

原文題目(出處)：	MRI features of mandibular osteomyelitis: practical criteria based on an association with conventional radiography features and clinical classification
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內文：

Radiological examinations	Diagnosis of mandibular osteomyelitis and evaluation of the response to treatment.	But limited in the acute stage because of low sensitivity.
Bone scintigraphy	Depict increased uptake even in the acute stage	Low specificity in diagnosing as osteomyelitis does not accurately identify the location of lesions.
Computed tomography (CT)	Evaluation of bony changes	Hardly depict bone marrow changes in the acute stage evaluate the early response to the treatment.

Magnetic resonance imaging (MRI) can well demonstrate the bone marrow changes caused by edema or inflammatory tissue due to increase of water content, which often replaces the normal fatty marrow in the acute stage.

This change of the bone marrow is shown as a low SI area on the T1-weighted image and a marked high SI area on T2-weighted or short TI inversion recovery (STIR) images

In the chronic stage, low SI area surrounded by high SI rim on both T1-weighted images and T2-weighted or STIR images.

Although MRI examination has the ability of early detection of osteomyelitis, but there is a relative dearth of reports regarding MRI diagnostic criteria applicable to each clinical stage of osteomyelitis.

The purposes of this study were

- (1) To analyze the relationship between the imaging features of MRI and conventional techniques
- (2) To establish practical MRI diagnostic criteria in relation to the treatment and outcome

METHODS**Subjects**

Fifty-five subjects who were clinically suspected as having bacterial mandibular osteomyelitis and

underwent MRI examination were enrolled in this study.

Criteria for inclusion into this study were recurrent and intolerable pain or swelling at the mandibular region and radiographic evidence of osteolytic and osteosclerotic lesion with variable amounts of periosteal reaction or sequestration. Subjects with osteoradionecrosis or anamnesis of surgical procedure for osteomyelitis were not included in the study

The period between the onset of symptoms and MRI examination ranged from 4 days to 5 years

All subjects were classified into 2 groups:

The acute or subacute group (23 subjects) with the period less than 1 month

The chronic group (32 subjects) with the period more than 1 month

Examinations

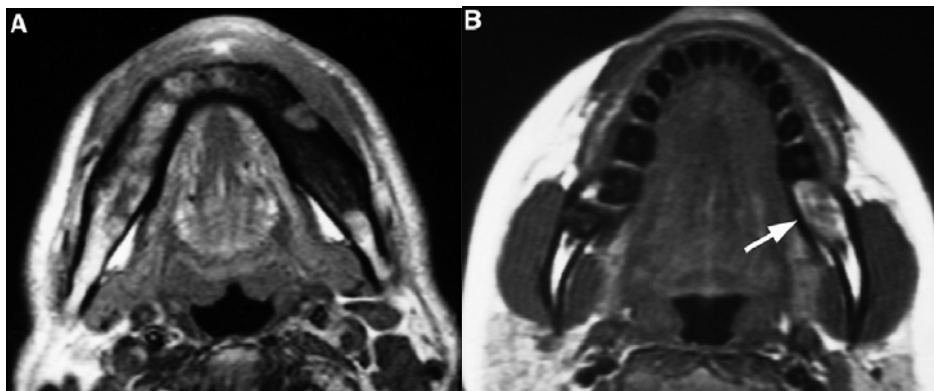
Magnetic resonance imaging examinations were performed with a 1.0-T Magnex-100XP (Shimadzu, Kyoto, Japan) and a head coil. Standard MRI sequences were performed: spin-echo T1-weighted images and STIR images. The section thickness was 5.0 mm with an intersection gap of 1.0 mm. Axial and coronal images were obtained.

Prior to MRI examination, conventional radiographs were obtained for all subjects. Computed tomographic examination was added in 41 subjects. Scans were performed with a slice thickness of 2 or 3 mm, and the scan plane was parallel to the occlusal plane or inferior margin of the mandible.

Evaluation of imaging features

T1-weighted images were classified into 2 patterns: low and no change. The pathological changes of the bone marrow were evaluated by comparison with the SI of the contralateral side.

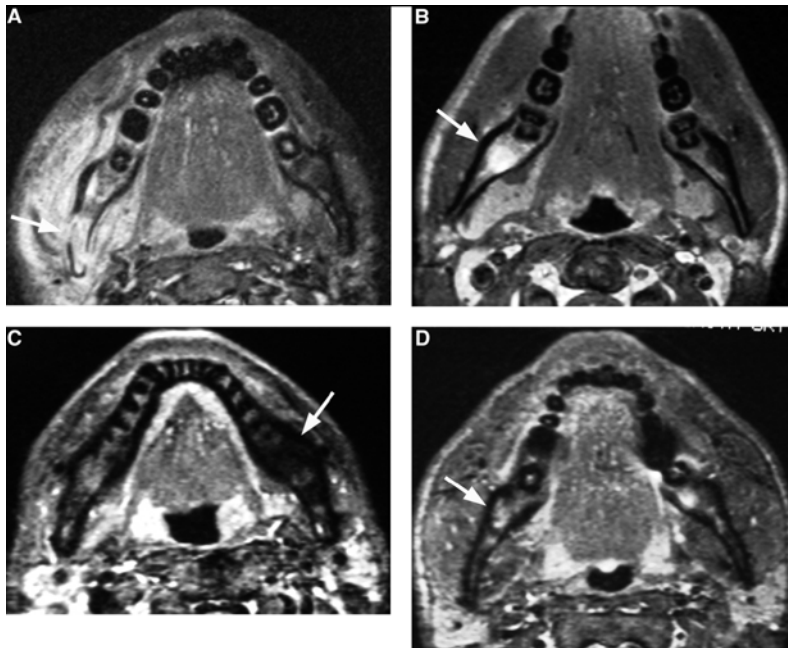
Low was defined as a decline in the SI of the bone marrow, and *no change* as a mild change or no change in the SI of the bone marrow.



Short T1 inversion recovery images were classified into 4 patterns: extensive high, focal high, low, and no change

Extensive high was defined as a strong and widespread increase in the SI of the bone marrow.

Focal high was a limited area increase in the SI. Low was defined as a decline in the SI of the bone marrow, and no change as a mild change or no change in the SI of the bone marrow.



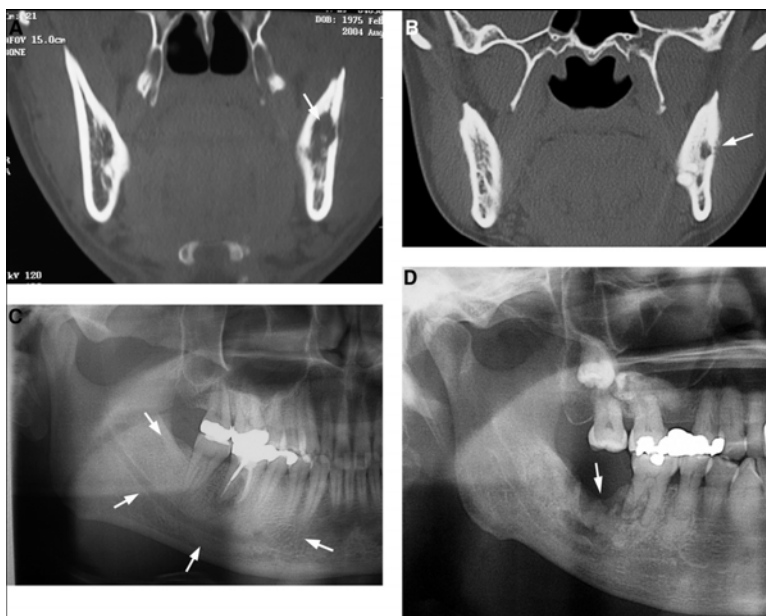
Bony changes on conventional images were evaluated with reference to the CT appearance

Lytic pattern was defined as having a feature that osteolysis was dominant.

Mixed pattern was a feature that osteosclerosis was combined with an equal or lesser amount of osteolysis.

Sclerotic pattern was a feature in which osteosclerosis was dominant.

Sequestrum pattern was a feature in which sequestration was seen with or without other bony changes.



Determination of the final diagnosis

The definitive diagnosis was confirmed by the pathological results or clinical course.

All subjects were followed up for more than 6 months after the end of treatment.

RESULTS

Treatment and the final diagnosis

17 subjects underwent radical surgical procedure such as decortication or fenestration of the buccal cortical bone of the mandible, accompanied by curettage of the affected areas, intra-arterial use of antibiotics, or hyperbaric oxygen therapy.

For 23 subjects, minor surgical procedure including curettage, sequestrectomy, extraction of the causative tooth, and incision of abscess, was performed.

Seven subjects were treated only with internal use of antibiotics.

Fifteen subjects who underwent surgical treatment were confirmed as osteomyelitis by pathological specimens.

In 41 (87%) of these 47 subjects, symptoms disappeared or markedly reduced after the treatment and did not recur within the observation period.

In 5 subjects, symptoms disappeared once but recurred.

The remaining 1 subject was not cured by the treatment, but the pathological specimen obtained during surgical procedure verified the diagnosis of osteomyelitis.

In contrast, 8 subjects could not be diagnosed as osteomyelitis.

Of these, 3 subjects were prescribed carbamazepine or received stellate ganglion block, leading to the symptoms temporarily disappearing or being reduced.

In 3 subjects, the symptoms disappeared spontaneously within 2 months; their symptoms might have been due to localized periodontitis or the healing process after tooth extraction.

The remaining 2 subjects probably had mental problems, such as cancer phobia.

Relationship between MRI and conventional imaging features

Table 1. Relationship between MRI features and bony appearance in 23 patients in the acute or subacute group

<i>MRI features</i>		<i>Bony appearances on conventional radiography and CT</i>				
<i>T1-weighted image</i>	<i>T2-weighted or STIR image</i>	<i>Lytic</i>	<i>Mixed</i>	<i>Sclerotic</i>	<i>Sequestration</i>	<i>No change</i>
Low	Extensive high	2	4	3	1	6
	Focal high		1	4		
	Low					
	No change					
No change	Extensive high					2*
	Focal high					
	Low					
	No change					
Total		2	5	7	1	8

Twenty-one subjects had low SI on T1-weighted imaging. Of these, 16 subjects had extensive high SI and 5 had focal high SI on T2-weighted or STIR imaging.

In 6 of these subjects, MRI appeared to be an effective tool for the diagnosis because there were no apparent bony changes on conventional radiography and CT

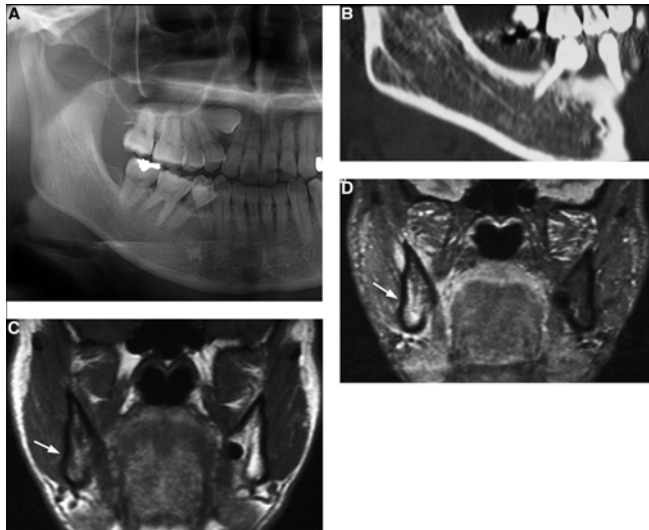


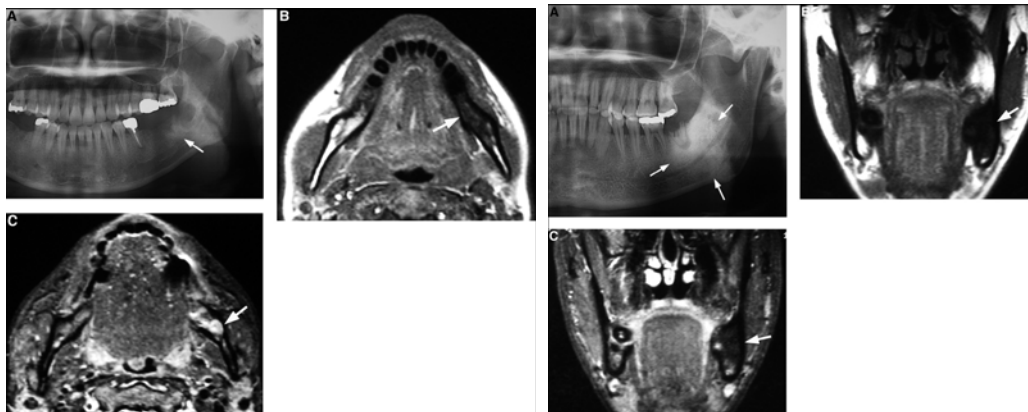
Table II. Relationship between MRI features and bony appearance in 32 patients in the chronic group

MRI features		Bony appearances on conventional radiography and CT				
T1-weighted image	T2-weighted or STIR image	Lytic	Mixed	Sclerotic	Sequestration	No change
Low	Extensive high	7	4	6	2	2
	Focal high					1
	Low					1
No change	No change	7	5	8	2	4*
	Extensive high					
	Focal high					
	Low					
Total	No change					2*
						10

19 subjects had an extensive high, and 6 subjects had focal high SI on STIR imaging

One subject showed low SI both on T1-weighted and STIR imaging

This appearance was characteristic in the chronic osteomyelitis.



Proposal of criteria for MRI

for the acute or subacute stage, the positive appearance of osteomyelitis is low SI on T1-weighted imaging, together with extensive high or focal high SI on T2-weighted or STIR imaging; for the chronic stage, appearance of low SI on both T1-weighted imaging and T2-weighted or STIR image is found.

DISCUSSION

Acute osteomyelitis usually responds to antimicrobial therapy, whereas chronic osteomyelitis usually

requires surgical procedure such as curettage of the necrotic bone and granulation tissue, and sequestrectomy. In the present study, however, no relationship was found between MRI findings and selection of treatment procedures. It will be necessary in the future to examine whether MRI image can contribute to the choice of therapeutic method.

MRI images of osteomyelitis have been characterized by changes in SI of the bone marrow, such as decrease on T1-weighted images and increase on T2-weighted images. The authors emphasize the utility of MRI to depict the bone marrow changes in the acute stage before bony changes are visualized on conventional radiography. As for the chronic stage, Schuknecht et al. have reported low SI both on T1- and T2-weighted images in some of the subjects.

Their conventional images demonstrate extensive sclerosis of the cancellous bone. These imaging features, which were also observed in one of the present cases, can be a characteristic feature in the chronic stage.

The STIR image is a recently introduced sequence. This technique enables us to evaluate T2 signals more easily with fat tissue suppression. Administration of gadolinium-DTPA may add very important information, such as a noncalcified periosteal reaction, definition of the limit of the sequestrum, and extension of the inflammation to soft tissue. These features were also detectable on STIR image, and therefore sequence with gadolinium-DTPA was not always used for making of MRI diagnostic criteria.

In conclusion, when osteomyelitis is suspected, especially for subjects without positive features of osteomyelitis on CT and conventional images, MRI with the 2 sequences, T1-weighted and T2-weighted or STIR, used in this study should be performed.

題號	題目
1	下列何者並非造成 osteomyelitis 的原因 (A) Odontogenic infection (B) Traumatic fracture (C) Chronic systemic disease (D) Radiation
答案(D)	出處：Oral and maxillofacial pathology 2 nd P127~P128
題號	題目
2	何者並非 chronic osteomyelitis 的治療方法 (A) Drainage (B) Curettage (C) Decortication (D) Hyperbaric oxygen
答案(A)	出處：Oral and maxillofacial pathology 2 nd P127~P128