INTRODUCTION
Ganglion cysts typically occur in soft tissue near limb joints. Intraosseous ganglion cysts are rare and occur most frequently in the long bones of the lower limb and carpal joints. We report an intraosseous ganglion cyst of the sternoclavicular joint. To our knowledge, ganglion cysts in soft tissue originating from the sternoclavicular joint are very rare, and an intraosseous ganglion cyst of the sternoclavicular joint has not been reported.

CASE REPORT
A 63-year-old man noticed a small mass on his right clavicle near the sternoclavicular joint and received puncturing treatment a few times over the course of a year without imaging examinations, but the mass relapsed after each treatment. The mass grew to over 4 cm in diameter in 1 year after the last puncture, and he visited our hospital. The mass was hard, painless on palpation, and was firmly adhered to the right clavicle near the sternoclavicular joint (Fig. 1). He had a left clavicle bone fracture 6 years prior, but there was no history of the right clavicle trauma, rheumatism, or tuberculosis. Laboratory examinations showed no abnormalities. Magnetic resonance imaging (MRI) was used to evaluate the mass. MRI revealed that the mass was a cyst. The cyst exhibited low intensity on T1-weighted images, high intensity on T2-weighted images, and high intensity on T2-weighted fat-suppressed images. The inside of the cyst appeared to contain small particles, and the stalk of the cyst extended into right clavicle (Fig. 2). We suspected an intraosseous ganglion cyst, and excisional biopsy was performed under general anesthesia. After the cyst was removed, the cavity in the clavicle was approximately 2 × 1 cm² in size, and connected to the sternoclavicular joint (Fig. 3). The cavity wall was curetted and filled the cavity with an artificial NEOBONE (Aimedic MMT, Tokyo, Japan) graft. The size of the resected cyst was 43 × 28 × 30 mm³, and the inside of the cyst was filled with a viscous, proteinaceous liquid, and dense fibrous material resembling rice bodies. Pathological examination revealed that the cyst consisted of fibrous connective tissue without lining cells and that the cyst wall was covered with granulations due to inflammation. The final diagnosis was an intraosseous ganglion cyst of the sternoclavicular joint.

Six months after surgery, the artificial bone in the cavity of right clavicle had not yet ossified, but there was no recurrence of the cyst and no fracture (Fig. 4).

DISCUSSION
Ganglion cysts occur in various parts of the body, but are generally observed in the soft tissue near the joints of the limbs, especially in the wrist. Few reports exist demonstrating ganglion cysts of the sternoclavicular joint, with the majority of cases occurring in children.

Ganglion cysts that occur in bone are called intraosseous ganglion cysts, which are relatively rare. Intraosseous ganglion cysts most often occurred in the long bones of the lower limbs and carpals. The pathogenesis of intraosseous ganglion cysts remains unclear, and these cysts fall...
into 2 categories: the primarily intraosseous “idiopathic” type and the penetrating type. The idiopathic type may result from intramedullary mucoid degeneration by intramedullary vascular disturbance and aseptic bone necrosis. The penetrating type may arise by penetration of a soft tissue ganglion into the underlying bone. Another theory suggests that the penetrating cysts develop when an intraosseous ganglion exists in the bone and spreads outside the bone. This ganglion cyst in our patient was considered as the penetrating type with a large extraosseous lesion, and the intraosseous lesion was connected to the sternoclavicular joint through the clavicle bone cavity.

Synovial cysts and ganglion cysts have similar clinical characteristics, but synovial cyst walls have lining cells, unlike ganglion cysts. Rice bodies composed of fibrin are often present in synovial cysts with chronic inflammatory conditions like rheumatism. In this case, the cyst wall had no lining cells and the rice bodies were thought to be caused by inflammation due to repeated puncture.

Intraosseous ganglion cysts are generally asymptomatic and are found in the presence of a penetrating tumor, or found coincidentally during imaging inspections. Correlation of radiographic and MRI features is useful for the correct diagnosis of intraosseous ganglion cysts. Because this case exhibited an extraosseous lesion, MRI was useful for diagnosis.
Treatment options depend on clinical symptoms and the imaging features. Surgery is recommended when symptoms, such as pain, are present, and in growing intraosseous cysts, which can cause complications, including fractures. Bone cavity curettage is frequently performed after resection of an intraosseous ganglion cyst, and the cavity should be filled by an autologous or an artificial bone graft, like bone cement, to avoid bone fractures or pain. We can conclude from this report that, though rare, ganglion cysts can develop at the sternoclavicular joint.

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