**NOTE** Surgery

**Computer Tomography Diagnosis of Meningoencephalocele in a Calf**

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**ABSTRACT.** A 24-day-old female Holstein calf had a soft, painless fluctuating swelling on the median plane in the frontal region, but did not show any clinical symptoms including neurological signs. Computer tomography (CT) distinctly showed the cyst filled with fluid and part of the encephalon. Hence, this swelling was diagnosed as meningoencephalocele, but not meningocele. The meningoencephalocele was successfully repaired surgically. Meningoencephalocele can thus be easily recognised by CT in a calf.

**KEY WORDS:** calf, computer tomography, meningoencephalocele.

While both meningoencephalocele and meningocele are very rare congenital anomalies, a cyst is observed on the median plane in the frontal region of a calf. The cyst may protrude through a normal opening such as the anterior fontanelle. A meningeal cyst which contains only cerebrospinal fluid is a meningocele, and the cyst which contains brain tissue in addition to cerebrospinal fluid is a meningoencephalocele. These defects have been described as a failure of the neural tube to fuse shortly after conception [2, 5, 6]. Their differentiation serves as a reference for operative procedure and prognosis. In meningoencephalocele, it needs putting the brain tissue back into the cranium as an operative procedure, and there is possibility that dyskinesia and hydrocephalus supervene as a prognosis. In humans, various types of meningoencephalocele patients can be recognised by computer tomography (CT) and magnetic resonance imaging techniques [2]. These abnormalities are commonly repaired surgically [3, 8]. In animals, the meningoencephalocele has also been described in other domestic animals such as pigs, dogs and cats [7, 9–11]. In cattle, although both meningoencephalocele and meningocele have also been diagnosed by radiography and ultrasonography [1, 4], their differentiation were not easy.

A 24-day-old female Holstein calf had a soft painless fluctuating swelling of 10 cm in diameter on the median plane in the frontal region from birth (Fig. 1A), and its size did not change thereafter. A sac with normal skin and hair was hanging towards the right side (Fig. 1B). This swelling had fluctuation and might have cerebrospinal fluid. Fine-needle aspiration for the swelling was not performed because of the risk of infection and the possibility of leakage of cerebrospinal fluid.

The gestation period of the calf was normal (280 days). From birth onward, the calf evidenced normal vigor and appetite without nervous symptoms. The physical constitution was normal; her body weight was 51.8 kg, and height was 82 cm at the 24th day of life. Before the delivery of the calf, the dam had annually received vaccinations against 3 virus diseases (Akabane disease, Aino virus infection and Chuzan disease) to prevent congenital anomalies. No abnormalities were found with respect to blood or serum biochemical tests.

A digital ultrasound scanner (EUB-6500, Hitachi, Japan) with a 9.0 MHz focal zone (to 125 mm) was used to examine the soft swelling. The swelling appeared to be a cyst filled with anechoic fluid, and shapeless tissues suggesting brain tissues were observed in the deep area (Fig. 1C). This picture suggested the presence of fluid and brain tissue. However, we could not decide whether the brain tissue was within the cyst. As the result, it was difficult to differentiate between the meningocele and meningoencephalocele by ultrasound examination. A tentative diagnosis of meningocele was made, and we decided to conduct a detailed examination by CT. Without contrast medium, CT imaging of the skull was performed under deep sedation with 2% xylazine (Rompun, Bayer HealthCare, Germany). Image acquisition was obtained using a multi-slice helical CT scanner (Asteion 4, Toshiba, Japan). CT images were acquired at 2-mm collimation, 120 kV, 75 mAs. The swelling filled with fluid, and a part of the encephalon was distinctly imaged (Fig. 2A). Then, it was diagnosed as a meningoencephalocele. Three-dimensional volume reconstruction of the calf skull indicated a circular defect (diameter: 6 cm) in the upper part of the median frontal line of the skull (Fig. 2B).

Corrective surgery was performed under deep sedation with xylazine and local anesthesia with 2 per cent lignocaine hydrochloride (Xylocaine polyamp 2%, AstraZeneca, Japan). An elliptical rostrocaudal skin incision was made as for a hernia repair. The underlying tissues were separated from the skin by blunt dissection. A needle removed approximately 450 ml of fluid. The fluid was clear and colorless, without viscosity. The specific gravity was 1.005. The swelling withered, and loose tissues remained, but were not resected. The superfluous tissues were folded and
sutured with chromic catgut. A part of skin of the swelling was resected, and its edges were closed with simple interrupted sutures of braided silk. Intramuscular injections of penicillin and chloramphenicol were given for 5 days. Recovery was uneventful without recurrence of the swelling (Fig. 2C). The skin sutures were removed 14 days after the operation, and then the calf was returned to her home pen. Two months following the operation, the calf was doing well, and did not show any neurological abnormalities.

The meningoencephalocele could be easily recognised by CT, and could also be repaired surgically in a calf. CT scans make it possible to differentiate between a meningocele and a meningoencephalocele, and to measure the diameter of the defect before surgery. The scans are a simple and valuable non-invasive diagnostic technique in a calf.

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