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Effect of paranasal anatomical variants on outcomes in patients with limited and diffuse chronic rhinosinusitis

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ABSTRACT

Objective: The role of anatomical variants of the paranasal sinuses in the aetiology of chronic rhinosinusitis (CRS) is not well understood. Furthermore, the effect of anatomical variants on long-term outcomes has not been described. This study aims to assess the effects of anatomical variants of the middle meatus on patients with limited and diffuse CRS.

Methods: A database analysis was conducted for patients with limited sinusitis (undergoing anterior FESS) and patients with diffuse sinusitis (undergoing complete FESS) between 2009 and 2013. Intergroup comparisons were made for symptom scores, CT scans, revision surgery, re-referrals following discharge and number of clinic follow-ups.

Results: A total of 86 patients were included in the study: 40 anterior FESS, 25 CRSwNP and 21 CRSsNP. Following surgery, anterior FESS symptom scores reduced by 4.6 ± 0.8 on average, while the CRSwNP and CRSsNP group reduced by 5.7 ± 1.1 and 5.9 ± 1.3 respectively. Patients undergoing anterior FESS required fewer clinic follow-ups than CRSwNP ($\Delta\ 2.7 \pm 0.9$, $P < 0.001$) and CRSsNP ($\Delta\ 3.3 \pm 0.6$, $P < 0.001$). Patients with fewer anatomical variants (0–2) required more follow-up (5.2 ± 0.6) than those with higher numbers of variants (3+) (3.8 ± 0.3, $P = 0.05$). No significant differences were seen between groups for revision surgery, repeat CT and re-referral rates.

Conclusion: Limited surgery for local disease demonstrated comparable symptom improvement to patients with extensive disease receiving extensive surgery. Patients with greater numbers of anatomical variants are associated with localised sinus disease who typically require less postoperative care after receiving limited surgery.

1. Introduction

The aetiology of chronic rhinosinusitis (CRS) is multifactorial and is likely to be highly variable between individuals. Functional endoscopic sinus surgery (FESS) achieves improvements in quality of life for the majority of patients with CRS [1–3]. However, the exact mechanism by which surgery improves symptoms and the extent of surgery required to effectively improve symptoms is yet to be described.

Studies have previously explored the correlation between CRS and anatomical variants of the middle meatus. One study found that patients with pan-sinusitis had fewer anatomical abnormalities (comparable to healthy normal controls), while those with localised CRS had significantly more anatomical abnormalities [4]. To date, there remains a paucity of data that describe the implications of anatomical variants in CRS or how much surgery is required to improve patient symptoms. Shen et al. compared radical FESS and conservative FESS with identical groups of CRS patients while Chakravati et al.

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compared CRS patients grouped into low and high Lund–Mackay Score (LMS) all receiving a standard FESS procedure. Neither study found a significant difference in symptom improvement when comparing different types of surgery or patient groups. Regardless of intervention, each group of CRS patients showed significant improvements in symptom scores after surgery. A study delineating the role of anatomical variants in postoperative outcomes is yet to be described.

The aim of this study was to compare postoperative outcomes in patients with limited, anterior sinusitis undergoing limited surgery to patients with pan-sinusitis undergoing standard complete FESS.

2. Methods

Patient databases were reviewed for consecutive patients with symptomatic, limited anterior CRS or pan-sinusitis (with or without polyps) between 2009 and 2013. Revision, odontogenic, fungal and patients with incomplete data were excluded. All patients underwent either anterior FESS for limited disease or complete standard FESS for pan-sinusitis. An anterior FESS was performed on patients with localised anterior disease limited to the maxillary sinus and middle meatus. It was defined as uncinectomy and middle meatal antrostomy with or without septoplasty and inferior turbinate reduction. In addition to this, complete standard FESS also included anterior and posterior ethmoidectomy, sphenoidotomy and frontal recess dissection. Institutional ethics committee approval was granted.

Fine slice computed tomography (CT) scans were reviewed in coronal, sagittal and axial planes. The total bilateral incidence of accessory ostia, conchae bullosae, Haller cells, lateralised uncinate processes, and paradoxical middle turbinates were recorded for each patient. Lund–Mackay scores were calculated from the first preoperative CT scan obtained. Participants completed a CRS symptom score survey prior to surgery and during follow-up appointments in which they rated the severity of five symptoms on a scale between 0 and 5, nasal obstruction, anterior rhinorrhea, posterior nasal drip, facial fullness, pain or pressure, and anosmia. Preoperative symptom scores were obtained from clinic prior to the surgery while postoperative scores were obtained from a clinic visit 4–6 weeks following the operation. Numbers of postoperative CT scans, revision operations, re-referral following discharge and number of postoperative follow-up visits were recorded.

A paradoxical middle turbinate was defined as a paradoxical curvature of the middle turbinate towards the ostiomeatal complex (and maxillary ostium). Haller cells were counted if in close proximity (3 mm) of the maxillary ostium (and therefore more likely to be implicated in ostial obstruction). Conchae bullosae were counted regardless of the degree of pneumatisation. The presence of both anterior and posterior accessory ostia was recorded.

Patient groups were further divided into two groups based on the total number of anatomical variants (0–2 and 3+ variants) for analysis.

Data analysis was performed using SPSS (Version 22; IBM, New York). Differences between groups were compared using a Student's *t*-test or multiple group analysis of variance with post hoc Tukey's HSD (honest significant difference). $P < 0.05$ was considered to be significant.

3. Results

A total of 86 patients met study criteria for analysis. This included 40 patients in the anterior FESS group and 46 in the complete FESS group. In the complete FESS group there were 25 CRS patients with polyps (CRSwNP) and 21 CRS patients without polyps (CRSsNP) (Table 1).

3.1. Comparison by sinusitis subgroup

Between the three groups, anterior FESS, CRSwNP and CRSsNP, significant differences were found for number of anatomical variants, preoperative symptom scores, postoperative symptom scores (Fig. 1) and the number of postoperative follow-ups. Comparisons between anatomical variants and operation type found anterior FESS patients to have a greater number of variants (3.6 ± 0.3) than patients with CRSwNP (1.2 ± 0.3, $P < 0.001$) and CRSsNP (2.5 ± 0.4, $P < 0.001$) (Table 2).

Preoperative symptom scores were on average lower in the anterior FESS group than in the CRSwNP and CRSsNP groups (12.1 ± 0.9, 17.4 ± 0.8 and 16.9 ± 1.2 respectively). The three groups had an average postoperative symptom score reduction of 3.7 ± 1.4, 7.2 ± 1.5 and 5.1 ± 1.7 respectively. While these symptom score reductions were significant for each group individually, there was no significance overall between the groups ($P = 0.255$).

Anterior FESS patients required fewer clinic visits than CRSwNP (Δ 2.7 ± 0.9, $P < 0.01$) and CRSsNP (Δ 3.3 ± 0.6, $P < 0.01$) prior to being discharged. Analysis of other postoperative encounters including repeat CT scans, re-referrals and revision surgeries showed no significant differences. Fewer revision surgeries were observed in the anterior FESS group than in the CRSwNP group (0.20 ± 0.10, $P = 0.06$) and CRSsNP group (0.11 ± 0.08, $P = 0.06$), suggesting tendency towards significance.

Table 1
Patient demographics and average Lund–Mackay Score (LMS).

	Total patients	Male	Female	Average age	Average LMS
Anterior FESS	40	17	23	47	1.6
CRSwNP	25	19	6	54	17.0
CRSsNP	21	15	6	51	13.7

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