

# Nasal Dermal Sinus Associated with a Dumbbell-Shaped Dermoid: A Case Report

Takafumi Shimogawa<sup>1</sup> Takato Morioka<sup>1</sup> Hisasuke Onozawa<sup>2</sup> Satoshi O. Suzuki<sup>3</sup> Ryutaro Kira<sup>4</sup>

<sup>1</sup>Department of Neurosurgery, Fukuoka Children's Hospital, Higashi-ku, Fukuoka-city, Japan

<sup>2</sup>Department of Plastic Surgery, Fukuoka Children's Hospital, Higashi-ku, Fukuoka-city, Japan

<sup>3</sup>Department of Neuropathology, Kyushu University, Higashi-ku, Fukuoka-city, Japan

<sup>4</sup>Department of Pediatric Neurology, Fukuoka Children's Hospital, Higashi-ku, Fukuoka-city, Japan

Address for correspondence Takafumi Shimogawa, MD, Department of Neurosurgery, Fukuoka Children's Hospital, 5-1-1 Kashiiteriha, Higashi-ku, Fukuoka-city, Fukuoka 813-0017 Japan (e-mail: shimogawa28@gmail.com).

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## Abstract

Nasal dermal sinus is a rare congenital anomaly. We report a case of the dermal sinus associated with a dumbbell-shaped dermoid and demonstrate the detailed anatomy. The patient was a boy aged 1 year and 4 months with a small pit at his nasion from birth and developed swelling of the forehead. The sagittal view of a T2-weighted image demonstrated a dumbbell-shaped, mixed intense dermoid at the foramen cecum. The sinus tract was depicted as a strand of isointensity between the dermoid and the nasion. Serial sagittal views of T1-weighted images revealed the capsule of the dermoid enhanced with contrast medium, and that the subcutaneous abscess was in continuity with the dermoid. On diffusion-weighted imaging, both the dermoid and subcutaneous abscess were demonstrated as a hyperintensity. Serial sections of the sagittal and coronal computed tomography scans clearly showed an enlarged fonticulus frontalis and foramen cecum remnant and dehiscence of the crista galli. The purulent dermoid cyst including the capsule and the dermal sinus tract were removed completely. We describe our detailed anatomical relationship between the sinus tract with dumbbell-shaped dermoid and the surrounding structures, and emphasize the importance of these anatomy for operation.

## Keywords

- ▶ nasal dermal sinus
- ▶ dermoid
- ▶ dumbbell-shaped dermoid

## Introduction

Nasal dermal sinus is a very rare congenital anomaly that is frequently associated with inclusion cysts (dermoid or epidermoid).<sup>1–3</sup> At the end of the second month of gestation, the nasal and frontal bones are separated by the fonticulus frontalis. In this period, the dura projects into the nasal area through the anterior skull base opening (foramen cecum), and lies in contact with the skin at the tip of the nose. Failure during ossification to obliterate this transcranial connection is the embryological pathway to nasal dermal sinus tract development.<sup>1–4</sup> In the present case, combined use of high resolution magnetic resonance imaging and computed tomography (CT) clearly demonstrated the

detailed anatomical relationship of the dermal sinus associated with a dumbbell-shaped dermoid to the surrounding structures such as the fonticulus frontalis and foramen cecum.<sup>3,5</sup>

## Case Report

### History and Examination

The patient was a boy aged 1 year and 4 months who had had a small pit at his nasion from birth and had developed swelling of the forehead. The pit seemed to be closed and no purulent discharge was noted (▶ **Fig. 1A**). The sagittal view of a T2-weighted image demonstrated a dumbbell-shaped,

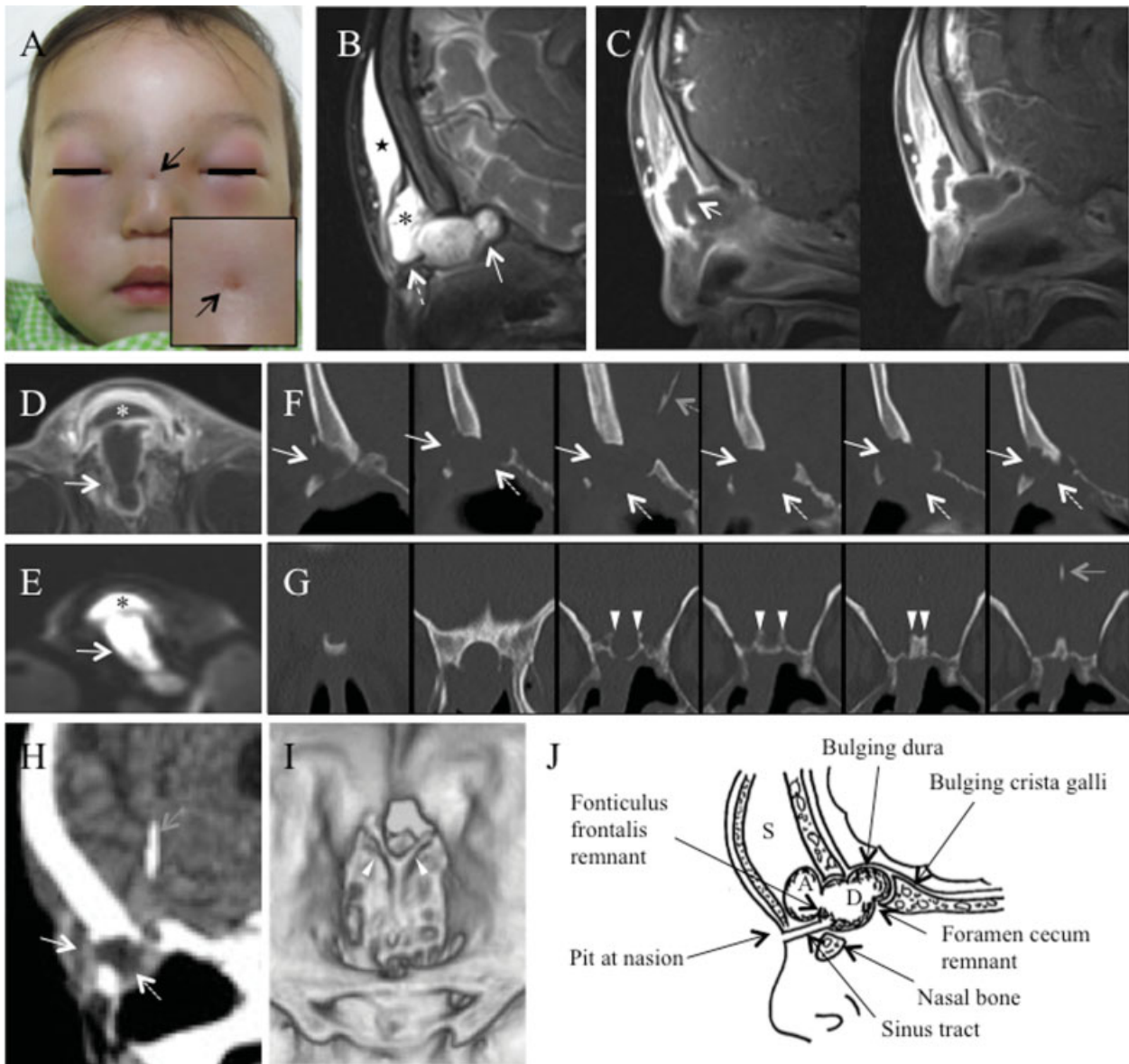
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**Fig. 1** (A) Photograph showing the swelling of the forehead. The black arrow indicates a small pit on the nasion. Inset is the magnified view of the pit, which seems to be closed and has no purulent discharge. (B) Sagittal view of T2-weighted image. There is a dumbbell-shaped mixed intense dermoid (white arrow) at the junction of the frontal bone and the anterior fossa (at the foramen cecum), and a strand of isointensity (nasal sinus tract) between the tumor and the nasion. An abscess in the subcutaneous tissue of the forehead (black asterisk) is noted adjacent to the dermoid. The subcutaneous swelling of the forehead is demonstrated as hyperintensity (solid star). (C) Serial sagittal views of T1-weighted image. The capsule of the dermoid is enhanced with contrast medium (Gd-DTPA). The subcutaneous abscess is in continuity with the dermoid (white arrow). The sinus tract is not apparent on this image. (D) Axial view of the Gd-enhanced T1-weighted image. The dermoid is dumbbell-shaped (white arrow indicates the neck of the dumbbell). The subcutaneous abscess (white asterisk) is noted adjacent to the dermoid. (E) Diffusion-weighted image at a level comparable to that of **Fig. 1D**. Both the dermoid (white arrow) and subcutaneous abscess (black asterisk) are demonstrated as a hyperintensity. (F, G, H) Serial sections of the sagittal (F, H) and coronal (G) computed tomography scan. The enlarged fonticulus frontalis remnant (white arrow), enlarged foramen cecum remnant (white dotted line), and dehiscence of the crista galli (white arrow heads) are clearly visible. Part of the falx is calcified (gray arrow). (I) Three-dimensional computed tomography. A bony defect is evident at the midline of the junction of the frontal bone and the anterior fossa with bifid crista galli (white arrow heads). (J) Schematic drawing demonstrating the anatomical relationship of the dermoid (D), subcutaneous abscess (A), and swelling (S) with surrounding structures.

mixed intense dermoid at the foramen cecum. The sinus tract was depicted as a strand of isointensity between the dermoid and the nasion. A subcutaneous abscess was noted adjacent to the dermoid, and the subcutaneous swelling of the forehead was demonstrated as hyperintensity (**Fig. 1B**). Serial sagittal views of T1-weighted images (T1WI) revealed the capsule of the dermoid enhanced

with contrast medium (gadolinium-diethylenetriamine penta-acetic acid [Gd-DTPA]), and that the subcutaneous abscess was in continuity with the dermoid cyst. The sinus tract was not apparent on the T1WI (**Fig. 1C**). On axial view of the Gd-enhanced T1WI, the subcutaneous abscess was also noted adjacent to the dumbbell-shaped dermoid (**Fig. 1D**). On diffusion-weighted imaging, both the

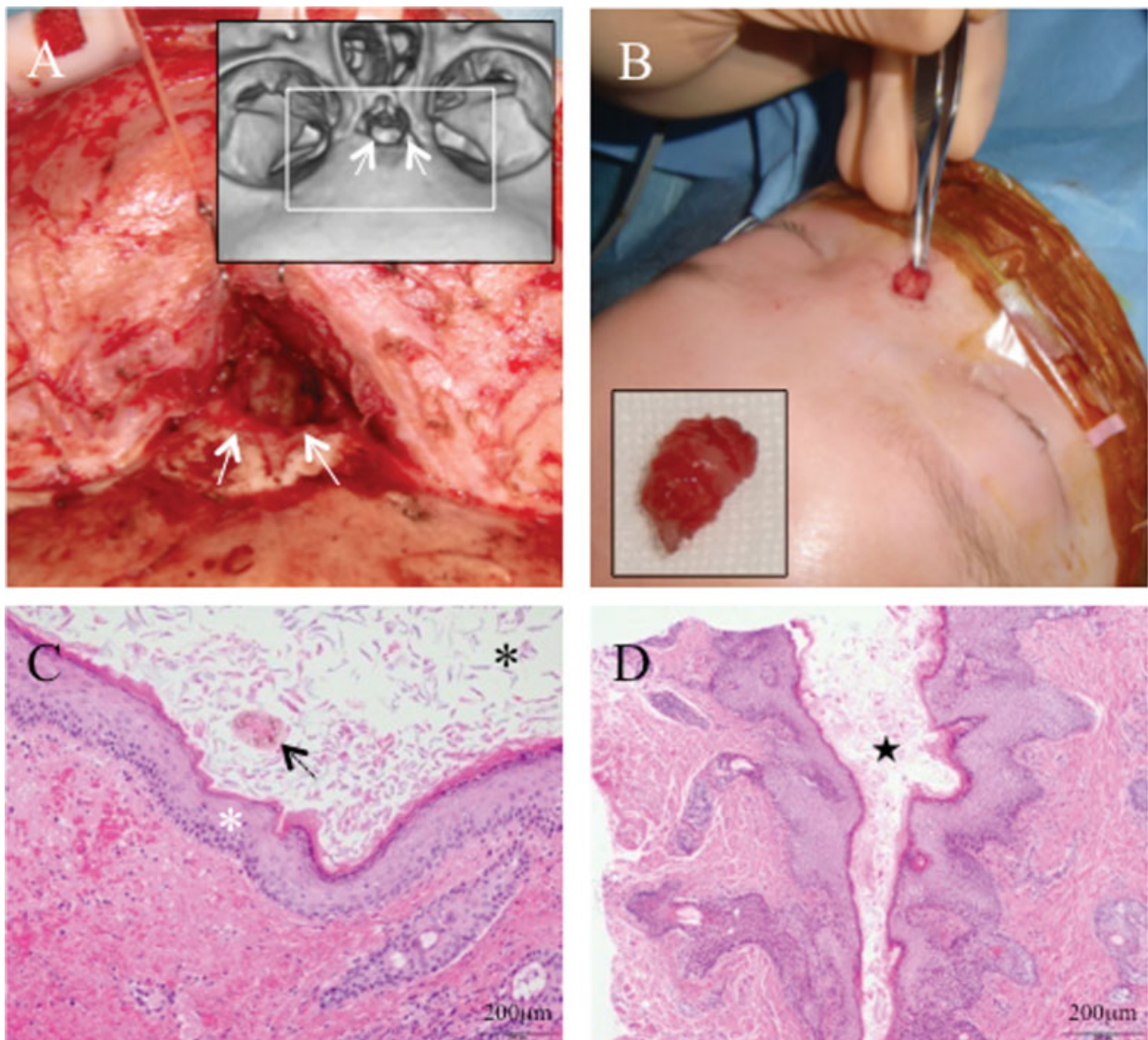
dermoid and subcutaneous abscess were demonstrated as a hyperintensity (►Fig. 1E). Serial sections of the sagittal and coronal CT scans clearly showed an enlarged fonticulus frontalis and foramen cecum remnant and dehiscence of the crista galli (►Fig. 1F, G, H). Three-dimensional CT imaging showed a bony defect at the midline of the junction of the frontal bone and the anterior fossa, with a bifid and bulging crista galli (►Fig. 1I).

### Operation and Pathological Findings

The subcutaneous abscess was evacuated through a coronal skin incision on the frontal region, and then the purulent

dermoid cyst including the capsule was removed. The part of the dermoid capsule that was tightly adherent to the dura was carefully coagulated. There was a bony defect at the nasion (►Fig. 2A). The dermal sinus tract was also dissected through a tiny skin incision (►Fig. 2B).

Microscopically, the dermoid cyst wall was typically lined by a keratinizing squamous epithelium. Intraluminal keratin and hair shafts were also demonstrated (►Fig. 2C). The sinus tract was a ductal structure lined by stratified squamous epithelium (►Fig. 2D). The orifice of the sinus was opened.



**Fig. 2** (A) Intraoperative photograph taken after removal of the dermoid through a coronal skin incision showing the bony defect (white arrows). Inset is a three-dimensional computed tomography image shown in the same orientation as (A). The white box indicates the extent of the operative field. The bony defect is also demonstrated as white arrows. (B) The sinus tract including the pit at the nasion was dissected with a tiny skin incision. Inset indicates the removed sinus tract. (C) Histopathological examination of the dermoid cyst wall. The dermoid cyst wall is lined by a keratinizing squamous epithelium (white asterisk). Intraluminal keratin (black asterisk) and hair shafts (black arrow) are also demonstrated. Stained with hematoxylin and eosin, scale bar indicates 200 µm. (D) Histopathological examination of the sinus tract. The nasal sinus tract is a ductal structure (black star) lined by stratified squamous epithelium. The orifice of the sinus is opened. Stained with hematoxylin and eosin, scale bar indicates 200 µm.

## Discussion

The schematic drawing in **Fig. 1J** demonstrates the detailed anatomical relationship between the sinus tract with dumbbell-shaped dermoid and the surrounding structures. The body of the dumbbell-shaped dermoid was located in the enlarged foveolus frontalis and foramen cecum remnant; the head of the dumbbell was the intracranial extension of the dermoid with bulging dura. A bifid and bulging crista galli was also attributed to the intracranial extension of the dermoid. Although bacteriologic examination failed to reveal the causative agents, the microscopically opened sinus tract resulted in the formation of the subcutaneous abscess adjacent to the purulent dermoid.

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