Case Report

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Temporomandibular Joint False Ankylosis in a Cat: A Case Report

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Abstract Temporomandibular joint (TMJ) ankylosis is a rare disease impairing mandible movement and can either be intra-articular (true) or extra-articular (false). A cat presented with an inability to open its mouth, drooling, and facial asymmetry. Computed tomography (CT) confirmed an extracapsular abnormal TMJ fusion, and a surgical plan was devised based on the CT imaging. Post-surgery, the cat regained mouth mobility (indicating false ankylosis) and showed an improved prognosis. This case of CT-diagnosed and treated feline TMJ false ankylosis underscores the indispensable role of CT in diagnosing and devising surgical strategies for feline TMJ false ankylosis.

Key words computed tomography, extracapsular ankylosis, feline, jaw movement, temporomandibular joint disorder.

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Introduction

Temporomandibular joint (TMJ) ankylosis is characterized by fibrous or bony fusion of the mandibular head and mandibular fossa (1). The primary etiology of TMJ ankylosis is trauma (8,14). Developmental, infectious, and neoplastic processes can also serve as contributing factors (11). TMJ ankylosis can result in skeletal or dental malocclusion, periodontitis, and mucosal ulceration (1). TMJ ankylosis is a rare and debilitating disease manifesting as partial or complete immobility of the mandible (15). In cats, mandibular immobility can cause issues such as eating difficulty, weight loss, cachexia, hepatic lipidosis, and masticatory muscle atrophy (14). Therefore, early and accurate diagnosis and treatment of ankylosis are crucial.

TMJ ankylosis can be intra-articular (true) or extra-articular (false) type (8). In veterinary medicine, only a few cases of feline false ankylosis have been reported (8,9,11,14,15). Furthermore, there are limited reports utilizing computed tomography (CT) for the diagnosis or treatment of false ankylosis in cats (8,9,11,14,15). This case report describes such a diagnostic approach using CT in a cat with a TMJ disorder. Additionally, it outlines the outcomes of the surgery planned using CT and describes the prognosis of the cat.

Case Report

A 3-year-old intact male Korean domestic short-haired stray cat, weighing 3.12 kg, presented with an inability to open its mouth, drooling, and facial asymmetry (Fig. 1). The medical history of the cat was not available due to its stray status. Complete blood count and serum chemistry tests yielded unremarkable results. Serological tests for feline infectious peritonitis and feline leukemia virus were negative, and no digestive symptoms were noted.

Initial suspicions included stomatitis, dental issues and TMJ diseases. To confirm the diagnosis, radiological examination (1417WGC, Rayence Co., Ltd., Hwaseong-si, South Korea) was performed. Radiography revealed an abnormal osseous structure around the right TMJ, and the mandible appeared to be displaced to the right (Fig. 1). Radiographic oblique view imaging was omitted as it was unnecessary, given the clear clinical symptom of the inability to move the mouth and the decision to proceed with CT imaging for surgical and treatment planning purposes. The oral examination was unfeasible due to the inability to open and close the mouth.

Anesthesia for oral examination, CT scan, and surgery was induced by intravenous administration of butorphanol (Butophan Inj., Myung Moon Pharma, Seoul, South Korea) (0.2 mg/kg) and propofol (Provive; Myungmoon Pharmaceutical Co., Seoul, South Korea) (6 mg/kg). Anesthesia was maintained using 1.5% isoflurane (Forane solution; Choongwae Pharma Corporation, Seoul, South Korea) in 100% oxygen through tracheostomy intubation. During the oral examination under anesthesia, the mouth remained immobile with an interincisor gap of around 7 mm (Fig. 1), which is significantly below the average interincisor gap of 62 ± 8 mm in normal anesthetized cats (4). Subsequent to the oral examination, a CT scan (TSX-031A Toshiba Medical Systems Co., Ltd., Tochigi, Japan) was conducted. The CT scan parameters employed in our study were set at 120 kVp and 100 mAs, with a slice thickness of 1.0 mm. A dose of two milliliters per kilogram of body weight of a non-ionic positive contrast agent (350 mgI/mL Omniopaque; GE Healthcare Inc., Princeton, NJ, USA) was intravenously administered using a CT power injector through the cephalic vein, at a controlled flow rate of 3 mL/s. Subsequently, post-contrast images were obtained approximately 2 minutes after the injection of the contrast medium. The assessment of the TMJ bones was conducted under the following conditions: a window width (WW) of 2,700 and

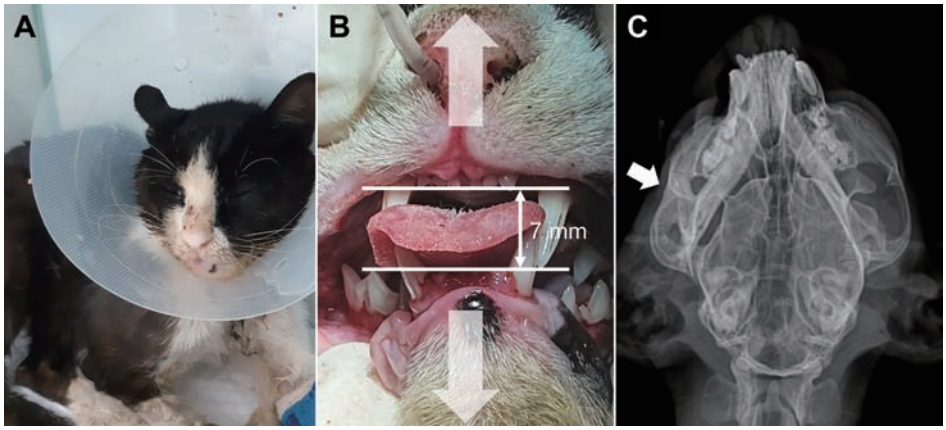

Fig. 1. (A) The patient at the first visit, with poor hair condition and low body weight. (B) We attempted to manipulate the patient's mandible and maxilla in the direction indicated by the respective semi-transparent arrows, but neither opening nor closing occurred. The interincisor gap was 7 mm. (C) Ventrodorsal radiographic projection of the patient's skull. Abnormal osseous structure (arrow) around the right temporomandibular joint and the mandible displaced to the right were observed. In all three images, the left side of the pictures corresponds to the patient's right side.

a window level (WL) of 350. Additionally, the evaluation of the soft tissues surrounding the TMJ was performed under conditions of a WW of 400 and a WL of 60, both before and after contrast enhancement. All image interpretation and 3D CT reconstructions were performed using RadiAnt DICOM VIEWER software (Medixant, Poznan, Poland). The CT scan showed an abnormal union (ankylotic block) between the right zygomatic arch and mandible, indicating false ankylosis (Fig. 2). Meanwhile, right TMJ space narrowing was also observed, making it difficult to rule out true ankylosis. Through the CT contrast examination, other conditions that could potentially hinder jaw movement, such as otitis media, myositis, and other neoplastic lesions, were ruled out (Fig. 2). Additionally, we reevaluated and differentiated it in three CT cross-sectional images: transverse, sagittal, and dorsal (Fig. 2).

Surgical removal of the ankylotic block was planned based on the three CT cross-sectional images and 3-dimensional reconstructed images (Fig. 2), and the exact resection range was specified. The ankylotic block was surgically removed (Fig. 3), allowing for free movement of the jaw. However, to prevent the progression to true ankylosis in the right TMJ, which had maintained a narrow joint space for a prolonged period, an additional prophylactic condylectomy was performed.

Post-operative oral examination under anesthesia confirmed the presence of plaque, gingivitis and mild stomatitis. No significant findings were observed on oral examinations and dental radiographs. Scaling was performed, and the stomatitis was treated to eliminate the risk factors of the recurrence of ankylosis. Stomatitis was managed medically.

The cat was discharged 18 days post-surgery, and on the 64th day post-surgery, a follow-up was conducted with a basic physical examination, excluding additional imaging. Controlled jaw exercises were prescribed within manageable limits. Post-operatively, facial asymmetry from condylectomy persisted but was the only clinically significant adverse outcome. The cat exhibited improved jaw mobility and eating ease. The cat's body weight decreased from 3.1 kg at presentation to 2.8 kg nine days post-surgery, and then increased to 3.3 kg within two months post-surgery.

Discussion

If a cat has the inability to open or close its mouth, as in this case, the differential diagnosis includes osteoarthritis, TMJ luxation, TMJ fracture, true ankylosis, stomatitis, myositis around the TMJ, sialitis, severe otitis media, neoplastic disease, false ankylosis, and neuropathy (2,7). Intra-articular problems of TMJ may be the cause, but other painful or mechanical diseases on the maxillofacial extra-articular region can also impede

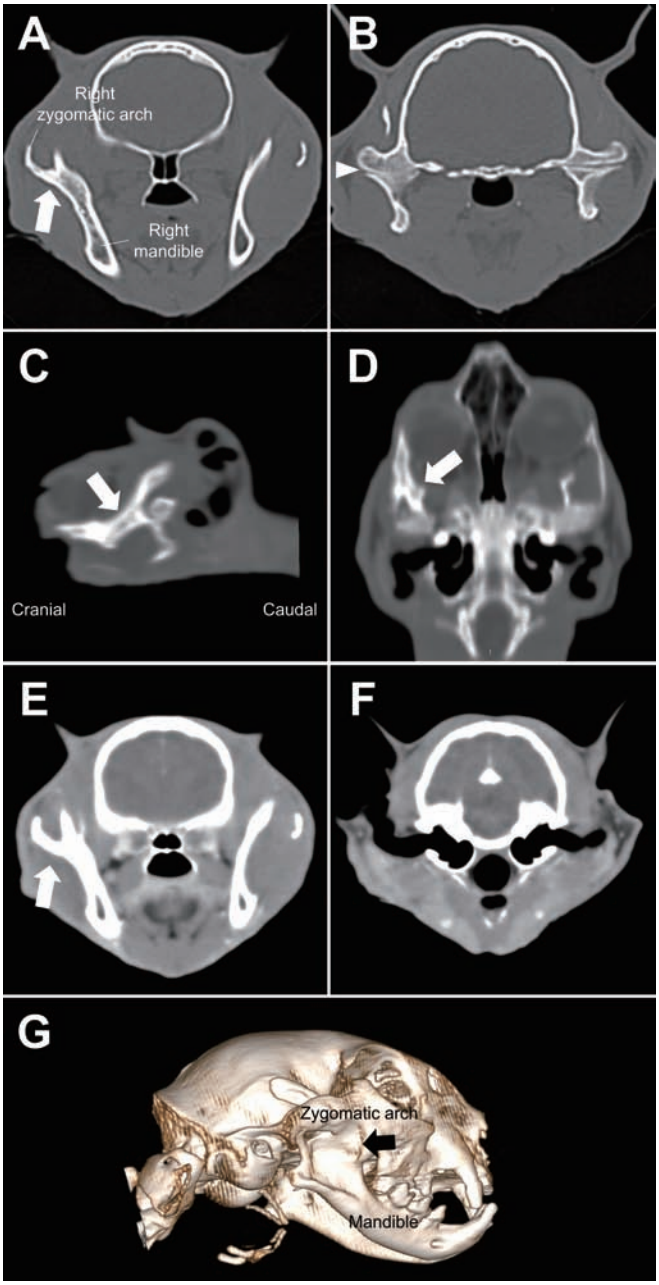

Fig. 2. The computed tomography (CT) transverse plane images (A, B), sagittal image (C), dorsal plane image (D) of the patient's skull (window level = 350, window width = 2,700). (A, C, D) The abnormal union (white arrow) between the right zygomatic arch and the right mandible was confirmed. (B) The temporomandibular joint space narrowing (white arrowhead) was also confirmed. (E, F) Transverse CT cross-sectional images were visualized with different window levels and window widths compared to (A, B, C, D) for soft tissue assessment. (E) There are no distinct abnormalities observed in the surrounding soft tissues, except for the abnormal union (white arrow). (F) No specific findings are identified in adjacent structures such as the tympanic bulla, brain, and pharynx. (G) The 3D CT reconstruction model image of the skull. The abnormal union (black arrow) is clearly visible in the 3D image.

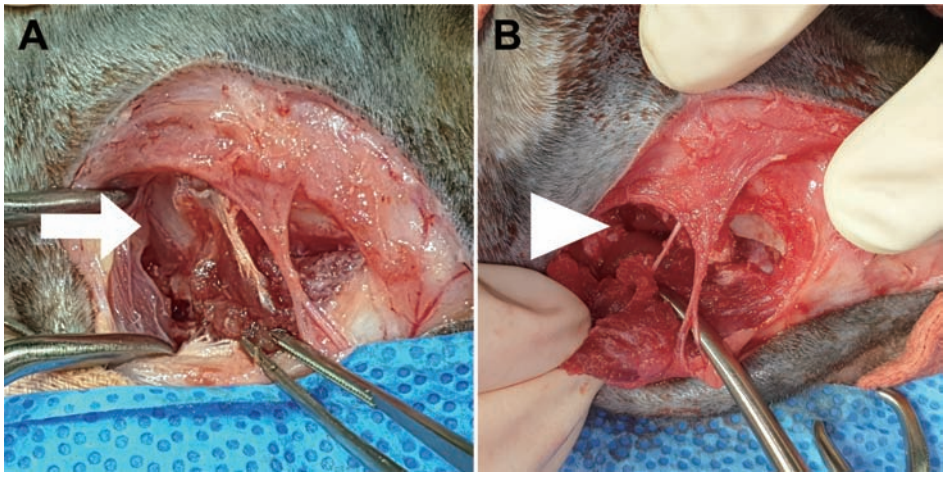

Fig. 3. Intraoperative photographs showing pre- and post-operative views of ankylotic body removal and condylectomy. (A) The condylar process (arrow) is exposed. (B) Post-surgical appearance after the removal of the condylar process and ankylotic block (arrowhead).

mouth movement (2). We needed to differentiate among these possibilities, and we proceeded with the simplest diagnostic method, which is radiographic imaging.

However, radiography evaluation of the TMJ is challenging due to the superimposed intricate bone structure of the skull (2,9,10,13). The crucial areas that need to be confirmed for the differentiation of the previously mentioned conditions, including the TMJ surfaces, muscles surrounding the TMJ, intraoral structures, ears, and salivary glands, are challenging to assess definitively on radiographs. Therefore, to achieve a more definitive and precise diagnosis, we opted for CT evaluation. The traditional radiographic oblique view for TMJ evaluation was intentionally omitted in this study (9,10,13). Given the clear clinical symptoms of the cat's inability to move its mouth and the scheduled CT imaging for surgical and treatment planning purposes, precise TMJ assessment was substituted with CT examination. While all the information obtainable from radiographic oblique views can be acquired through CT examination, we determined that radiographic oblique view assessment cannot fully replace CT imaging.

CT scan made it easy to observe and evaluate the complex maxillofacial structures in various cross-sections without interference from other structures (Fig. 2). The 3-dimensional reconstructed CT image of clearly visualized the range of the lesion, which was of great help in planning surgery or treatment (Fig. 2). In addition, it was possible to evaluate the soft tissues around the TMJ and the internal organs of the skull such as inner ear, middle ear, and brain, with a contrast-enhanced CT scan. CT contrast examination allowed for the detection of any nodules or masses around the TMJ, enabling the differentiation of neoplastic lesions.

There has been a case where false ankylosis in a cat was diagnosed and surgically corrected solely based on radiographic assessment without CT evaluation, leading to the necessity for reoperation (11). Evaluating the cat's TMJ using radiographic imaging alone is challenging, and it has been noted that CT imaging is valuable for TMJ visualization (10,13). Furthermore, it has been pointed out that relying solely on radiographic assessment may result in underestimation (1, 10,14). Due to the limitations of radiographic examinations and the advantages of CT scans, CT has become the gold standard for TMJ evaluation, especially for diagnosing ankylosis, in veterinary medicine (1,5,8,9,14,15). In our case, the location and extent of the ankylotic block, which was difficult to specify on radiographs, could be accurately identified with a CT scan. Except for ankylotic block and TMJ space narrowing, other causes that might impede mouth movement could be excluded with a CT scan.

Corticosteroid medications can be used to treat myositis or other inflammatory conditions around the TMJ (3), but the prognosis is poor if only the medical treatment is performed without corresponding surgical treatment. Non-surgical intervention by forcing the jaw opening can cause inflammation and microtrauma, promoting the recurrence of true or false ankylosis (8). In other words, surgery is necessary for the treatment of false ankylosis, and CT can provide essential information to guide the surgical approach.

In this case, the 3-dimensional reconstructed CT model image helped to precisely plan the surgery by specifying the exact resection range. In the right TMJ, where the joint surfaces were in contact with a narrow joint space, osteoarthritis or other joint diseases could be induced, which could lead to true ankylosis later. Therefore, a right condylectomy was performed together. The CT scan was also helpful in making the decision for the prophylactic surgery (8).

Oral and dental diseases can cause recurrence of false ankylosis by causing inflammation or fibrosis around the TMJ even after surgery. Therefore, it is necessary to treat them

together. Dental scaling and treatment for stomatitis were performed to prevent the recurrence of false ankylosis.

Postoperative physiotherapy is important for restoring jaw mobility and can be modified. It is often necessary to recover the atrophied jaw muscles after not being used for a long time due to false ankylosis in subsequent postoperative management (12). Physiotherapy prevents postsurgical hypomobility and any fibrous adhesions that can lead to the recurrence of false ankylosis (1,7,9,12). Therefore, we continued to incorporate simple exercises to promote mouth movement in post-operative management as physiotherapy (6,9).

Conclusions

This case describes a diagnosis, surgical approach, treatment, and postoperative management of a cat with malnourishment, facial asymmetry, and an inability to move the jaw due to false ankylosis using CT. In cases of cats with problems of jaw movement, a CT scan is highly valuable for diagnosis and treatment, particularly when ankylosis is suspected, as it becomes indispensable.

Author Contributions

Conceptualization: Yoon S, Lee JH, Yoon H; Data curation: Yoon S, Lee JH, Lee SE, Yoon H; Formal analysis: Yoon S, Lee JH, Lee SE, Yoon H; Investigation: Yoon S, Lee JH, Lee SE, Yoon H; Methodology: Yoon S, Lee JH, Yoon H; Project administration: Yoon S, Yoon H; Resources: Lee JH, Lee SE, Yoon H; Software: Yoon S; Supervision: Yoon H; Validation: Yoon S, Lee JH; Visualization: Yoon S; Writing - original draft: Yoon S; Writing - review & editing: Yoon S, Yoon H.

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Conflicts of Interest

The authors have no conflicting interests.

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