

Temporomandibular dislocation caused by pancreatic cancer metastasis: A case report

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Abstract. Metastasis-induced dislocation of the temporomandibular joint (TMJ) is rare. The present study describes a case of TMJ dislocation caused by metastasis from pancreatic cancer, and discusses this in the context of literature on occlusal abnormality and/or dislocation due to metastasis. In the present case, unilateral TMJ dislocation was suspected when the patient first presented; destructive bone changes were not observed on conventional radiographs, and magnetic resonance imaging (MRI) revealed a tumorous lesion. The present case suggests that healthcare professionals should consider whether a malignant disease is present in cases of occlusal abnormality and/or dislocation of the TMJ, and that, in patients with TMJ dislocation that cannot easily be repositioned, additional imaging examinations, including MRI, should be performed as soon as possible, regardless of whether destructive bone changes are present. Metastasis to the TMJ is typically associated with generalized skeletal metastasis in the final stage of malignancy. Therefore, it is crucial to consider the possibility of cervical spine metastasis in order to decrease the risk of cervical fracture when attempting reduction of a TMJ dislocation, particularly in patients with a history of cancer.

Introduction

Dislocation of the temporomandibular joint (TMJ) is defined as an excessive forward movement of the condyle beyond the articular eminence with complete separation of the articular surfaces and fixation in that position (1). Although dislocation or subdislocation of the TMJ is typically bilateral, it may be unilateral and cause occlusal abnormality (2). TMJ dislocation

is typically associated with hypermobility of the mandible and poor development of the articular fossa (1,2). The differential diagnosis for diseases leading to malocclusion and/or dislocation in this region includes dental malocclusion without skeletal anomalies, skeletal malocclusion, articular disc displacement, thickness of the retrodiscal tissue, trauma, infection, arthritis, tumor or tumor-like lesions, and neuromuscular diseases (3,4). TMJ dislocation is rarely associated with tumor or tumor-like lesions, and cases of metastasis-induced TMJ dislocation are extremely rare (5).

The 5-year survival rate of pancreatic cancer (PC) was reported to be no more than 5% in China (6) and the USA (7). Patients with PC often exhibit no symptoms in the early stage, and the early clinical symptoms of PC that are present are typically non-specific, including back and shoulder pain, dyspepsia, dysphagia, changes in bowel habits and lethargy (8). Therefore, patients with PC are often diagnosed at an advanced stage and distant metastases are occasionally detected at the initial diagnosis (8). The most frequent metastatic sites are the liver and peritoneum, followed by the lungs (9). PC rarely metastasizes to the head and neck region, and there are few reports in the English literature of PC metastasizing to the mandibular condyle (10).

The current report presents a case of TMJ dislocation caused by PC metastasis, and discusses this in the context of literature on occlusal abnormality and/or TMJ dislocation due to metastasis.

Case report

An 85-year-old female was referred to the Department of Dentistry and Oral Surgery, the University of Fukui Hospital (Fukui, Japan) in January 2012 presenting with trismus, mandibular deviation toward the left side, and spontaneous pain in the right auricular and buccal region for 3 months. Physical examination revealed trismus and facial asymmetry due to mandibular deviation toward the left side and right preauricular depression. Panoramic radiography and lateral oblique transcranial projection revealed anterior displacement of the right mandibular condyle, whereas the left condyle was located in the mandibular fossa (Figs. 1 and 2). The patient was diagnosed with right temporomandibular dislocation upon presentation to the Department of Dentistry and Oral Surgery, the University of Fukui Hospital, and reduction of the dislocation was

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Figure 1. Panoramic radiograph revealing anterior deviation of the right mandibular condyle.

unsuccessfully attempted. Magnetic resonance imaging (MRI) revealed a tumorous lesion extending from the right temporal muscle to the right sphenoid bone, right temporomandibular dislocation and anterior displacement of the right articular disc (Fig. 3). Enhanced computed tomography (CT) revealed a tumorous lesion from the right temporal muscle to the right pterygoid muscles, and intracranial and orbital extension was observed (Fig. 4). Three-dimensional CT using the OsiriX program (version 4.1.2; Pixmeo SARL, Geneva, Switzerland) demonstrated dislocation of the right TMJ (Fig. 5) (11). Technetium-99 m methylene diphosphonate and gallium-67 citrate scintigraphy showed abnormally increased uptake in the right temporal and sphenoidal regions and multiple sites throughout the body, including the skull bones, upper and lower jaw, vertebrae, ribs, scapula, sternum and pelvic bone, and in each femur (Fig. 6). An enhanced CT scan of the chest and abdomen revealed a 4-cm nodule in the tail of the pancreas and a hypoenhanced mass in the liver (Fig. 7). Laboratory examination revealed increased C-reactive protein (0.89 mg/dl; normal range, <0.32 mg/dl), carcinoembryonic antigen (CEA; 83.5 ng/ml; normal range, <5.0 ng/ml), carbohydrate antigen 19-9 (CA19-9; 52,541.7 U/ml; normal range, <37.0 U/ml) and DUPAN-2 (2,660 U/ml; normal range, 0-150 U/ml), which are tumor markers of gastrointestinal cancer and PC. Therefore, the patient was diagnosed with PC with multiple metastases by a gastroenterologist in the Department of Gastroenterology, the University of Fukui Hospital. In addition, the patient was diagnosed with PC metastasis-associated dislocation of the TMJ. The patient and the patient's family chose not to undergo further examinations, including biopsy. Chemotherapy and palliative therapy were proposed instead of surgery due to the age and general condition of the patient and the progression of the lesion. The patient opted for palliative therapy and was discharged from hospital and succumbed to cachexia 2 months after initially presenting with disease.

Written informed consent for the publication of this case report and associated images was obtained from the patient's family.

Discussion

Kolokythas *et al* (10) reported in their review article that metastasis to the oral cavity is rare in PC, with an incidence of 1-8%, and metastasis to the TMJ is extremely rare. Approximately 33% of cases of previously undiscovered primary tumor

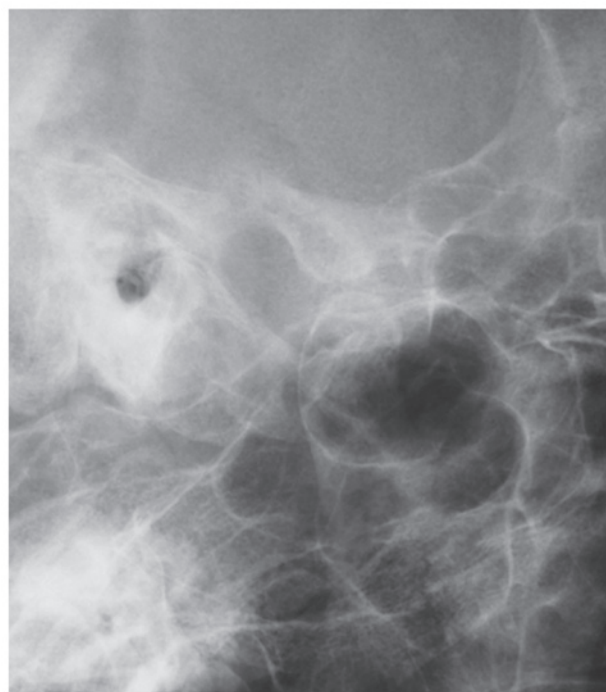


Figure 2. Lateral oblique transcranial projection radiograph revealing frontal deviation of the right mandibular condyle.

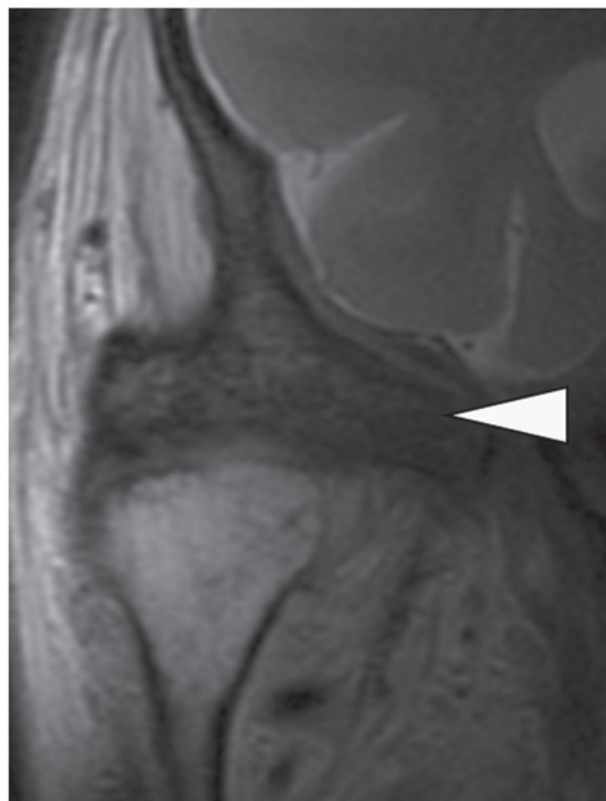


Figure 3. T2-weighted magnetic resonance imaging scan revealing a tumorous lesion (white arrowhead) from the right temporal bone to the right sphenoid bone.

presented with oral metastasis as the first indication (10). According to the literature on 796 cases of oral and maxillofacial metastases, the most common metastatic site was the

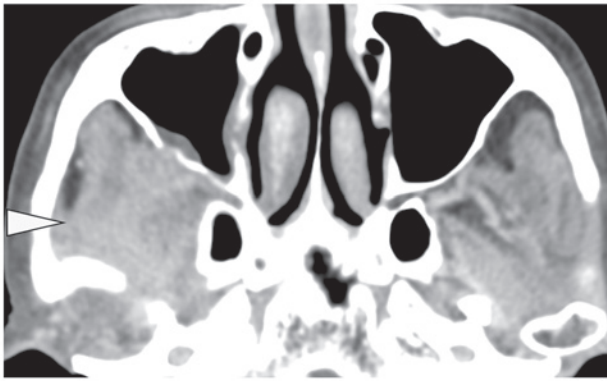


Figure 4. Head and neck enhanced computed tomography scan revealing a tumorous lesion (white arrowhead) of ~3 cm at the maximum diameter, extending from the right temporal muscle to the right pterygoid muscles with intracranial and orbital extension, with internal necrosis or degeneration. The right condyle was not observed due to anterior displacement induced by the tumor. The left condyle was located in the mandibular fossa.

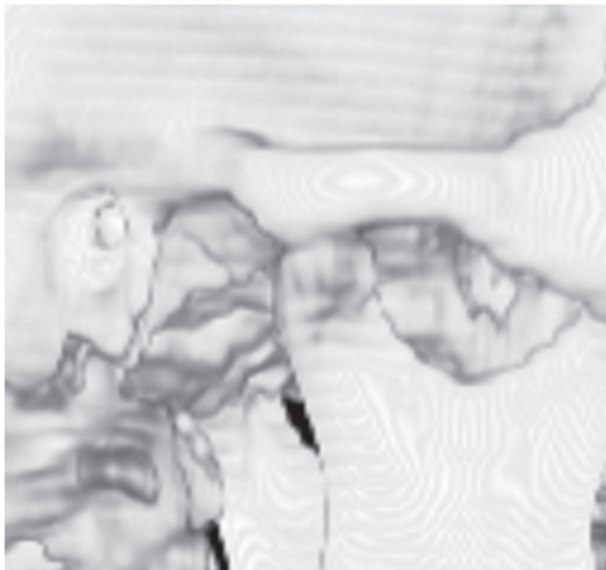


Figure 5. Three-dimensional computed tomography scan using the OsiriX program, demonstrating dislocation of the right temporomandibular joint.

mandible (283/796 cases, 35.6%), and only 39/796 cases (4.9%) were of metastasis to the mandibular condyle (12). A review of the literature from between 1954 and 2013 identified 66 cases of metastasis to the TMJ (29 males, 35 females and 2 of unknown gender; age range, 32-85 years; mean age \pm standard deviation, 59.0 \pm 11.4 years); pain and/or swelling were common clinical symptoms in these patients (13).

Rubin *et al* (14) reported that symptoms of TMJ dysfunction, including pain, trismus and mandibular deviation, coupled with swelling and radiographic evidence of a destructive lesion or pathological fracture, may suggest the presence of a malignancy, either primary or metastatic. A tumor occurring in the TMJ often obstructs the opening of the jaws; however, in the present study, the tumor in the mandibular fossa caused TMJ dislocation by pushing the condyle out of the fossa (3). The literature review revealed 11 cases of occlusal abnormality and/or TMJ dislocation due to metastasis (5 males and 6 females; age range,

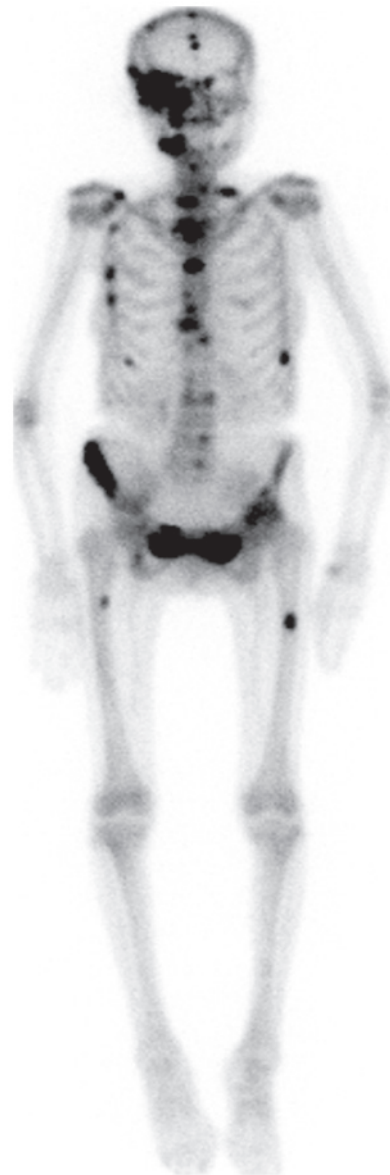


Figure 6. ^{99m}Tc scintigraphy exhibiting abnormally increased MDP uptake in the right temporal and sphenoidal region and multiple throughout the body, including the skull, upper and lower jaw, vertebrae, ribs, scapula, sternum, pelvic bone and each femur.



Figure 7. Abdominal enhanced computed tomography scan revealing a poorly enhanced tumor (4 cm at the maximum diameter, white arrowhead) in the pancreatic tail.

Table I. Cases of OA and/or TMJ dislocation due to metastasis.

Authors	Year	Patient sex	Patient age, years	Primary lesion site	Pathological diagnosis	OA	Dislocation of TMJ	Condyilar destruction on conventional radiographs	Additional imaging examination (Refs.)
Butler	1975	F	49	N.A.	N.A.	(+)	N.A.	N.A.	N.A. (15)
Jagger <i>et al</i>	1978	M	63	N.A.	Multiple myeloma	(+)	N.A.	(+), pathological fracture	N.A. (16)
Giles and McDonald	1982	F	55	Rectum	Adenocarcinoma	(+)	N.A.	(+), pathological fracture	Scintigraphy (17)
Rubin <i>et al</i>	1989	F	67	N.A.	Adenocarcinoma	N.A.	(+)	(-)	CT, scintigraphy (14)
Stavropoulos and Ord	1993	F	55	Breast	Adenocarcinoma	(+)	N.A.	(+), pathological fracture	CT (18)
Meneghini <i>et al</i>	2002	F	63	Sacrococcygeal region	Chordoma	(+)	N.A.	(+)	CT (19)
Smolka <i>et al</i>	2004	M	67	Stomach	Adenocarcinoma	N.A.	(+)	(-)	CT, MRI (20)
Sari <i>et al</i>	2006	M	65	Lung	Squamous cell carcinoma	N.A.	(+)	N.A.	CT, MRI (21)
Boniello <i>et al</i>	2008	M	60	Lung	Adenocarcinoma	N.A.	(+)	N.A.	N.A. (5)
Kruse <i>et al</i>	2010	M	85	Thyroid gland ^a	N.A.	(+)	N.A.	(+), pathological fracture	PET-CT (22)
Scolozzi <i>et al</i>	2012	F	72	Lung	Large cell carcinoma	(+)	N.A.	(+)	CT, MRI, PET-CT (23)
Present study		F	85	Pancreas ^a	N.A.	N.A.	(+)	(-)	CT, MRI, scintigraphy -

^aSuspected. (+), present; (-), absent; TMJ, temporomandibular joint; OA, occlusal abnormality; F, female; M, male; CT, computed tomography; MRI, magnetic resonance imaging; N.A., not available; PET, positron emission tomography.

49-85 years; mean age \pm standard deviation, 63.7 ± 9.6 years), 4 of which were cases of TMJ dislocation (Table I) (5,14-23). Condylar destruction, including pathological fracture, was often observed using conventional radiography in cases of occlusal abnormality, whereas it was not observed in cases of TMJ dislocation (16-18,22). Smolka *et al* (20) reported a case of TMJ dislocation due to synovial metastasis without destructive bone changes, in which a tumorous lesion was revealed using MRI. In the present study, unilateral TMJ dislocation was suspected when the patient initially presented, since destructive bone changes were not observed using conventional radiography and MRI revealed a tumorous lesion. The present study highlights the importance of considering whether a malignant disease is present in cases of occlusal abnormality and/or dislocation of the TMJ, and suggests that, in patients with TMJ dislocation that cannot easily be repositioned, additional imaging examinations, including MRI, should be performed as soon as possible, regardless of whether destructive bone changes are observed.

In cases of metastasis to the TMJ, the most common primary site was the breast and the most common histological type of tumor was adenocarcinoma (13). Metastasis to the TMJ was typically associated with generalized skeletal metastasis in the final stage of malignancy, and mortality occurred in the majority of patients within 1 year after the diagnosis of metastasis (24). The mechanism underlying metastasis to the mandible is considered to be hematogenous spread, since there is no lymphatic system in the jaw bone (10,24). Metastases are more likely to occur in regions with increased red marrow concentration since malignant cells become lodged in red marrow as the initial site for skeletal metastasis, or occur in regions with abrupt angulation of the vessel due to the decelerated blood flow, which aids the deposition of malignant cells (25,26). In previous studies, the majority of mandibular metastases (53%) occurred in the molar and premolar regions where red marrow was present and blood flow was decelerated (12,26). By contrast, metastasis to the mandibular condyle rarely occurs due to a lack of substantial hematopoietic marrow and limited local blood supply (10). In addition, synovial metastases, among which the knee is the most common site, appear to be rare (27). The normal synovium contains blood and lymphatic vessels. Therefore, this tissue could be associated with metastasis (27). However, the majority of synovial metastases are reportedly the direct extension of bone metastases into the adjacent joint, while hematogenous metastasis is rare (27). McConnell *et al* (27) reported that synovial metastases occurred following knee arthroplasty in 2 patients with gastrointestinal cancer. Hematogenous metastasis to the mandible and synovial membrane may occur through the Batson venous plexus (28).

CEA, CA19-9 and DUPAN-2 are recognized markers for PC (29,30). Ni *et al* (29) reported that the sensitivity of CA19-9 alone was 80%, and that the specificity of CEA combined with CA19-9 was 84% in the diagnosis of PC. Furthermore, the median survival time of patients with a CA19-9 serum level $\geq 1,000$ U/ml was 6 months (29). Goonetilleke and Siriwardena (30) reported that the sensitivity and specificity of CA19-9 for diagnosing PC were 79 and 82%, respectively, and those of DUPAN-2 were 65 and 80%, respectively. Furthermore, a CA19-9 serum level >40 U/ml with positive or equivocal radiological findings was highly suggestive of a diagnosis of PC (30). In the present study, the serum levels of

tumor markers specific for PC (CEA, CA19-9 and DUPAN-2) were increased beyond the normal range. These results were consistent with those of the imaging examinations, and suggested that PC was present.

To conclude, the present study suggested that healthcare professionals should consider whether a malignancy is present in cases of occlusal abnormality and/or TMJ dislocation, and that, in patients with TMJ dislocation that cannot easily be repositioned, additional imaging examinations, including MRI, should be performed as soon as possible, regardless of whether there are destructive bone changes. Metastasis to the TMJ is typically associated with generalized skeletal metastasis in the final stage of malignancy (24); in the present case, destructive changes to the cervical spine due to metastasis was observed on the CT scan shortly before the patient succumbed to the disease. Therefore, it is necessary to consider the possibility of cervical spine metastasis in order to decrease the risk of cervical fracture when attempting reduction of a TMJ dislocation, particularly in patients with a history of cancer.

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