

Reconstruction of temporomandibular joint ankylosis with temporalis myofascial flap in a cat: a case report

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ABSTRACT: An approximately 7-year-old 1.7kg, female Siamese cat with a history of a malocclusion and an inability to open its mouth was referred the Animal Medical Center, Chonbuk National University. The cat had shown signs since it was adopted four years earlier but the cause was not determined. The mandible was deviated 2 mm to left, the mouth could be opened only 2 mm and attempts to open the jaws caused considerable pain. Radiographs indicated new bone formation and a loss of joint space in the right temporomandibular joint(TMJ). 3-dimensional CT showed bony fusion and bone thickness in the right TMJ. The physical, 3-dimensional CT and radiographic examinations revealed right TMJ ankylosis. Under general anesthesia, surgical treatment was performed to remove the ankylosis block with subsequent interpositional arthroplasty using a temporalis myofascial flap. The patient showed distinct improvement in both the articular functionality and clinical signs.

Keywords: condylectomy; interpositional arthroplasty; ankylotic block

Temporomandibular joint(TMJ) ankylosis is characterized by the formation of a bony or fibrous mass that replaces the normal articulation. An ankylotic block causes a decrease in mandibular mobility, particularly hindering mouth opening, as well as anterior and lateral movement (Kazanjian, 1955).

TMJ ankylosis is classified as either true or false. True ankylosis is a condition that results in osseous or fibrous adhesion between the surfaces of the TMJ, within the limits of the articular capsule. False ankylosis results from diseases not directly related to the joint (Miller et al., 1975).

A variety of factors can cause TMJ ankylosis, including trauma, systemic and neoplasms in the area. A higher incidence of post-traumatic ankylosis in cats and dogs has been reported (Sullivan, 1989; Mark A et al., 1996; Meomartino et al., 1999; Okumura et al., 1999; Maas and Theyse, 2007).

The treatment for TMJ ankylosis is complete ankylotic block removal and a more normal range of jaw motion. Several techniques have been defined in human medicine for surgical correction of TMJ ankylosis. These include subsequent arthroplasty,

autologous tissue between articular surfaces or heterologous material to restore the anatomic sutructure and normal function (Erol et al., 2006).

A temporalis myofascial flap is used in maxillofacial reconstructive surgery. It has the advantages of a vascularized tissue flap, easy pedicled transfer and simulates physiological action (Cheung, 1996; Shimizu et al., 2006). There are no reports of the clinical use of a temporalis myofascial flap for the reconstruction of TMJ ankylosis in small animal surgery. This report describes the successful use of a temporalis myofascial flap and condylectomy for the treatment of TMJ ankylosis in a cat.

Case presentation

An approximately 7-year-old, female Siamese cat weighing 1.7 kg was referred to the Animal Medical Center, Chonbuk National University for evolution, malocclusion and an inability to open the mouth. The cat had shown signs since it was adopted four years earlier but the cause was not determined. The



Figure 1. Ventrodorsal skull radiograph showed osteoproliferation around the right TMJ between coronoid process and the zygomatic arch

owner reported that the cat had eaten a powder diet and was unable to groom itself. A physical examination showed the cat to be cachexic, depressed, and approximately 5% dehydrated. The temperature, pulse, and respiratory rate were within the reference ranges. The mandible was deviated 2 mm to left, opened only 2 mm and attempts to open the jaws caused significant pain. A complete blood count was performed, and all values were within the reference ranges. Serum biochemistry analysis demonstrated decreased the total protein (5.1 g/dl; reference range, 5.5 to 7.7 g/dl), and cholesterol (55 mg/dl, reference range, 64 to 229 mg/dl) lev-



Figure 2. Transverse CT image showed completely remodeling and bony fusion of the right temporomandibular joint

els to be in the reference ranges. Radiographs and CT imaging showed bone proliferation and a round irregular bony mass around the right TMJ between the coronoid process and the zygomatic arch (Figure 1 and 2). A three-dimensional CT reconstruction of the skull demonstrated new bone formation: condylar bony fusion to the zygomatic arches (Figure 3). Right true TMJ ankylosis was diagnosed based on the physical and diagnostic imaging findings.

Before surgery, the patient received cephalexin 25 mg/kg *i.m.* (Methilexin[®], Union Korea Pharm, Korea) for prophylaxis. The patient was premedicated with atropin sulfate 0.02 mg/kg (Atropine Sulfate Daewon[®], Dae Won Pharm, Korea) *s.c.*, induced propofol 5 mg/kg *i.v.* (Anepol IN[®], Ha Na Pharm, Korea) and a trachostomy tube was placed. Anesthesia maintained with enflurane and oxygen.

The surgical approach to the right TMJ joint was initiated through a 6 cm long incision following



Figure 3. Three-dimensional CT reconstruction of skull in a lateral view showed the bone proliferation between condylar process and zygomatic bone



Figure 4. Resection of ankylosis block and creation gap arthroplasty

the ventral border of the zygomatic arch and centered over the joint. The platysma muscle directly under the skin was incised along the same plane as the skin. The origin of the masseter muscle was elevated subperiosteally and the muscle was retracted in an anterior ventral direction to expose the TMJ. A condylectomy was performed by removing the ankylosis block around the right TMJ between the coronoid process and the zygomatic arch. Gap arthroplasty was created by removing the osseous tissue with surgical burs and a ronger (Figure 4). The temporalis myofascial flap was harvested at this stage. The facial nerves were identi-



Figure 5. The temporalis myofascial flap was raised. Pedicled flap placed into the gap arthroplasty

fied, the superficial temporal fascia was incised and the deep temporal fascia covering the temporalis muscle was exposed. The muscle was raised with a periosteal elevator and was left attached to its vascular pedicles (Figure 5). The temporalis myofascial flap was reflected, turned over the zygomatic arch, and inserted into the defect gap. The flap was fixed to the new joint space with 3–0 vicryl sutures. The debris was removed by irrigation and suction, and the overlying tissues were repaired in layers. The jaw was opened forcibly and measured after surgery. The patient was administered cephalexin 25 mg/kg *i.m.* (Methilexin®, Union Korea Pharm, Korea) for 10 days postoperatively. Four weeks after surgery, the cat was able to eat a hard diet without discomfort, and could groom itself. The patient showed distinctive improvement both in articular functionality and clinical signs (Figure 6). Completely recovery was observed after surgery



Figure 6. Mouth opening before treatment (A); mouth opening 20 months after treatment (B)

and there were no complications observed during the 24 months follow-up.

DISCUSSION

TMJ ankylosis is characterized by abnormal immobility and consolidation of the TMJ. The primary etiology of TMJ ankylosis includes trauma and a tumor of the TMJ. It was demonstrated that TMJ trauma is the most common cause of TMJ ankylosis. In a retrospectively study of 10 cases of TMJ ankylosis in cats and dogs, TMJ trauma was documented as the major etiology factor in 60% of cases (Maas and Theyse, 2007). The finding of trauma being the cause of TMJ ankylosis is similar to a previous study (Sullivan, 1989; Mark et al., 1996; Meomartino et al., 1999; Okumura et al., 1999).

It is important to take a TMJ ankylosis image examination in order to diagnose the type and extent of the deformity. In veterinary medicine, radiographic images have been used as an important diagnostic tool in TMJ disease. Osteoproliferation of the TMJ can be observed in conventional radiographic images, such as the lateral view, dorsoventral view, oblique view (Schwarz et al., 2002). However, a radiographic evaluation of the TMJ is difficult, due to the overlapping of structures and image distortion.

CT images can provide precise and detailed information for a diagnosis of TMJ problems. CT images also produce three-dimensional images from computer software. These three-dimensional images can allow a diagnosis as well as a determination of the prognosis, treatment planning, and estimation of the treatment outcome (Maas and Theyse, 2007). CT images are limited when making a diagnosis of fibrous TMJ ankylosis. In this type of ankylosis, magnetic resonance images (MRI) provide better diagnostic information (Landes et al., 2006). It allows a thorough examination of the soft tissues and components of the TMJ problem but its use in veterinary medicine is still limited.

The treatment of TMJ ankylosis in cats and dogs used a condylectomy, coronoidectomy and complete resection of the ankylotic block. Most cases were treated successfully with gap arthroplasty including a condylectomy (Tomlinson and Presnell, 1983; Sullivan, 1989; Mark et al., 1996; Meomartino et al., 1999; Maas and Theyse, 2007). In an experimental study of the functional and anatomic changes af-

ter gap arthroplasty using an animal model, it was reported gap arthroplasty for TMJ ankylosis did not restore the TMJ functionally and histologically to the preexisting state (Matsuura et al., 2001). In human medicine, a variety of interposition materials have been used to prevent recurrence after the treatment of TMJ ankylosis, including skin, temporalis muscle, costochondral, auricular cartilage, non-biological material (Chossegras et al., 1999; Erol et al., 2006; Matsuura et al., 2006; Takaishi et al., 2007).

The temporalis myofascial flap holds great promise for a reconstruction of various maxillofacial defects (Cheung, 1996). In animal experimental studies, TMJ ankylosis was treated with muscle grafts interposition arthroplasty, and showed a successful temporalis muscle graft reconstruction with gap arthroplasty and a stabilization procedure in TMJ ankylosis (Shimizu et al., 2006). The advantage of a temporalis myofascial flap in a TMJ reconstruction include close proximity to the TMJ, which provides movement of the flap during function and simulates the physiologic action of the disc (Su-Gwan, 2001). The temporalis myofascial flap is quite valuable and useful for reconstructing TMJ ankylosis.

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