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CO_2 laser cauterization approach to congenital pyriform sinus fistula☆

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ABSTRACT

Objective: To evaluate the efficacy of CO_2 laser cauterization with suspension microlaryngoscopy as a definitive surgical treatment for pediatric Congenital Pyriform Sinus Fistula (CPSF).
Material and methods: This is a cohort retrospective study. Thyroid function and cervical ultrasonography examinations were performed before operation. Enhanced magnetic resonance imaging (MRI) was performed on patients with a repeated infection (≥2 times) and/or if they had a prior open surgery. Patients were divided into two groups: the <8-year-old group and the ≥8-year-old group. The differences in the number of cauterization procedures between the two age groups and between the initial treatment and the retreatment groups were analyzed.
Results: CO_2 laser cauterizations with suspension microlaryngoscopy were performed for 104 CPSF patients. No complications occurred. Three patients had a recurrence in the follow-up. The number of surgical cauterization operations was fewer than 3 in 85.1% of the patients. There was no significant difference in the number of cauterizations among the different age groups or between the initial treatment and retreatment groups ($P > 0.05$).
Conclusion: CO_2 laser cauterization with suspension microlaryngoscopy is a safe, effective, and minimally invasive approach to CPSF with optimal patient outcomes.
Type of study: Treatment Study.
Level of evidence: Level III.

Congenital Pyriform Sinus Fistula (CPSF) is a rare branchiogenous disease of the neck. Surgical treatment in the quiescent stage of inflammation is the definitive treatment option for removal of this entity. With advancements in technology and the trend towards minimally invasive surgical approaches, several authors have proposed using chemical cauterization, electrocautery, and other such strategies to target the CPSF [1]. In 2010, Leboulanger [2] first reported the use of carbon dioxide (CO_2) laser cauterization for treatment of a pyriform sinus fistula. To date, many other studies describing endoscopic CO_2 laser cauterization to treat CPSF have been published in the literature; however, in total, there were only approximately 38 cases reported worldwide. Indeed, the highest number of cases reported in a single study was 19 [3]. As such, due to the relative infrequency of CPSF, the prior studies have not been able to arrive at as standardized diagnosis or treatment protocol.

The aims of this present study were to evaluate the efficacy of CO_2 laser cauterization with suspension microlaryngoscopy (A suspension laryngoscope was utilized to expose the pyriform sinus and microscope was used to search for the fistula and complete cauterization procedure) as a definitive surgical treatment for CPSF and to explore the relationship between the number of cauterization operations and outcomes.

1. Material and methods

This work has been approved by the local ethics board of Beijing Children's Hospital, Beijing, China. Patient consent was obtained for all patients enrolled in this study. Beijing Children's Hospital is one of the largest free standing pediatric hospitals in Asia with over 3 million annual patient visits and is part of a consortium of over 20 referring

☆ We declare that none of the authors has any potential financial conflict of interest related to this manuscript. This work has not been published elsewhere, and the manuscript is not currently under consideration by any other journal.

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hospitals. For standardization, all the surgical procedures were performed by two pediatric otolaryngologists in this study.

1.1. Criteria of selection

All patients suspected as CPSF without surgical contraindications were included in this study.

1.2. Preoperative assessment

All patients underwent cervical ultrasonography. Enhanced MRI examination was performed on patients with a repeated infection (≥2 times) and/or if they have had a prior open surgery (Fig. 1 A and B).

Patients with an acute infection of the CPSF received appropriate antibiotics and NSAIDs (Non-Steroidal Anti-inflammatory Drugs) treatment, incision and drainage, and medications to control their thyroid function as necessary. These patients were then "cooled down" for a period of 4 weeks. Patients in the quiescent stage of inflammation (more than 4 weeks after acute stage) underwent suspension microlaryngoscopy exploration and CO_2 laser cauterization if a sinus fistula was found in the pyriform sinus.

1.3. Operative technique for CO_2 laser cauterization procedure

All patients underwent general anesthesia in the supine position. A suspension laryngoscope was utilized to expose the pyriform sinus and search for the fistula. If no sinus fistula was observed, open surgery was performed using an external cervical approach. For the cases with an observed internal pyriform sinus fistula, the fistula and the Betz fold were fully exposed (Fig. 2A). A CO_2 laser system (Lumenis AcuPulse Duo™) set at 3 W in continuous pulse mode was used for intraoperative cauterization. Taking the age of the child and the size of fistula into consideration, cauterization was performed to a depth varying from 0.5 cm to 1.2 cm (median 1 cm) into the fistula with a diameter of approximately 0.5 cm around the fistula. The cauterization depth reached about 2 mm of the submucosal layer while the Betz fold was cauterized (Fig. 2B).

1.4. Postoperative care

In the postoperative period, cephalosporin (60 mg/kg.d) and metronidazole (30 mg/kg.d) were administered for 3 days as well as

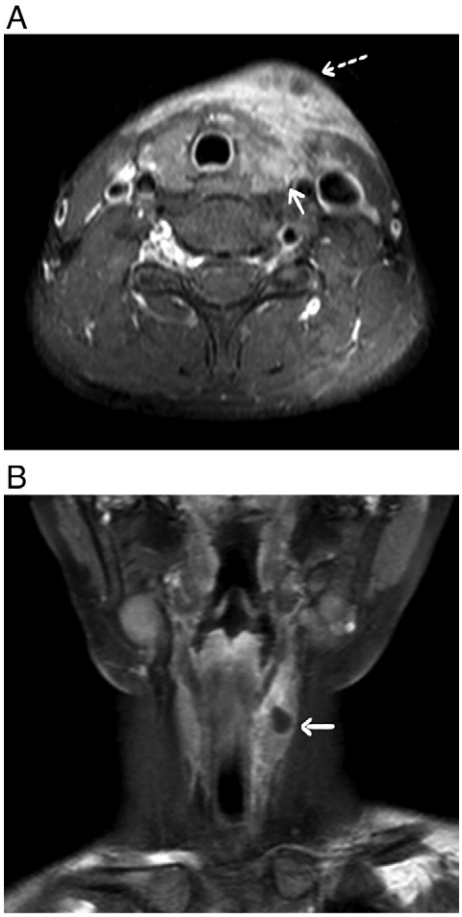

Fig. 1. A, Cervical enhanced MRI (axial): Abnormal mass in the left anterior subcutaneous soft tissue involved left thyroid gland, which was unevenly enhanced (solid arrow). An abscess was present (dashed arrow). B, Cervical enhanced MRI (coronal): the abnormal mass of the left side neck involved the left thyroid and showed uneven enhancement. A traveling air-filled fistula was observed (arrow).

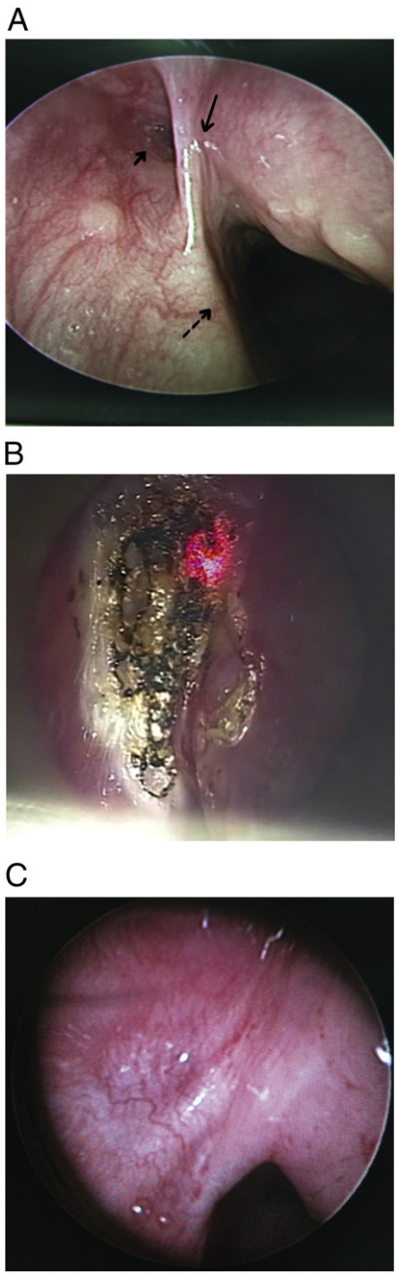

Fig. 2. A, Suspended laryngoscopy revealed a left pyriform sinus fistula (short arrow), the Betz fold (long arrow) and the esophageal entrance (dotted arrow). B, The internal fistula and Betz ligaments after CO_2 laser cauterization were eschar-like. C, At 10 weeks after the CO_2 laser cauterization, suspended laryngoscopy revealed the closure of the fistula.

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