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Endoscopic Surgery for Facial Subcutaneous and Nasal Submucosal Abscesses in a Child

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We herein report a case of abscess formation from the subcutaneous area of the face to the submucosa of the nasal cavity. To our knowledge, this case was unprecedented, but we were able to cure the patient by applying endoscopic sinus surgery techniques. A 13-year-old boy visited a local clinic because of right facial swelling. Contrast-enhanced computed tomography (CT) showed abscess formation from the subcutaneous region of the face to the submucosa of the nasal cavity, and endoscopic surgery was performed. In surgery, endoscopic modified medial maxillectomy (EMMM) and a direct approach to the anterior and lateral parts of the maxillary sinus with an endoscope (DALMA) were applied to perform radical drainage. The patient was discharged from the hospital on postoperative day 7 after completion of antimicrobial therapy because of good progress. Two months postoperatively, healing of the incision and maintenance of openness of the maxillary sinus were confirmed, and the follow-up was terminated. Endoscopic surgery is the first-choice treatment because of its superior therapeutic efficacy and functional preservation.

Keywords: child; endoscopic surgery; facial subcutaneous abscess; nasal submucosal abscess; *Parvimonas micra*
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Introduction

Subperiosteal orbital abscess secondary to acute sinusitis in children is a well-recognized inflammatory disease (McCoy et al. 2021; Lu et al. 2024). Other possible sites of abscess formation in children include the nasal septum; however, reports are limited (Macaskill and Moolman 2024).

We herein report a case of abscess formation from the subcutaneous area of the face to the submucosa of the nasal cavity. To our knowledge, this case was unprecedented, but we were able to cure the patient by applying endoscopic sinus surgery techniques. The intraoperative findings and techniques are described in detail.

Written informed consent was obtained from the patients and their parents to publish the findings.

Case Presentation

A 13-year-old boy visited a local clinic because of right facial swelling for 3 days and was referred to our department with suspected subperiosteal orbital abscess secondary to acute sinusitis. The patient did not brush his teeth, his oral hygiene was extremely poor, and he had numerous untreated caries.

The patient had significant redness and swelling of the right side of the face and could not open his right eye (Fig. 1). The right nostril mucosa was severely swollen, and the endoscope could not be inserted. Blood biochemistry tests revealed elevated white blood cell counts, mainly neutrophils. Contrast-enhanced computed tomography (CT) revealed a low-density area with a limbal contrast effect from the surroundings of the piriform aperture to the outer right lateral nasal cavity. In contrast, low-density areas in the sinuses were mild and were not accompanied by contrast effects (Fig. 2).

Based on these findings, we considered the possibility of abscess formation. The most severely swollen area of the face was punctured, and pus was aspirated. A bacterial culture was performed, and *Parvimonas micra* (*P. micra*) was later detected. The approach to the abscess was discussed with the plastic surgeon; since it was assumed that a facial incision would cause aesthetic problems and a gingi-

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val incision would not provide sufficient therapeutic effect, endoscopic surgery was performed.

Surgery was performed under total intravenous anesthesia (TIVA). The body was placed in the reverse Trendelenburg position, with the head elevated to 15°. Placing gauze soaked with 1:5,000 adrenaline in the nasal cavity before surgery stimulated mucosal shrinkage and secured the operative field (Fig. 3A). After topical gauze placement, 1% lidocaine with 1:100,000 adrenaline was injected at the tip of the piriform aperture. An incision was made just above the tip of the piriform aperture using an electric scalpel (UA Needle, UA-L02; GUNZE MEDICAL Ltd., Osaka, Japan). Massive pus drainage was observed as soon as it reached the bone (Fig. 3B). The mucosa of the outer nasal cavity was dissected under the periosteum to identify the posterior-most part of the abscess (Fig. 3C). The bone was removed, and the nasolacrimal duct was deflected medially to identify the upper edge of the abscess (Fig. 3D). The medial wall of the maxillary sinus was removed to open the maxillary sinus, and only mild mucosal edema was noted. Finally, the buccal subcutaneous tissue was dissected subperiosteally to reveal the anterior wall of the maxillary sinus, which reached the anterior and inferior edges of the abscess cavity (Fig. 3E). After sufficient rinsing, a horizontal incision was made in the outer mucosa of the inferior meatus to allow for observation of the maxillary sinus from the inferior nasal passage. A 4-mm drain tube (Penrose Drain; Fuji Systems Corp., Tokyo, Japan) was placed under the periosteum, and the incision was sutured with polyglactin 910 (5-0 Coated Vicryl with TF needle 13 mm, 1/2c; Ethicon Inc., Somerville, NJ, USA) to complete the surgery (Fig. 3F). The operative time was 58 min, and blood loss was 20 ml.

Postoperatively, administration of sulbactam-ampicillin (SBT-ABPC) 4.5 g per day and nasal rinse with saline solution was performed. In addition, the patient was

Fig. 1. The patient had significant redness and swelling of the right face and could not open his right eye.

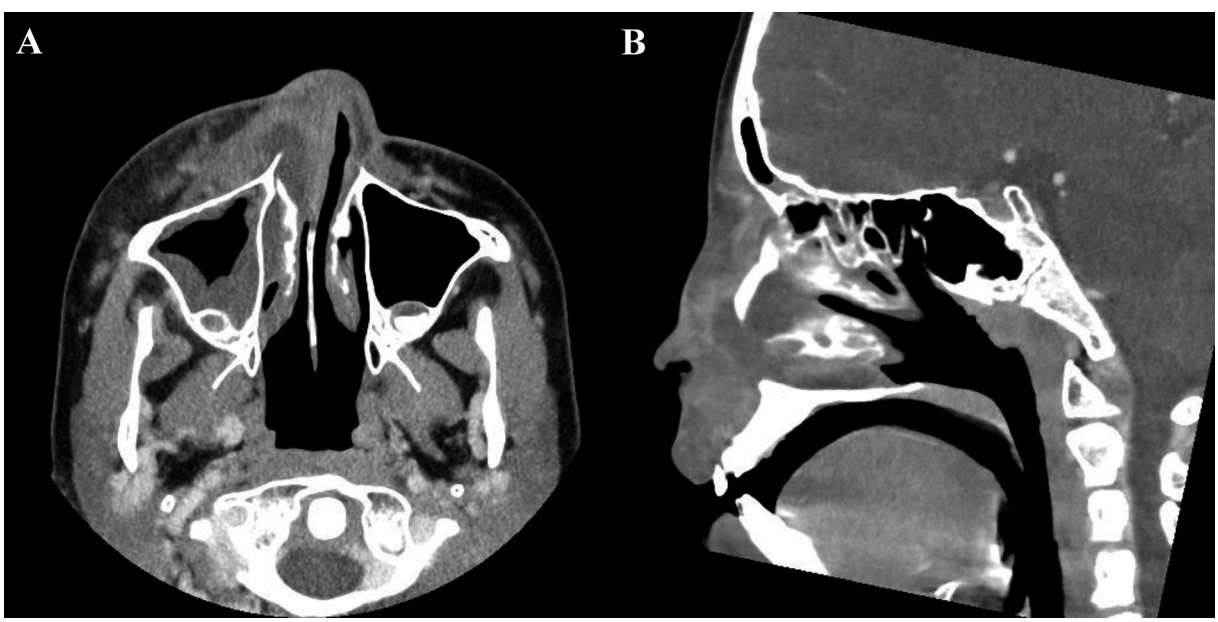

Fig. 2. Preoperative radiological examinations.
Contrast-enhanced computed tomography (CT) showed a low-density area with a limbal contrast effect from the surroundings of the piriform aperture to the outer right lateral nasal cavity. In contrast, the low-density area in the sinuses was mild and not accompanied by contrast effects (A: axial, B: sagittal).

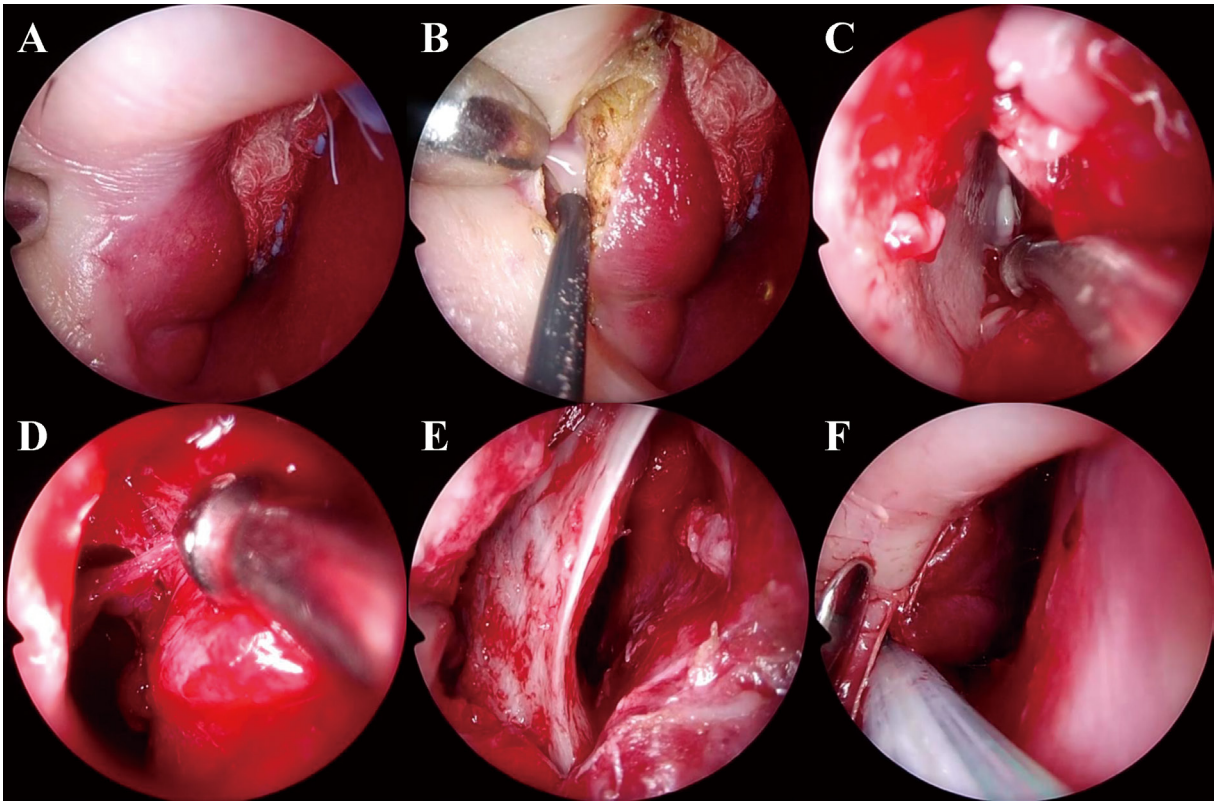

Fig. 3. Intraoperative endoscopic findings.
(A) Placing gauze soaked with 1:5,000 adrenaline in the nasal cavity before the surgery stimulated mucosal shrinkage and secured the operative field. (B) An incision was made just above the tip of the piriform aperture. Massive drainage of pus was observed as soon as it reached the bone. (C) The mucosa of the outer nasal cavity was dissected under the periosteum to identify the most posterior part of the abscess. (D) The bone was removed, and the nasolacrimal duct was deflected medially to identify the upper edge of the abscess. (E) The buccal subcutaneous tissue was dissected subperiosteally to reveal the maxillary sinus's anterior wall, reaching the abscess cavity's anterior and inferior edges. (F) A 4-mm drain was placed under the periosteum, and the incision was sutured with polyglactin 910 to complete the surgery.

referred to a dentist, and treatment of the causative tooth was initiated. Over time, facial swelling and redness decreased, and blood biochemistry tests showed improvement in the inflammatory response; therefore, the drain was removed on the third postoperative day. The patient was discharged from the hospital on postoperative day 7 after completion of antimicrobial therapy because of good progress. Two months postoperatively, healing of the incision and maintenance of openness of the maxillary sinus were confirmed (Fig. 4A,B), and the follow-up was terminated.

Discussion

We encountered a case of abscess formation from the subcutaneous surface of the face to the submucosa of the nasal cavity. Based on these observations, we believe that otolaryngologists need to manage acute inflammatory diseases of the nasal cavity and sinus.

The most similar condition to the present case was a subperiosteal orbital abscess, which was considered the most likely diagnosis until CT was conducted. Subperiosteal orbital abscesses can be attributed to acute sinusitis (Lu et al. 2024). However, the possibility of a subperiosteal orbital abscess can be ruled out because of the lack of inflammatory findings in the sinuses in this case. In addition, focusing on the causative agent may be useful in differentiating between these two diseases. The common organisms that cause subperiosteal orbital abscesses are, in order of frequency, *Streptococcus*, *Staphylococcus*, *Haemophilus influenzae*, and *Eikenella corrodens*, while anaerobic cultures are negative in most cases (McCoy et al. 2021). The organism responsible for the present case was *P. micra*, a Gram-positive anaerobic bacterium distributed in the oral cavity and one of the bacterial species most frequently isolated from infected root canals of teeth with chronic apical periodontitis (Rôças and Siqueira 2008). The same bacteria have been reported to cause orbital cellulitis in children after facial trauma (Chew et al. 2024). However, our patient had no history of facial trauma. Antiresorptive agent-related osteonecrosis of the jaw is a common condition in which abscesses form under the skin of the face (Matsumoto et al. 2021). It is important to remember that poor oral hygiene is a risk factor for acute inflammatory disease in the nasal cavity and sinus region, even without any notable comorbidities or episodes.

In surgery, endoscopic modified medial maxillectomy (EMMM) (Nakayama et al. 2012) and a direct approach to

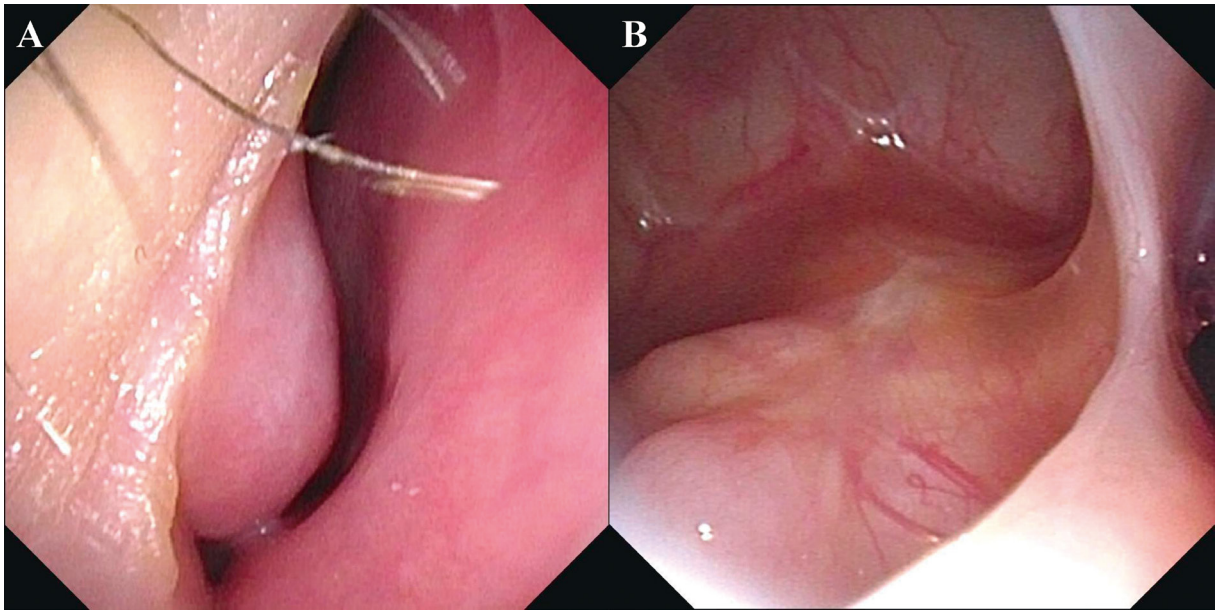

Fig. 4. The endoscopic findings of the right nasal cavity at two months post-surgery.
(A) The incision at the anterior end of the inferior turbinate has completely epithelialized, and the nasal cavity shape is well-maintained. (B) The maxillary sinus is widely open to the inferior meatus, with no signs of mucosal edema, nasal discharge, or crusting.

the anterior and lateral parts of the maxillary sinus with an endoscope (DALMA) were applied to perform radical drainage (Omura et al. 2019). Both techniques are intended to allow an approach to maxillary sinus lesions while maintaining nasal morphology, and the combination of these two techniques allows an approach to any site in the maxillary sinus (Omura et al. 2019). In this case, the abscess was located subcutaneously in the facial skin (under the periosteum of the anterior wall of the maxillary sinus) and the submucosa of the nasal cavity (under the periosteum of the inner lateral wall of the maxillary sinus); both EMMM and DALMA therefore needed to be implemented. Since the EMMM and DALMA techniques can be performed through the same mucosal incision, we believe this is the best treatment method because it does not require an external incision yet allows us to approach the entire abscess, and we did not observe any complications. When performing Endoscopic Sinus Surgery (ESS) in children, it is necessary to consider the subsequent development of the maxillofacial region. However, there has been a reported case of a 15-year-old girl who underwent full-house ESS, and at 9 years post-surgery, the frontal and sphenoid sinuses showed no issues with development (Nomura et al. 2022). Additionally, reports suggest that endoscopic skull base surgery does not hinder maxillofacial growth in younger children (Chen et al. 2019; Parasher et al. 2020). While minimally invasive surgery with a high degree of radicality is desirable, it is important to remember that inadequate surgery may lead to the risk of abscess recurrence.

Although the incision must be sutured to preserve the nasal cavity, polyglactin 910 (Vicryl) is known to drop spontaneously several months after surgery (Hemmi et al. 2024), making it useful even in children, for whom painful postoperative procedures are difficult to perform. TIVA and the reverse Trendelenburg position have been shown to reduce blood loss during endoscopic surgeries (Kolia and Man 2019; Iftikhar et al. 2021). The fact that the surgery was completed with only a small amount of blood loss is thought to be due in large part to the effects of TIVA and the reverse Trendelenburg position. In addition to the surgical technique, a proper surgical setup is also essential. Local injection and topical use of vasoconstrictors are controversial (Alsaleh et al. 2019). However, there is no doubt that in this case, it had some effect on securing the operative field of vision. Depending on the patient's background, local injection and topical use of vasoconstrictors may be worth considering, if necessary.

To our knowledge, there have been no reports of similar cases, indicating that this is a rare condition indeed. However, it is clear based on these findings that otolaryngologists can provide the best treatment by demonstrating their expertise. By improving the quality of surgeries routinely provided, we can also respond to unforeseen circumstances. Surgeons must make every effort to improve surgical techniques.

In conclusion, we encountered a case of abscess formation from the subcutaneous surface of the face to the submucosa of the nasal cavity. Endoscopic surgery is the first-choice treatment because of its superior therapeutic efficacy and functional preservation.

Conflict of Interest

The authors declare no conflict of interest.

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