



Review Article

Recurrences of surgery for antrochoanal polyps in children: A systematic review



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ABSTRACT

Objectives: The main purpose was to evaluate the recurrence rate after surgery for antrochoanal polyps (ACPs) in children; secondly, we have analyzed the rate of recurrence for different types of surgery and the risk factors involved.

Methods: We performed a systematic review searching PubMed and MEDLINE databases including English-language published studies from June 1989 to October 2017 regarding surgical treatment of ACPs in children. **Results:** We included thirteen studies, eight were retrospective and five prospective, with 285 participants, the mean rate of recurrence after ACPs surgery was 15.0% (95% CI:11.0–20.0). Functional endoscopic sinus surgery (FESS) was the main type of surgery used for primary cases (75.4%) followed by the combined approach i.e. FESS with a transcanine sinusoscopy or mini Caldwell-Luc (14%), the Caldwell-Luc (CWL) (8%) and simple polypectomy (SP) (2.8%). Our analysis has demonstrated a significant reduction of recurrences using the combined approach 0% (95% CI: 0.0–8.0) compared with FESS 17.7% (95% CI: 12.8–23.4) or SP 50% (95% CI:15.7–84.3) ($p < .05$) but no significant differences with CWL 9.1% (95% CI: 1.1–29.2) and others surgical approaches ($p > .05$). The analysis of the possible risk factors involved in recurrences are inconclusive.

Conclusion: Recurrences of ACPs in children are still high. The endoscopic sinus surgery is considered the first choice for primary treatment, whilst the external approach may be a valid option in case of recurrence. It seems that the combined approach could reduce recurrence rates in selected patients that cannot be completely managed with endoscopy.

1. Introduction

Antrochoanal polyps (ACPs), also known as Killian polyps, are benign lesions arising from the maxillary sinus and extending through the nasal cavity to the choana [1]. They constitute approximately 4–6% of all nasal polyps in general population increasing to 35% in children [2,3] without a clear gender difference [4,5]. Although various hypotheses have been described, the etiology and pathogenesis of ACPs are still unknown [6,7]. The majority have accepted the “blocked acinus theory”: it is believed that ACPs arise from an antral cysts development caused by acinar mucus gland obstruction as a result of chronic phlogosis (allergic or infectious) [4]. Frosini et al. explained that the closure of the osteomeatal complex/middle meatus level determines an increase in pressure in the Highmore antrum forcing the herniation of the polyp into nasal cavity through the accessory ostium

[6]. Others have indicated that lymphatic obstruction, whether primary (area of higher tissue pressure) or secondary to chronic sinusitis might play a role in the formation and growth of ACPs [7,8]. Nasal obstruction and nasal discharge are the most common presenting symptoms although in rare cases the presentation could be severe with dyspnea and/or obstructing sleep apnea, dysphagia or epistaxis [9–12]. The treatment of ACPs is essentially surgical and functional endoscopic sinus surgery (FESS) has become widely accepted in children [13]. It consists in the excision of the polyp (transnasally or transorally depending on the size) and in the treatment of the obstructed osteomeatal complex. Other external approaches such as the Caldwell-Luc (CWL) procedure [5], mini Caldwell-Luc [14] or transcanine sinusoscopy (TS) [15–18] could be used alone or associated with the endoscopic surgery. Although more effective and safe surgical techniques have been developed, recurrences of ACPs in children are still high and at present

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there isn't an accepted indication for revision surgery or wait and see Refs. [19,20].

We conducted a systematic review of the current evidence regarding ACPs surgery in children. Our aims were to assess the rate of recurrence of ACPs surgery in children and, secondly, to analyze the rate of recurrence for different types of surgery and the potential risk factors involved.

2. Material and methods

A systematic literature search was done using PubMed and MEDLINE databases in order to identify the studies regarding surgical treatment of antrochoanal polyps in pediatric population. No restrictions were placed on publication date, articles and/or abstracts in any other language than English were excluded. We searched using the following Medical Subject Headings (MeSH)/Index terms: “antrochoanal polyps”, “recurrence”, “children”, “pediatric”. Results included publications from June 1989 until October 2017. Additionally, bibliographies of included articles were reviewed for further relevant studies not identified in the electronic database search. Two reviewers (F.G and G.W.) screened the potential studies selecting them according to eligibility criteria and any disagreement was resolved by discussion. We defined as primary cases children who underwent surgery for ACP for the first time, while the cases of recurrence as revision surgery. All the selected studies reported exclusively the number of recurrences after primary surgery.

The association between type of surgery and recurrences was determined using Pearson's chi squared tests (χ^2) with significance level of $p < .05$.

3. Results

The study flow diagram is shown in Fig. 1. Thirteen published articles were ultimately identified as relevant to our research.

Table 1 reports the study characteristics included in the systematic review. Eight were retrospective [4,5,14,16,18,21–23] and five were prospective [15,17,20,24,25]. No ones were controlled. Overall they contained a total of 285 subjects. Sample sizes ranged from 7 to 39 (median 25) and the mean age was 11 years. The male to female ratio of 1,15 was calculated considering gender differences reported in ten studies [4,5,14–18,20,22,25]. The combined study period was from 1977 to 2014 [4,20] and the median study duration was 10 years. The period of follow-up in which recurrences were noted was highly variable ranging between 5 months and 10 years, only Orvidas et al. considered a wide range between 2 days and 26.8 years aided by telephone interview [5].

The type of surgery used for treatment of APCs and the associated recurrences considering the selected studies are detailed in Table 2. Regarding the primary surgery, functional endoscopic sinus surgery (FESS) was performed in most patients (75.4%), nasal endoscopy associated with a transcanine sinusoscopy (TS) or mini Caldwell-Luc in 14% cases while the Caldwell-Luc (CWL) approach and the simple polypectomy (SP) in 8% and 3% of cases respectively. Revision surgery was the CWL procedure in case of 50% of recurrences, FESS associated with TS or mini CWL in 27.2% of cases and FESS alone in 16%, three cases were treated with nasal steroids. Only six authors calculated the time for recurrence which varied from 5 months to 8.1 years [4,5,14,22,24,25]. The analysis of the rate of recurrence of the 13 included studies is illustrated in Fig. 2. The mean rate of recurrence of antrochoanal surgery in children was 15.0% (95% CI:11.0–21.0). It varies from 0% to 64%.

Fig. 3 shows the rate of recurrence for type of primary surgery. The percentage of recurrences varies from 50% (95% CI: 15.7–84.3) using simple polypectomy to 0% (95% CI: 0.0–8.0) with the combined approach. For the Caldwell-Luc approach it was 9.1% (95% CI: 1.1–29.2) and 17.7% (95% CI: 12.8–23.4) for nasal endoscopy. There was a

significant difference between rate of recurrence after FESS + TS/mini CWL versus FESS alone ($p = .008$) or versus SP ($p = .0001$) and no significant differences comparing the Caldwell-Luc with the others surgical approaches ($p > .05$).

In the reviewed studies were reported various potential risk factors for recurrences of surgery for ACPs in children: the type of origin of the polyp in the maxillary sinus [14,17,21,22,25] and/or its side of origin (left, right or both maxillary sinus) [5,14,15,20,22,25], the presence of sinusitis [5,15,17,18,20,22,24,25] and/or allergy [5,15,18,21], and the presence of various anatomical features (i.e. septal deviation, inferior turbinate hypertrophy, presence of concha bullosae or adenoids hypertrophy) [15,22,25]. Overall, none of these predisposing conditions has been proved to increase the risk of recurrence in children operated for ACPs.

4. Discussion

In this review, we have found that the mean rate of recurrences of ACPs surgery in children was 15.0% (95% CI:11.0–21.0). The relevance of this high recurrence rate remains to be clarified considering that ACP is a localized benign condition, and the efficacy of surgical approaches are considerably improved in the last decades.

The primary aim of this surgery is the complete removal of the polyp because recurrent ACPs are most probably due to regrowth of any missed residual polypoidal tissues within the maxillary antrum. Distinct types of surgical approaches have been used with varying degree of success, and with different potential morbidity. This is particularly true in the treatment of pediatric patients.

Nowadays, functional endoscopic sinus surgery is considered the main type of surgery for primary cases of APCs in children (75% of cases) for two reasons. First, it has been demonstrated to be safe and only rare and minor complications have been reported (i.e., synchia between inferior turbinate and septum or epistaxis [5,24]). Second, if present, predisposing anatomical factors (e.g., septal deviation, adenoids hypertrophy, inferior turbinate hypertrophy, concha bullosa, etc.) potentially contributing to osteomeatal complex obstruction may be corrected during endoscopic surgery [15,22,25]. The external approaches (i.e. the Caldwell-Luc [4,5], and the modified CWL [24]), are used in 8% of cases of primary surgery. These open procedures are progressively less utilized, especially in children. This is due to the concerns regarding the risk of damaging the growing teeth and the developing maxillary bone that may result in facial pain, swelling or paresthesias [5,17]. Therefore, they are preferably used for revision surgery in case of recurrence after nasal endoscopy. In order to provide an appropriate exposition of the antrum with low risk of complications, some authors introduced the combined approach. It includes the nasal endoscopy sinus surgery with mini invasive transcanine puncture [15–18], and the mini Caldwell-Luc [14]. Generally, they are used for both primary and revision cases without a standardized protocol.

The analysis of the rate of recurrence for the different types of surgeries shows a statistically significant differences between rate of recurrences of the combined approach versus FESS and SP (both with $p < .05$). These results could support the hypothesis that recurrences could be prevented by the correct identification of the origin of the polyps, and the restoration of maxillary ventilation by opening the ostium. Thus, the combined approach could guarantee the complete removal of the polyp through the two openings according to the position of insertion (posterior, anterior, lateral, medial or inferior wall of the maxillary sinus [14,17,21,22,25]), and the treatment of the obstructed osteomeatal complex. To date there are no studies in the literature regarding the potential complications of this approach. This is an important limitation that should be attentively addressed in future trials, in order to ascertain the safety of this surgical procedure.

Regarding the possibility of failure of the endoscopic approach, we suppose that it mainly depends on the difficult identification of the origin of the polyp in the recess of maxillary sinus through the

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