osaka, Japan) was intravenously administered and the T1-weighted SE sequences using the FS technique were repeated before and after the contrast medium was administered. The typical scanning sequence consisted of IV bolus injection of 10 or 15 ml at approximately 1 ml/s, followed by 1 min delay and scanned. The field of view was 24×24 cm. The matrix size was 256–512 × 192–256, and the slice thickness was 4.5–5 mm with 0.5–1 mm inter-slice spacing. Initially, we did not use the chemical shift selective FS technique for the T2-weighted MR images ($n = 5$). Thereafter, we routinely used the T2-weighted SE sequence with the chemical shift selective FS technique ($n = 21$).

The following features were evaluated on the CT and MR images by three radiologists without the knowledge of tumor location and size: the detectability of the lesion, the tumor margin, the border of the lesion, the aspect of the lesion, the contrast between the lesion and surrounding tissue, the signal intensity of the lesion, the enhancement of contrast medium, the aspect of the lesion after the injection of contrast medium, the detectability of the capsule, and the detectability of bone resorption of the lesion.

The detectability of the lesion was classified as either positive or negative. The tumor margin was classified as either well-defined or ill-defined. The border of the lesion was classified as either smooth or lobulate. The aspect of the lesion was classified as either homogeneous or inhomogeneous. The contrast between the lesion and the surrounding tissue was classified as either high or low. The signal intensity of the lesion in relation to the adjacent muscle was classified into four groups: high, intermediate, low, or mixed with high and low. The enhancement of contrast medium was classified as high or low. The aspect of the lesion after the injection of contrast medium was classified as either homogeneous, inhomogeneous, or only in the periphery. The detectability of the capsule was classified as either positive or negative. In addition, bone resorption was also classified as either positive or negative.

3. Results

3.1. CT image findings

The findings on CT images are shown in Table 2. Table 2 shows the findings of all cases, including the palate cases findings (Fig. 1), the parotid gland cases findings (Fig. 2), and the submandibular cases findings (Fig. 3), respectively.

The tumor detectabilities were 77% on axial plain CT images, 90% on axial CE CT images, respectively. The tumor could be detected in only 2 of 12 palate cases on the coronal CE CT images.

The tumor margin was well-defined in many cases on all CT images (73–92%). The border of the lesion on the CT images tended to be smooth (55–62%). The aspect of the tumor on plain CT images tended to be inhomogeneous (71%). The contrast between the lesion and the surrounding tissue on plain CT images (56%) tended to be low, while that of CE CT images tended to be high (81 or 55%). The signal intensity on plain CT images showed an intermediate signal intensity (82%) and that on CE CT images showed from intermediate to high signal intensity. The enhancement of contrast medium tended to be high on CT (51 or 64%). The aspect after contrast medium administration showed an inhomogeneous enhancement (78 or 91%) or only in the periphery enhancement (22 or 9%) on CE CT images. The capsule could hardly be detected on CT images (0–5%). Bone resorption was confirmed in 16 of the palate ($n = 15$) or maxilla ($n = 1$) cases based on the surgical findings. Bone resorption tended to be positive on axial plain and CE CT images (60 or 79%), but negative on coronal CE CT images (20%).

Pleomorphic adenoma showed similar findings regarding almost all features in the palate, parotid gland, and submandibular gland on CT images. However, the border of the lesion in the parotid gland on CT images showed lobulate, while that in the palate or submandibular gland showed smooth. Regarding the contrast between the lesion and surrounding tissue, the parotid

Table 2
Summary of CT image findings

Examination		CT axial CE(-)			CT axial CE(+)			CT coronal CE(+)		
Case		44	(21/ 9/ 10)		41	(20/ 7/ 10)		23	(14/ 0/ 7)	
Detectability	positive	34	(77%)	(14/ 9/ 7)	37	(90%)	(17/ 7/ 9)	11	(48%)	(2/ 0/ 7)
	negative	10	(23%)	(7/ 0/ 3)	4	(10%)	(3/ 0/ 1)	12	(52%)	(12/ 0/ 0)
	no contrast	7		(4/ 0/ 3)	3		(2/ 0/ 1)	1		(1/ 0/ 0)
	artifact	3		(3/ 0/ 0)	1		(1/ 0/ 0)	11		(11/ 0/ 0)
	too small	0		(0/ 0/ 0)	0		(0/ 0/ 0)	0		(0/ 0/ 0)
Tumor margin	well-defined	29	(85%)	(13/ 7/ 6)	34	(92%)	(16/ 6/ 8)	8	(73%)	(2/ 0/ 4)
	ill-defined	5	(15%)	(1/ 2/ 1)	3	(8%)	(1/ 1/ 1)	3	(27%)	(0/ 0/ 3)
Border	smooth	20	(59%)	(13/ 1/ 4)	23	(62%)	(15/ 1/ 5)	6	(55%)	(2/ 0/ 4)
	lobulate	14	(41%)	(1/ 8/ 3)	14	(38%)	(2/ 6/ 4)	5	(45%)	(0/ 0/ 3)
Aspect	homogeneous	10	(29%)	(5/ 2/ 3)	-			-		
	inhomogeneous	24	(71%)	(9/ 7/ 4)	-			-		
Contrast	high	15	(44%)	(2/ 7/ 3)	30	(81%)	(10/ 7/ 9)	6	(55%)	(2/ 0/ 3)
	low	19	(56%)	(12/ 2/ 4)	7	(19%)	(7/ 0/ 0)	5	(45%)	(0/ 0/ 4)
Signal intensity	high	0	(0%)	(0/ 0/ 0)	14	(38%)	(5/ 2/ 6)	6	(55%)	(2/ 0/ 4)
	intermediate	28	(82%)	(12/ 8/ 4)	15	(41%)	(10/ 1/ 1)	5	(45%)	(0/ 0/ 3)
	low	6	(18%)	(2/ 1/ 3)	3	(8%)	(1/ 0/ 2)	0	(0%)	(0/ 0/ 0)
	mixed	0	(0%)	(0/ 0/ 0)	5	(14%)	(1/ 4/ 0)	0	(0%)	(0/ 0/ 0)
Enhancement of CM	high	-			19	(51%)	(6/ 6/ 6)	7	(64%)	(2/ 0/ 4)
	low	-			18	(49%)	(11/ 1/ 3)	4	(36%)	(0/ 0/ 3)
Aspect after CM	homogeneous	-			0	(0%)	(0/ 0/ 0)	0	(0%)	(0/ 0/ 0)
	inhomogeneous	-			29	(78%)	(13 3/ 9)	10	(91%)	(2/ 0/ 7)
	periphery only	-			8	(22%)	(4/ 4/ 0)	1	(9%)	(0/ 0/ 0)
Capsule	positive	1	(3%)	(0/ 1/ 0)	2	(5%)	(1/ 1/ 0)	0	(0%)	(0/ 0/ 0)
	negative	33	(97%)	(14/ 8/ 7)	35	(95%)	(16/ 6/ 9)	11	(100%)	(2/ 0/ 7)
Bone resorption	positive	9	(60%)	(8/ 0/ 0)	11	(79%)	(10/ 0/ 0)	2	(20%)	(2/ 0/ 0)
	surgically positive	15		(14/ 0/ 0)	14		(13/ 0/ 0)	10		(10/ 0/ 0)

Number: all cases (percentage) (palate cases/parotid gland cases/submandibular gland cases). FS, fat suppression technique; CE, contrast enhancement; CM, contrast medium.

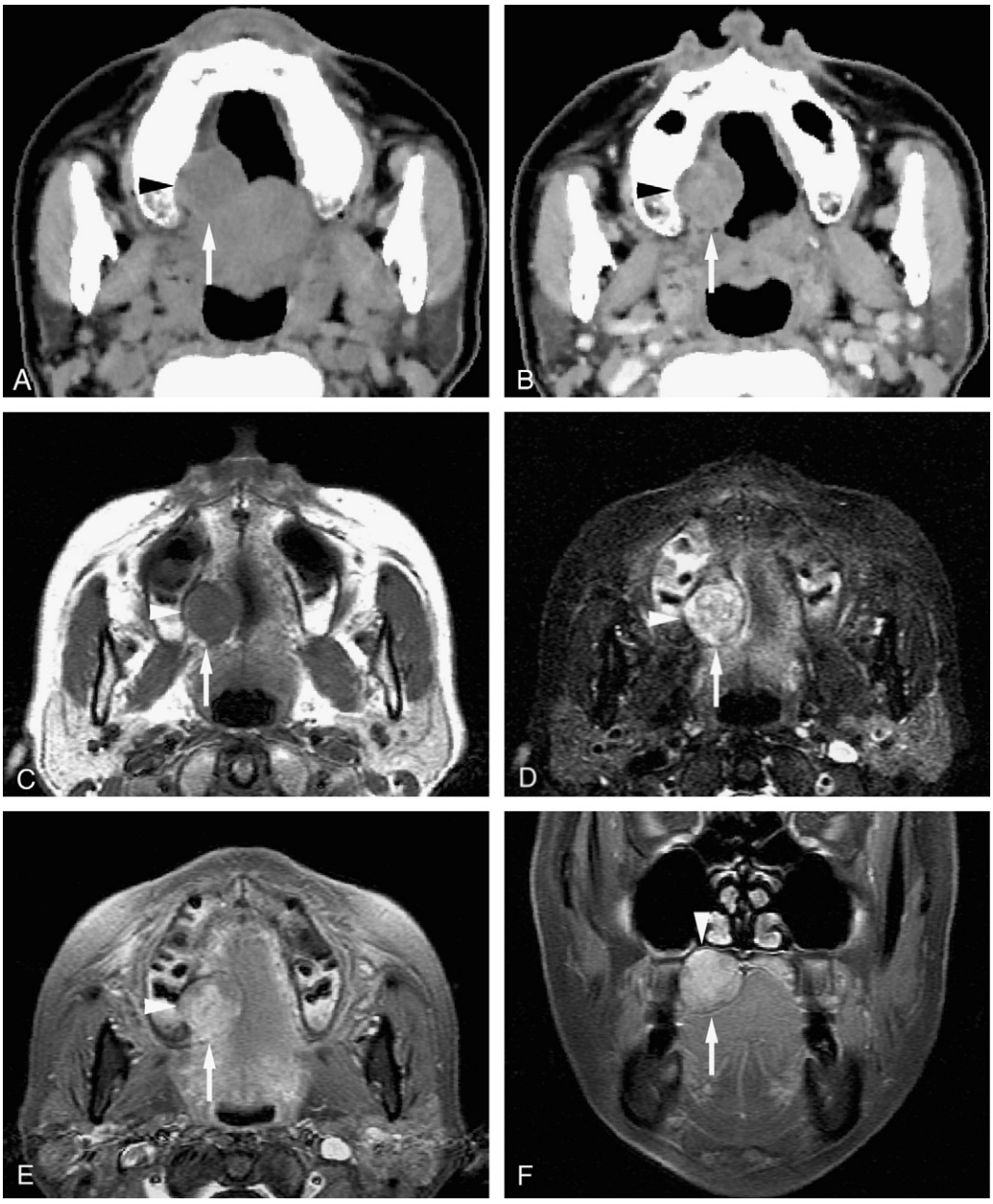

Fig. 1. Pleomorphic adenoma of the palate in a 59-year-old male. The well-defined margin and smooth border tumor (arrows) and bone resorption (arrowheads) can be detected on CT and MR images. (A) The tumor shows inhomogeneous intermediate signal intensity on a plain CT image. (B) After contrast medium administration the tumor shows an inhomogeneous enhancement on a CE CT image. (C) The T1-weighted MR image shows an intermediate signal intensity mass. (D) The T2-weighted MR image with FS technique shows inhomogeneous high signal intensity mass. (E) After contrast medium administration the tumor shows an inhomogeneous enhancement on the CE T1-weighted image using the FS technique. (F) Bone resorption of the palatal bone can be detected on a coronal CE T1-weighted MR image using the FS technique.

gland cases tended to show high, while the palate and submandibular gland cases tended to show low on plain CT images. The mixed signal intensity included in four of seven parotid gland cases. Concerning the enhancement of contrast medium, the parotid and submandibular cases tended to show high on axial CE CT images, but the palate cases tended to show low.

3.2. MR image findings

The findings on MR images are shown in Table 3. Table 3 shows the findings of all cases, including the palate cases findings (Fig. 1), the parotid gland cases findings (Fig. 2), and the submandibular cases findings (Fig. 3), respectively.

The tumor detectabilities were 86% on axial T1-weighted MR images, 88% on axial T2-weighted MR images, and 85% on axial CE T1-weighted MR images, respectively.

The tumor margin was well-defined in many cases on all MR images (91–100%). The border of the lesion tended to be lobulated on the MR images, except for on axial T1-weighted MR images. The aspect of the tumor on T1-weighted MR images tended to be homogeneous (54%), while that on T2-weighted MR images tended to be inhomogeneous (91 or 100%). The

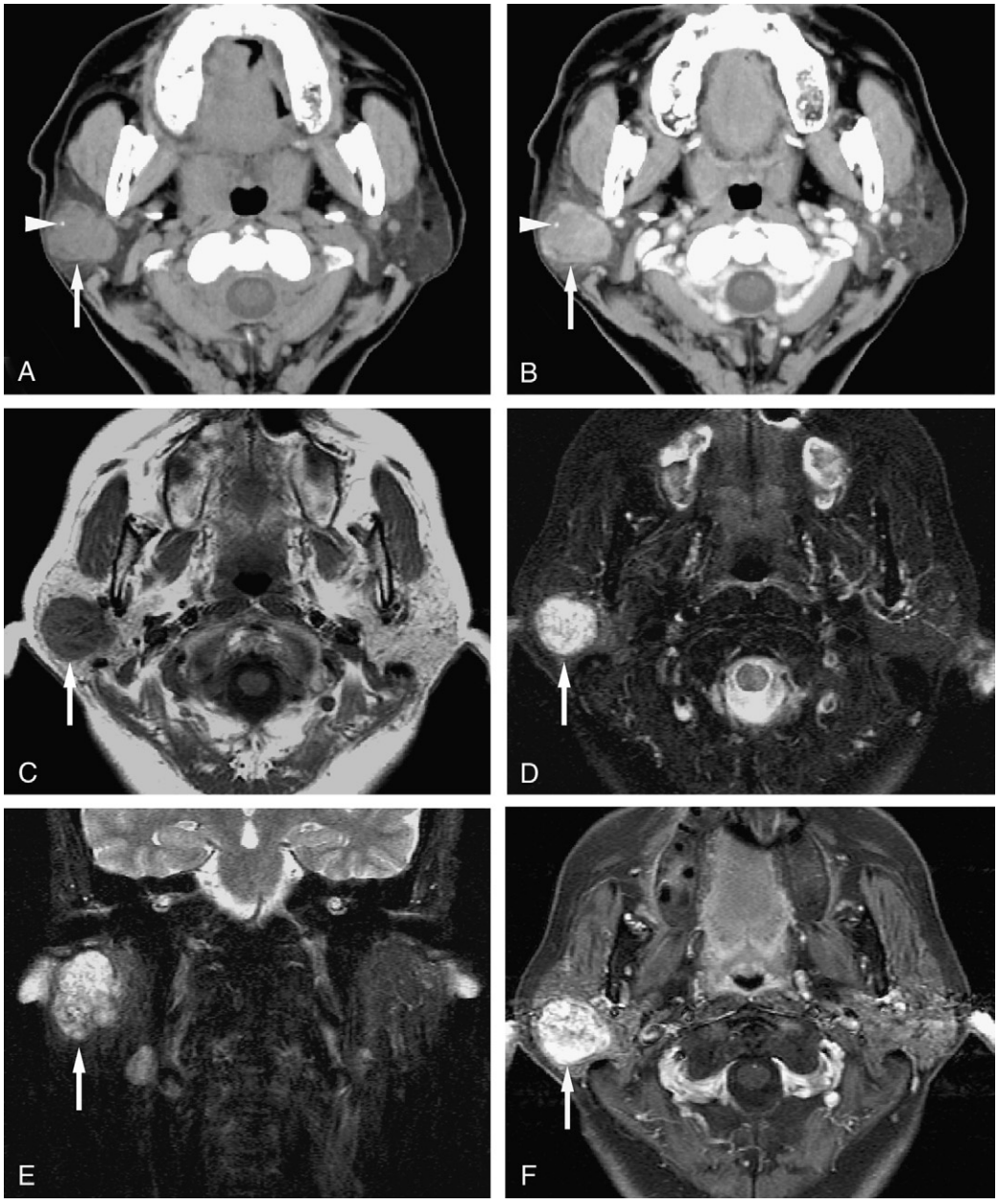

Fig. 2. Pleomorphic adenoma of the parotid gland in a 57-year-old female. A well-defined margin tumor (arrows) can be detected on both CT and MR images. The CT image shows calcification in the tumor (arrowheads). (A) The tumor shows an inhomogeneous intermediate signal intensity on a plain CT image. (B) After contrast medium administration the tumor shows an inhomogeneous enhancement on a CE CT image. (C) The axial T1-weighted MR image shows an intermediate signal intensity mass. (D) On an axial T2-weighted MR image using the FS technique, the tumor shows an inhomogeneous high signal intensity mass and the capsule can also be detected. (E) The tumor shows a lobulated border on a coronal T2-weighted MR image using the FS technique. (F) After contrast medium administration the tumor shows an inhomogeneous enhancement on a CE T1-weighted image using the FS technique.

contrast between the lesion and the surrounding tissue tended to be high on T1-weighted (67%), T2-weighted (96 or 90%), and CE T1-weighted MR images (68 or 83%). The signal intensity on T1-weighted MR images (75%) showed an intermediate signal intensity, while that on the T2-weighted (96 or 90%) and CE T1-weighted (77 or 70%) MR images showed a high signal intensity. The enhancement of contrast medium tended to be high on MR images (87%). The aspect after contrast medium administration showed an inhomogeneous enhancement (73 or 70%) or only in the periphery enhancement (23 or 26%) in almost all cases on the MR images. The capsule could hardly be detected on T1-weighted MR images (33%). However, the capsule could be detected in many cases on the T2-weighted (87 or 90%) and CE T1-weighted (64 or 57%) images. Bone resorption was confirmed in five of the palate cases based on the surgical findings. Bone resorption tended to be positive on MR (60–75%) images.

Pleomorphic adenoma showed similar findings regarding almost all features in the palate, parotid gland, and submandibular gland on MR images. However, the border of the lesion in the parotid and submandibular gland on MR images tended to show

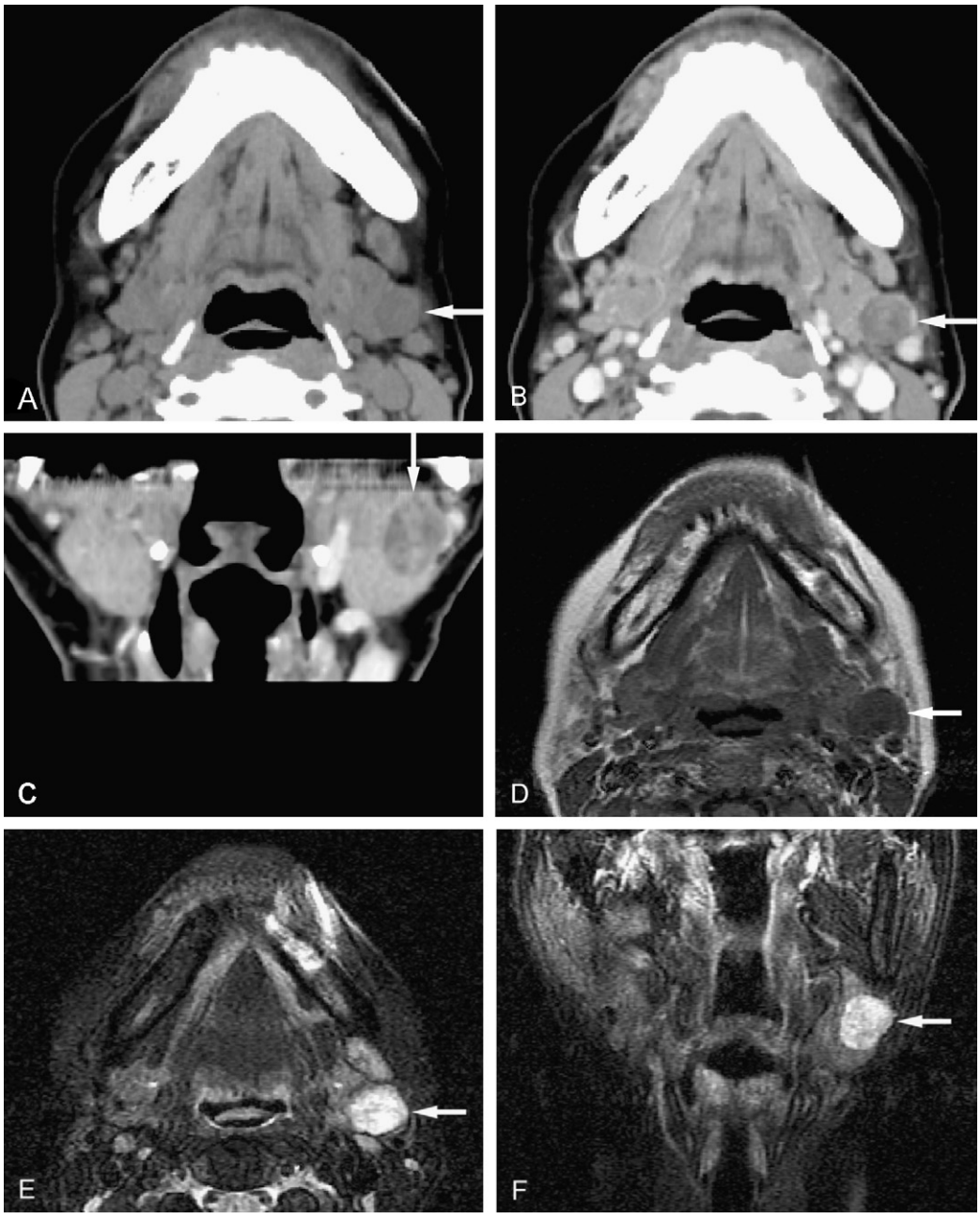

Fig. 3. Pleomorphic adenoma of the submandibular gland in a 55-year-old female. A well-defined margin and smooth border tumor (arrows) can be detected on the CT and MR images. (A) The tumor shows a homogeneous intermediate signal intensity on a plain CT image. (B) After contrast medium administration the tumor shows a low signal intensity and an inhomogeneous enhancement on an axial CE CT image. (C) The tumor shows a low signal intensity on a coronal reformatted CE CT image. (D) The axial T1-weighted MR image shows an intermediate signal intensity mass. (E) On an axial T2-weighted MR image using the FS technique, the tumor shows an inhomogeneous high signal intensity mass. (F) The tumor shows a lobulated border and inhomogeneous high signal intensity on a coronal T2-weighted MR image using the FS technique.

lobulate, while that in the palate showed smooth. The mixed signal intensity included only in parotid gland cases.

4. Discussion

The salivary gland neoplasms represent less than 3% of all head and neck tumors. From 70% to 80% of parotid gland tumors, 40–58% of submandibular gland tumors, 15–30% of sublingual gland tumors, and 20–51% of minor salivary gland tumors are benign [1]. Pleomorphic adenoma is the most common salivary gland tumors involving both the major and minor salivary gland [2]. Parotid pleomorphic adenomas are almost always treated by either a superficial or total parotidectomy with a preservation of the facial nerve. Submandibular pleomorphic adenomas are generally treated by a total excision of the gland. Minor salivary gland pleomorphic adenomas are best treated by a total excision which includes the rim of the surrounding tissue [2]. Therefore, the tumor detection and the appropriate

Table 3
Summary of MR image findings

Examination		MR T1w axial CE(-)		MR T2w +/- FS axial CE(-)		MR T2w +/- FS coronal CE(-)		MR T1w + FS axial CE(+)		MR T1w + FS coronal CE(+)	
Case		28		26		20		26		25	
Detectability	positive	24	86%	23	88%	20	100%	22	85%	23	92%
	negative	4	14%	3	12%	0	0%	4	15%	2	8%
	no contrast	2		1		0		2		1	
	artifact	1		1		0		1		1	
	too small	1		1		0		1		0	
Tumor margin	well-defined	22	92%	21	91%	20	100%	20	91%	22	96%
	ill-defined	2	8%	2	9%	0	0%	2	9%	1	4%
Border	smooth	12	50%	5	22%	6	30%	6	27%	7	30%
	lobulate	12	50%	18	78%	14	70%	16	73%	16	70%
Aspect	homogeneous	13	54%	2	9%	0	0%	-		-	
	inhomogeneous	11	46%	21	91%	20	100%	-		-	
Contrast	high	16	67%	22	96%	18	90%	15	68%	19	83%
	low	8	33%	1	4%	2	10%	7	32%	4	17%
Signal intensity	high	1	4%	22	96%	18	90%	17	77%	16	70%
	intermediate	18	75%	1	4%	2	10%	2	9%	4	17%
	low	4	17%	0	0%	0	0%	0	0%	0	0%
	mixed	1	4%	0	0%	0	0%	3	14%	3	13%
Enhancement of CM	high	-		-		-		19	87%	20	87%
	low	-		-		-		3	14%	3	13%
Aspect after CM	homogeneous	-		-		-		1	5%	1	4%
	inhomogeneous	-		-		-		16	73%	16	70%
	periphery only	-		-		-		5	23%	6	26%
Capsule	positive	8	33%	20	87%	18	90%	14	64%	13	57%
	negative	16	67%	3	13%	2	10%	8	36%	10	43%
Bone resorption	positive	3	60%	2	67%	2	67%	3	75%	3	75%
	surgically positive	5		3		3		4		4	

Number: all cases (percentage) (palate cases/parotid gland cases/submandibular gland cases). FS, fat suppression technique; CE, contrast enhancement; CM, contrast medium.

for delineating the extent of pleomorphic adenoma are essential before surgery.

The recurrence rate of pleomorphic adenoma has been reported to range between 1% and 50% [1]. The recurrence rate is related to the surgical procedure. The studies, which included patients who were treated by enucleation, demonstrated a high recurrence rate. The malignant degeneration of pleomorphic adenoma has been reported to range approximately from 2% to 5% [1]. However, it has been estimated that nearly 25% of all pleomorphic adenomas may undergo malignant change if left untreated, and concerned the duration [1,18,19]. Because of this high rate of the malignant degeneration, pleomorphic adenomas must therefore be completely resected.

In the present study, pleomorphic adenomas in the palate were included in nearly the same cases of pleomorphic adenomas in parotid gland and submandibular gland. These ratios regarding the site of pleomorphic adenoma were different in comparison those described in a previous report [1]. This study was performed at a dental hospital. At dental hospitals, numerous lesions in oral cavity are treated in a large number of cases. Therefore, palate cases are thus considered to make up a majority of such cases.

In our data, the tumor detectability on axial MR images was almost the same as that on CT images. However, the tumor detectability of the coronal CE CT images was lower than the other images. The reasons why the tumor could not be detected on CT and/or MR images were due to the lack of contrast between the tumor and the surrounding tissue, metallic artifacts, or small tumors which were surgically proven to measure 3 mm or less in size.

The CT image appearance of pleomorphic adenoma has been reported to be either a smoothly marginated tumor, a spherical small tumor or a lobulated large tumor [1,14,15]. After contrast medium administration pleomorphic adenoma tends to show variable enhancement on CT [1]. Bogaert et al. reported that pleomorphic adenoma of the parotid gland showed an inhomogeneous pattern on CT images in a majority of cases [14]. Lev et al. reported that a delayed CT enhancement was found in pleomorphic adenomas of the parotid gland, with an increasingly homogeneous filling in contrast materials over time [15].

Regarding our data of CT images, pleomorphic adenoma tended to show a well-defined margin (73–92%), a smooth border (55–62%), an inhomogeneous aspect (71%), a low contrast between the tumor and the surrounding tissue (56%) on plain CT images and a high contrast (55 or 81%) on CE CT images, and an intermediate signal intensity (82%) on plain CT images and intermediate or high signal intensity on CE CT images. After contrast medium administration, pleomorphic adenoma tended to show a slightly high enhancement (51 or 64%) and either an inhomogeneous (78 or 91%) or a periphery (22 or 9%) enhancement on the CE CT images. We did not evaluate pleomorphic adenomas by enhanced CT at the late phase.

The MR image appearance of pleomorphic adenoma has been reported to be homogeneous with an intermediate to low signal intensity on the T1-weighted images, an inhomogeneous to high signal intensity on the T2-weighted images, and an

inhomogeneous enhancement on the CE T1-weighted images [1,7,8,10–12]. Tsushima et al. and Joe et al. reported either a bright or high signal intensity on the T2-weighted images to be a useful finding as pleomorphic adenoma [10,11]. Ikeda et al. reported the MR findings of a complete capsule, a lobulated contour, or a high T2 signal intensity to have a high predictive value for the diagnosis of pleomorphic adenoma [12].

According to our data, pleomorphic adenomas tended to show an intermediate signal intensity on the T1-weighted images (75%), an inhomogeneous (91 or 100%) high (96 or 90%) signal intensity on the T2-weighted images either with or without the FS technique, and an inhomogeneous (73 or 70%) high (87%) enhancement on the CE T1-weighted images with the FS technique, and these findings were similar to those previously reported [1,7,8,10–12]. However some pleomorphic adenomas showed different features such as a high signal intensity on T1-weighted images (4%) or an intermediate signal intensity on T2-weighted images (4 or 10%). Many pleomorphic adenomas in our study showed a lobulated border (50–78%) and capsule positive findings (33–90%), but not all. Our findings suggest that it is difficult to perfectly diagnose pleomorphic adenomas based only on MR images.

Pleomorphic adenomas do not have true capsules. Rather, they have pseudocapsules with small protrusions, pseudopodia, extending into the surrounding normal tissue [20]. We could detect the capsule in almost all cases on both T2-weighted (87 or 90%) and CE T1-weighted (64 or 57%) images using the FS technique, but we could not detect it on CT images (0–5%). Due to its superior soft tissue contrast, MR imaging has major advantages over CT [3,21]. Metallic artifacts from dental restorations also occurred on the CT images in the oral and maxillofacial area. Our findings suggest that it is possible to detect the capsule in pleomorphic adenoma using MR images.

It is not possible to reliably differentiate benign from malignant salivary gland tumors on CT and MR images [8–10]. As a result, specific findings need to be determined from biopsy specimens. Som and Biller reported that if a mass was seen with low T1- and T2-weighted signal intensities then the lesion would thus be considered to be a highly aggressive malignancy [7]. Joe and Westesson reported that the invasion of the muscle appeared to be associated with malignant tumors [11]. In the present study, there was no pleomorphic adenoma which showed low T1- and T2-weighted signal intensities, and also showed invasion of the surrounding muscle or bone.

5. Conclusions

The detectability of pleomorphic adenomas was almost same on axial CT and MR images. However, pleomorphic adenomas in the palate were difficult to accurately detect on coronal CT images. On CT images, pleomorphic adenoma tended to show a well-defined margin, a smooth border, an inhomogeneous aspect, a low or high contrast, and intermediate or high signal intensity. After contrast medium administration, pleomorphic adenoma tended to show a slightly high enhancement and either an inhomogeneous or a periphery enhancement on the CE CT images. On MR images, pleomorphic adenomas tended to show well-defined margin, a lobulate border, an inhomogeneous aspect, a high contrast, and intermediate or high signal intensity. After contrast medium administration, pleomorphic adenoma tended to show a slightly high enhancement and either an inhomogeneous or a periphery enhancement on MR images. The capsule detectability of MR images was also superior to that of CT images. Our findings suggest that it is possible to detect the capsule in pleomorphic adenoma using MR images. Moreover, observations from optional directions (axial, coronal and sagittal images) seemed to be appropriate for delineating the extent of the lesion in such cases. Therefore, pleomorphic adenomas in head and neck area should be evaluate with MR images.

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