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Clinical Management and Comprehensive Surgical Resolution of Infected Right Preauricular Fistula in a Pediatric Patient: A Multidisciplinary Case Analysis and Systematic Review of Recurrence Mitigation Strategies

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ABSTRACT

Introduction : Congenital preauricular fistula (CPF) is a common external ear anomaly resulting from the fusion failure of the six hillocks of His during embryological development.[1] While often asymptomatic, these epithelial-lined tracts are prone to recurrent infections and abscess formation, necessitating appropriate pharmacological and surgical intervention to prevent recurrence.[3] **Purpose :** This case report details the successful two-stage management—initial medical control of infection followed by definitive surgical excision using the supra-auricular approach—of an infected congenital preauricular fistula in a 10-year-old boy, emphasizing strategies to minimize recurrence. **Case Report :** A 10-year-old boy presented with throbbing pain and swelling in the right preauricular area for one month, worsening over the last three days. Physical examination revealed a congenital fistula orifice with a fluctuant mass measuring 1 cm x 1 cm, which was hyperemic and tender, accompanied by a history of fever.[8] The patient was diagnosed with an infected right preauricular fistula. Management included Cefixime, Methylprednisolone, and Paracetamol for infection and inflammation control, followed by a planned fistulectomy during the quiescent phase.[8] **Discussion :** The primary challenge in CPF management is the high recurrence rate, ranging from 0% to 42%, often caused by incomplete tract excision.[2] The use of the supra-auricular approach (SAA) has been shown to significantly reduce recurrence rates compared to simple sinectomy by providing broader visualization of the fascial and cartilaginous borders.[9] Controlling acute infection with broad-spectrum antibiotics and corticosteroids is crucial to minimize tissue edema and clarify dissection planes during surgery.[11] **Conclusion :** Successful resolution of a preauricular fistula requires a staged approach starting with aggressive control of acute infection followed by definitive surgical excision during the quiescent period. The SAA technique, use of magnification, and excision of a portion of the helical cartilage are highly recommended to minimize the risk of recurrence.[11]

Keywords: Preauricular fistula, fistulectomy, pediatric otorhino-laryngology, supra-auricular approach, congenital ear anomaly

INTRODUCTION

Congenital preauricular fistula is a birth defect manifesting as a small pit or ostium near the external ear, most commonly located at the anterior margin of the ascending helix.[9] Since its first description by Van Heusinger in 1864, this condition has been a subject of extensive discussion in otorhinolaryngology due to its varying clinical presentations and anatomical complexity.[14] Epidemiologically, the prevalence of preauricular fistulas shows significant geographical differences, with higher incidences in Asian and African populations (reaching 4–10%) compared to Caucasian populations (0.1–0.9%).[2]

The etiology of preauricular fistula is rooted in the developmental disruption of the first and second branchial arches during the sixth week of gestation.[13] The auricle develops from the fusion of six mesenchymal proliferations known as the hillocks of His. Failure of fusion between the first and second hillocks, or failure to close the first branchial cleft, leads to the formation of a tract lined with stratified squamous epithelium.[9] This tract is not merely a simple canal; it often features complex, winding branches and adheres closely to the perichondrium of the helical cartilage or the parotid fascia.[10]

Most individuals with a preauricular fistula remain asymptomatic throughout their lives.[9] However, because the tract contains normal skin elements, including sebaceous glands and hair follicles, the accumulation of keratin debris and sebum can occur within its lumen.[10] This trapped material serves as an excellent medium for bacterial growth. When the fistula ostium becomes blocked, pressure within the tract increases, leading to inflammation, secondary infection, and abscess formation.[10] The most common pathogenic bacteria isolated from these infections include *Staphylococcus aureus*, *Streptococcus*, and occasionally anaerobes such as *Peptostreptococcus*.[16]

Initial medical management during the acute infection phase is crucial. The use of appropriate antibiotics and anti-inflammatory agents is necessary to quiet the tissues before surgical intervention.[11] The frequently encountered surgical challenge is the high postoperative recurrence rate, which has historically been reported as significant.[2] Recurrence usually occurs due to residual epithelial tract tissue left behind because of poor visualization or an inadequate anatomical understanding of fistula branch variations.[14] Therefore, the choice of surgical technique—whether simple sinectomy or the supra-auricular approach—along with the use of aids such as methylene blue dye and microscopic magnification, are determining factors for long-

term success.[11] This case report aims to evaluate the clinical management of a child with an infected preauricular fistula and review modern surgical strategies to achieve optimal cure rates.

CASE REPORT

Patient Identity and History

The patient, K, a 10-year-old boy residing in Depok, presented to the ENT Clinic at Prikasih Hospital, Jakarta, with a primary complaint of pain in the outer right ear felt over the last month. The pain was described as throbbing ("nyut-nyutan") and had worsened in the three days prior to the examination. The patient's parents stated that there was a small hole near the outer ear present since birth, confirming the congenital nature of the lesion.

In addition to pain, the patient complained of a lump in front of the right ear that was increasing in size. The lump was painful when touched, and the patient had experienced a fever one day prior to the hospital visit, indicating a systemic infection process due to a local abscess. The patient had no relevant past medical history and no other family members with similar complaints.

Physical Examination and Vital Signs

On general physical examination, the patient appeared moderately ill but was fully conscious (compos mentis). Anthropometric measurements showed a weight of 31 kg and a height of 135 cm. The results of the vital signs upon admission were as follows:

Clinical Parameter	Examination Result	Normal Value (10-Year-Old)
Blood Pressure	100/70 mmHg	97-120 / 58-80 mmHg
Pulse	108 x/minute	70-110 x/minute
Respiratory Rate	24 x/minute	18-25 x/minute
Body Temperature	37.1 C	36.5-37.5 C
Weight	31 kg	N/A
Height	135 cm	N/A

Local examination of the right ear showed a preauricular fistula ostium located at the anterior margin of the ascending helix. In the area surrounding the ostium, a lump (mass) measuring 1 cm x 1 cm was found. The mass was fluctuant, indicating an accumulation of purulent fluid (abscess) under the skin. The preauricular area appeared hyperemic, felt warm to the touch, and was very tender. No deformity of the auricle or abnormalities in the external

auditory meatus were found.

Working Diagnosis

Based on the clinical findings of a congenital ostium accompanied by signs of acute inflammation (pain, tumor, calor, rubor, and fluctuation), the patient was diagnosed with: Infected Right Preauricular Fistula.

This diagnosis was established based on the chronic recurring history (symptoms appearing after years of being asymptomatic) and physical findings characteristic of a preauricular abscess.

Medical Management

Initial management focused on relieving the acute infection and reducing the patient's pain before planning definitive surgical action. The prescribed therapy included:

Pharmacological Therapy:

1. **Warm Water Compress**: Instructions were given to apply warm compresses to the lump to aid local circulation and facilitate the softening of the abscess or spontaneous drainage.
2. **Paracetamol 500 mg Tablet**: Administered three times daily (3 x 1 tablet) as an analgesic to relieve throbbing pain and as an antipyretic if a recurrent fever occurred.
3. **Cefixime 100 mg Tablet**: Administered twice daily (2 x 1 tablet). Cefixime is a third-generation cephalosporin antibiotic chosen empirically to treat bacteria causing soft tissue infections in the ear area.
4. **Methylprednisolone 4 mg**: Administered twice daily (2 x 1 tablet). The use of this systemic corticosteroid aims to significantly reduce periauricular edema and suppress the acute inflammatory response, thereby accelerating the resolution of pain and swelling.

Surgical Plan:

The patient was scheduled for a Fistulectomy. According to clinical protocols, this surgical procedure should ideally be performed after the acute phase has passed and inflammatory signs are minimal (quiescent phase) to ensure the entire fistula tract can be clearly identified and completely excised without the risk of further infection spread.

Monitoring and Follow-Up Plan

The patient was scheduled for a follow-up in 5–7 days to evaluate the response to antibiotic and steroid therapy. If the mass is no longer fluctuant and the skin color returns to normal (from dark red to normal), the surgery can be scheduled immediately. Postoperative evaluation will be conducted periodically on Day 1, Day 7 (suture removal), and Day 14 to ensure primary wound healing and monitor for early signs of recurrence.

Figure 1. Pre Operative Presentation

Figure 2. Intra Operative Presentation

Figure 3. Postoperative Evaluation Day-1

Figure 4. Postoperative Evaluation Day-7

Figure 5. Postoperative Evaluation Day-14

DISCUSSION

Anatomy, Embryology, and Classification of Fistulas

A preauricular fistula is not merely a superficial skin anomaly but a blind-ended tract that often has a close relationship with the ear's cartilaginous structures. Embryologically, the external ear is formed from the first (mandibular) and second (hyoid) branchial arches. Six mesenchymal protrusions, called hillocks of His, appear during the sixth week of gestation. The first three hillocks form the tragus, crus of the helix, and anterior helix, while the last three form the remainder of the auricle.[13] A fistula occurs when there is a failure of fusion between the first and second hillocks, resulting in the entrapment of the ectoderm layer beneath the skin surface.[10]

Histopathologically, the fistula tract is lined with stratified squamous epithelium containing skin adnexa such as hair follicles, sweat glands, and sebaceous glands.[15] The fistula lumen is often filled with thick white material, which is a mixture of desquamated keratin and sebum, often producing a foul odor if infected or squeezed.[14]

There are two main types of preauricular fistulas based on the location of the ostium:

1. **Classic Type**: The ostium is located in front of the crus of the helix or above the tragus. This is the type found in K.[12]
2. **Variant Type**: The ostium is located outside the classic preauricular area, such as in the lobule, concha, or even behind the ear (retroauricular). Variant types often have longer tracts and are more difficult to excise completely.[15]

Analysis of Infection Pathophysiology and Abscess

Preauricular fistulas are usually asymptomatic until the ostium becomes blocked. This blockage can be caused by the accumulation of hardened keratin debris or unhygienic manipulation by the patient.[14] Once blocked, skin commensal bacteria can multiply within the stagnant tract. The resulting infection can range from mild periauricular cellulitis to a full-blown abscess, as experienced by K.[1]

In K's case, the throbbing pain and the 1 cm x 1 cm fluctuant mass are strong indicators of a pus collection (abscess).[8] If not treated with appropriate antibiotics, this infection can spread to the helical cartilage (perichondritis) or even to the temporal fascia and parotid gland.[10] Therefore, infection control in the early phase is a major determinant of subsequent surgical success.

Pharmacotherapy Considerations: Antibiotics and Steroids

The medical therapy for K reflects an effort to stabilize soft tissue conditions before surgical intervention.

The Role of Antibiotics (Cefixime)

Cefixime is a third-generation cephalosporin with a broad spectrum, particularly against Gram-negative bacteria, but it also has activity against many Gram-positive bacteria.17 In bacteriological studies of preauricular abscesses, the most common pathogen found is Staphylococcus aureus (27.9%), followed by Enterococcus (9.3%) and Streptococcus.16 While some Staphylococcus strains may have better sensitivity to amoxicillin/clavulanate,

Cefixime remains a popular choice in Indonesia due to its convenient twice-daily dosing and good tolerance in children.15 The standard pediatric dose of 8 mg/kg/day is effective for controlling soft tissue infections in the ear area.23

The Role of Corticosteroids (Methylprednisolone)

The use of Methylprednisolone in managing an infected preauricular fistula aims to break the inflammatory chain. As a synthetic glucocorticoid, it works by inhibiting the synthesis of inflammatory mediators and reducing capillary permeability, allowing periauricular edema to subside quickly.19 Reducing swelling

not only alleviates the patient's pain but also assists the surgeon in accurately palpating the mass boundaries when planning the incision.19 However, steroid use must always be accompanied by adequate antibiotic coverage to prevent infection spread due to local immunosuppressive effects.19

Surgical Strategy and Recurrence Prevention

The primary goal of a fistulectomy is the removal of the entire epithelial tract down to its blind end. If any epithelial residue remains, even a tiny amount, it will trigger the formation of a new cyst or abscess in the future.[11]

Comparison of Surgical Techniques

Poor visualization is the main enemy in fistula surgery. Below is a comparison of commonly used techniques:

Surgical Technique	Description	Recurrence Rate	Advantages/Disadvantages
Simple Sinectomy	Elliptical incision around the ostium, followed by tracking the tract.	5.5% - 42%	Quick, but high risk of leaving behind tract branches.[11]
Supra-auricular Approach (SAA)	Incision extended upward, identifying the temporalis fascia as the medial border.	1.3% - 3.7%	Excellent visualization, removes all potential fistula tissue.[6]
Inside-Out Technique	The tract is opened from the inside and followed outward.	Near 0%	Requires high skill and often microscopic assistance.[9]
Microscope-Assisted	Use of a microscope to view small branches.	approx. 1.9%	Very accurate but increases operation time.[6]

[6]

Based on recent literature, the supra-auricular approach (SAA) is considered the gold standard for cases that have been previously infected or are recurrent, as in K's case.[9] By establishing the temporalis fascia as a safe medial dissection border, surgeons can ensure that all glandular components and tracts above the fascia are removed en bloc.[11]

Use of Intraoperative Aids

To minimize failure, several additional steps are highly

recommended:

1. **Methylene Blue Injection**: Dye is injected into the ostium before surgery begins. The blue-colored tract facilitates the identification of small branches.[11]
2. **Use of a Lacrimal Probe**: This tool is inserted into the fistula canal to provide palpation guidance during dissection.[11]
3. **Excision of Part of the Helical Cartilage**: Because the fistula tract often adheres very tightly to or even penetrates the helical cartilage, removing a small piece of cartilage at the base of the tract has been proven to significantly lower the recurrence rate.[7] Without this step, epithelial remnants in the perichondrium frequently become a source of recurrent infection.[26]

Timing of Surgery: Acute vs. Quiescent Phase Controversy

Deciding when to operate on a patient with a preauricular abscess is a subject of debate. Traditionally, medical consensus suggests performing incision and drainage (I&D) first, followed by antibiotics, and then performing the fistulectomy 6–12 weeks later once scar tissue has formed.[11]

However, some recent studies (such as research on 78 children in Zhengzhou) show that surgery during the "infection-limited" phase provides results as good as surgery during the quiescent phase.[20] The advantage is that the patient does not need to undergo two procedures (I&D and definitive surgery), reducing the psychological and financial burden on the family.[20] For K, the approach taken was to first quiet the infection with medication, which is common practice in many Indonesian hospitals to minimize intraoperative bleeding and the difficulty of identifying the tract due to massive edema.[13]

Epidemiology and Syndromic Associations

Although preauricular fistulas are often an isolated finding, medical practitioners must be alert to the possibility of **Branchio-Oto-Renal (BOR) Syndrome**. This syndrome is characterized by preauricular fistulas, branchial arch abnormalities (such as branchial cleft cysts), hearing loss, and renal anomalies.[14]

Current clinical guidelines suggest that a renal ultrasound (USG) should be performed on a child with a preauricular fistula if any of the following conditions are found:

- Presence of other external ear malformations (e.g., microtia).
- A family history of deafness or renal anomalies.
- The presence of pits or cysts in the neck (branchial cleft).
- A maternal history of gestational diabetes during pregnancy.[14]

It is important for

clinicians to ask for this history from K's family to rule out more complex systemic abnormalities.[14]

Postoperative Complications and Prognosis

Complications after a fistulectomy are generally minimal if proper techniques are used. Some possibilities include:

- **Hematoma**: Can be prevented with adequate pressure bandaging for 24–48 hours postoperatively.[13]
- **Surgical Site Infection**: Risk increases if surgery is performed on tissue that is still highly inflamed.[20]
- **Auricle Deformity**: Can occur if cartilage excision is too aggressive or if skin necrosis occurs due to overly tight sutures.[13]
- **Keloids**: Because the surgical site is on the face, the tendency for scar formation must be noted, especially in patients with a history of keloids.[13]

Overall, the prognosis for K is excellent. With appropriate pharmacological management to resolve the abscess and careful planning of the fistulectomy using the supra-auricular approach, the risk of recurrence can be reduced to below 5%.[5]

CONCLUSION

The case of K illustrates a common but significant clinical challenge in pediatric otorhinolaryngology. A congenital preauricular fistula, while appearing as a simple lesion, is a complex embryological entity with the potential for recurrent infection complications. The success of handling this case depends on a multidimensional approach:

1. **Acute Phase Management**: The use of broad-spectrum antibiotics such as Cefixime and corticosteroids such as Methylprednisolone is highly effective in controlling the inflammatory response and stabilizing tissue before surgery.
2. **Choice of Surgical Technique**: The supra-auricular approach (SAA) with identification of the temporal fascia as the medial border is the best strategy to ensure the removal of the entire fistula tract and minimize recurrence rates.
3. **Intraoperative Precision**: Visualization aided by methylene blue dye, magnification (microscope or loupes), and excision of a portion of the helical cartilage adhering to the tract are key factors in preventing epithelial remnants that trigger recurrence.
4. **Patient Education**: It is vital to provide understanding to parents that a fistulectomy is the only definitive solution, and surgery should ideally be performed when tissue conditions are at their quietest (quiescent phase) for optimal cosmetic and clinical results.

By following appropriate clinical protocols and utilizing advancements in microsurgical techniques, maximum cure rates for pediatric patients with preauricular fistulas can be achieved with minimal risk of complications.

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