

The axillary flap is a safer but tedious technique for Agger nasi cell removal compared to punch out procedures

Maysara A. Youssef^a, MSc; Ahmed A. Sadek^a, MD; and Moustafa Talaat, MD^a

^a Otorhinolaryngology Dept., Faculty of Medicine, Minia University, Minia 61511, Egypt.

Abstract:

Objective: This study prospectively assessed the axillary flap approach versus punch-out procedure for agger nasi cell (ANC) removal. This is a key for successful frontal sinus surgery and its implication on the patency of the frontal ostium and middle turbinate lateralization (MTL).

Subjects and Methods: The study subjects consisted of 50 patients of whom 30 patients were males (80 frontal sinuses; 30 patients with bilateral disease and 20 patients with unilateral disease) with proven chronic frontal sinusitis, with pneumatized ANC according to CT findings. All patients underwent Endoscopic Sinus Surgery (ESS) with dissection of frontal recess. Group I included 40 sides that underwent removal of ANC using the axillary flap procedure (procedure 1), Group II included 40 sides that underwent removal of ANC using the punch out procedure (procedure 2). Adelaide chronic rhinosinusitis (CRS) symptom scoring questionnaires were used for all patients during their last follow-up visit 3 months after surgery.

Results: ANC were the most common variation and were observed in all the patients (20 patients unilaterally and 30 patients bilaterally). MTL following ANC removal has been found in 7.5% of Group I and 25% in Group II patients. Association between Adelaide symptoms severity score of postoperative symptoms and MTL was significant for nasal obstruction and rhinorrhea in both procedures (1 and 2). Non-visualization of the frontal ostium following ANC removal has been found in 7.5% of Group I and 15% in Group II. Comparison between both procedures on MTL and non-visualization shows that the number of patients with MTL-positive using procedure 1 was significantly less than procedure 2 while there was a non-significant difference between procedure 1 and 2 regarding non-visualization.

Conclusions: The axillary flap technique is a safer procedure for resection of the ANC with perfect healing and less incidence of intraoperative and postoperative complications. However, it is a relatively difficult procedure and very time-consuming while punch out procedure is a relatively easy, less time-consuming procedure.

INTRODUCTION

The surgery in the frontal recess and on the frontal sinus remains a problem. This is because of the complex anatomy, the large anatomical variation of the frontal recess [18] and the location of the frontal recess behind the frontal beak [19].

The agger nasi cell (ANC) is the first cell seen in the coronal scan anterior to the insertion of the middle turbinate and is present in more than 90% of patients [2]. This cell forms the key to understanding the anatomy of the frontal recess as it can be easily identified on the computed tomography (CT) scan and

in the patient during surgery[20]. The presence and pneumatization degree of the ANC affect the anteroposterior dimension of the frontal sinus ostium and size of frontal beak [20]. The present study prospectively assessed the best technique for ANC removal using the axillary flap approach versus punch-out procedure as it is the key for a successful frontal sinus surgery and its implication on the patency of the frontal ostium and middle turbinate lateralization (MTL).

SUBJECTS AND METHODS

This is a prospective study conducted at the Department of Otorhinolaryngology, Minia University, Minia, Egypt, in the period from December 2015 to December 2016. The study subjects consisted of 50 patients (80 frontal sinuses) with chronic frontal sinusitis, with pneumatized ANC according to CT findings, who were prepared for Endoscopic Sinus Surgery (ESS). These patients were not responding to medical treatment in the presence of radiological and endoscopic evidence of chronic frontal sinusitis. All patients were subjected to complete pre- and postoperative means applied in ESS. Of these 50 patients, there was a male-to-female ratio of 3:2 (30 male and 20 female patients), and a mean age of ~ 29 year.

All patients undergone ESS with dissection of frontal recess. Inclusion criteria consisted of all patients with frontal sinus pathology including chronic sinusitis, allergic polyposis and mucocoeles with ANC presence confirmed by CT and undergoing ESS with dissection of frontal recess. Exclusion criteria included patients undergoing ESS without frontal recess dissection, patients below the age of 16 years, patients with

malignant tumor involvement of frontal recess, frontal sinus, cases where ESS was abandoned due to excessive bleeding and patients who had previous ESS. The study subjects were prepared for ESS (80 procedures, 30 patients with bilateral disease and 20 patients with unilateral disease) was subdivided into two groups (Group I and Group II). Group I included 40 sides who undergone removal of ANC using the axillary flap procedure (procedure 1) and Group II included 40 sides undergone removal of ANC using the punch out procedure (procedure 2). Post-operative Adelaide chronic rhinosinusitis (CRS) symptom scoring questionnaires was used to all patients during their last follow-up visit after 3 months to assess the possibility of post-operative symptoms.

Statistical Analysis:

All statistical procedures were done using Statistical Package for Social Sciences (SPSS) computer software (version 24). Statistical significance is set at $P < 0.05$. To assess baseline characteristics, Fischer's exact test was used to test any unequal confounding effect of clinical variables between MTL-positive and MTL-negative patients. To test the association between postoperative symptoms (Adelaide symptoms severity score) and MTL, Chi square was used to test the significance between them in addition to Spearman correlation to assess existence of any correlation and its strength. In addition, Chi square test was used to compare between effects of procedure 1 and procedure 2 on MTL and non-visualization and Cramer's correlation was used to assess if any correlation existed between them in addition to its strength.

Results

Of the 50 patients, there was a male-to-female ratio of 3:2 (30 male patients of whom 20 had bilateral disease and 10 had unilateral disease and 20 female patients (10 with bilateral disease and 10 with unilateral disease). Gender distribution among both groups was as follows: Group I (40 sides) included 15 female patients and 25 male patients while Group II (40 sides) included 15 female patients and 25 male patients. The Mean age of both groups is shown in Table 1.

A summary of the patient symptoms, complications and the preoperative Lund and Mackay radiological score of the frontal sinuses is presented in Table 2. Twenty-six patients had chronic sinusitis in each group, four patients had allergic fungal sinusitis in group I, ten patients had allergic nasal polyps in each group and four patients had mucoceles in group II. Four patients had preoperative complications one patient with intracranial and orbital complications having posterior table erosion with extension of the fronto-ethmoidal mucocele intracranially with erosion of the orbital roof and lamina papyracea with proptosis and blindness as shown in Fig. 1. Two patients had medial orbital wall erosion with extension of the mucocele into the orbit with proptosis and blindness of one of them and one patient with mucocele of the right ANC.

Concha bullosa of middle turbinate was observed in 20% of the study cases (10 patients): two patients on the right side, two patients on the left side and six patients on both sides, paradoxical middle turbinate was observed in eight (16%) of the study cases: one patient on the right side, two patients on the left side and five patients on both sides. Haller's cell was observed in four (8%) of the study cases: one patient on the right side, one patient on the left side and two patients on both sides. Pneumatization of crista galli was observed in four patients (8%) of the study cases and deviated nasal septum (DNS) as anatomical variations was observed in 20 (40%) of the study subjects: eight patients on the right side and twelve patients on the left side (Table 3).

Analysis of baseline characteristics revealed that there is non-significant effect regarding the confounding effect of clinical variables; chronic sinusitis, polyps, allergic fungal sinusitis and mucoceles between MTL-positive and MTL-negative subjects in both procedures (1 and 2). The patients with bilateral disease were operated by both procedures one side with axillary flap procedure and the other side with punch out procedure. ANC were the most common variation and were observed in all the patients (20 patients unilaterally and 30 patients bilaterally).

Post-operative Adelaide CRS symptom scoring questionnaires was used to all patients during their last follow-up visit. This questionnaire includes questions on a five-point scale about the severity of five major CRS symptoms (nasal obstruction, rhinorrhea, postnasal drip, headache, and anosmia). The presence/absence of a symptom was determined according to the Adelaide symptom scoring system with a score of 1 meaning absence of the symptom (Table 4).

The postoperative status/anatomical location of the middle turbinate were recorded to assess lateralization. MTL was defined as any portion of the body or head of the MT contacting the lateral nasal wall. We, also, recorded whether the frontal sinus could be visualized, independent of MTL or not. MTL following ANC removal has been found in 7.5% in Group I and 25% in Group II. Association between Adelaide symptoms severity

score of postoperative symptoms and MTL was significant for nasal obstruction and rhinorrhea in both procedures (1 and 2).

Visualization of frontal sinus recess and frontal sinus ostium was assessed by the ability to pass a 2.7 mm endoscope into the middle meatus to view these structures. Non visualization of the frontal ostium following ANC removal has been found in 7.5% of Group I and 15% in Group II.

We wanted to ascertain whether occurrence of MTL following surgery was associated with a poorer postoperative outcome or not. Comparison between the effect of procedure 1 and procedure 2 on MTL and non-visualization (Table 5) shows that the number of patients with MTL-positive using procedure 1 was significantly less than procedure 2 while there was a non-significant difference between procedure 1 and 2 regarding non-visualization.

Discussion

We identified the ANC in all the patients (30 patients bilaterally and 20 patients unilaterally) which is coincident with one study [16] on 220 patients, where 100% of patients showed presence of ANC. In another study [13] on 192 patients, the prevalence of ANC was 89% and in a third study on 202 patients [11], it was 94.1%, and 94% in a fourth study on 57 patients [8].

In our study, it was observed that axillary flap technique is a very time consuming procedure and needs experience in contrary to a study performed by others [20] who stated that it is a relatively easy procedure.

In our study, MTL following ANC removal has been found in 7.5% of Group I and 25% of Group II. In another study, a lateralized middle turbinate was present in 78% of patients undergoing revision FESS [15]. However, two other studies reported much lower rates of postoperative middle turbinate lateralization, ranging from 22% to 36% [7, 17]. The rate of MTL was approximately 15% in one study using axillary flap approach [6] and 25% in another study performed on 151 using axillary flap approach [1].

The association between MTL and postoperative symptoms as recorded on

the Adelaide symptoms severity questionnaire was significant for nasal obstruction and rhinorrhea in both procedures while in another study [1], the association between MTL and postoperative symptoms was not significant using Kruskal-Wallis test on sixty-nine patients. The authors, then, tested for an association between MTL and the mere presence/absence of symptoms using univariate logistic regression models, and this also was not significant. Although they concluded that MTL is among the most common explanation for ESS failure and increase in the risk of revision surgery.

In order to prevent lateralization while preserving the MTs, numerous techniques have been described to encourage a medial position. One of the most widely recognized techniques is the controlled

synechiatechnique (Bolgerization) [3], suture conchopexy (or medialization) of the MTs [9], metal clips to temporarily fix the MT to the septum [14] and middle meatal spacers [12]. In our study, we adopted the bolgerization technique.

In our study, non-visualization of the frontal ostium following ANC removal has been found in 7.5% of Group I and 15% in Group II. In one study on 64

patients (128 sides) using the axillary flap in removal of ANC, the non-visualization of the frontal ostium was 4% [19]. Non-visualization was reported in 13% [4] while another report found 10% [10] and another study found 17.7% [5].

Results of association between Adelaide symptoms severity score of postoperative symptoms and non-visualization, was significant for rhinorrhea, postnasal drip, headache/facial pain and anosmia in procedure 1 and for headache/facial pain and anosmia in procedure 2. Results of effect of procedure 1 and 2 on MTL showed that the number of patients with MTL-positive in procedure 1 was significantly less than procedure 2, while there was no significant difference

between procedure 1 and 2 regarding non-visualization.

Conclusion

The axillary flap technique is a safer procedure for resection of the ANC with perfect healing and less incidence of intraoperative (as insulting lamina papyracea) and postoperative complications (as MTL and adhesions). However, it is a relatively difficult procedure and very time consuming while punch out procedure is a relatively easy, less time consuming procedure. The punch out procedure carries risks of intraoperative complications (as insulting lamina papyracea) and postoperative adhesions and MTL. Therefore, the axillary flap technique is superior to punch out procedure in resection of ANC

Table (1): Baseline analysis of the study regarding gender and age distribution

(N=80)

Variables regarding age and gender	group (1)	group (2)
Gender (Count)		
Female	15	15
Male	25	25
Total	40	40
Age (Mean ± SD)		
Female	29.1 ± 8.1	31.7 ± 11.7
Male	29.0 ± 11.6	28.4 ± 12.8
Total	29.0 ± 10.3	29.7 ± 12.4

Table 2: Preoperative symptoms, complications and radiologic disease score for the frontal sinuses

Disease process	No.		Pre-operative Frontal Pain	Pre-operative complications	Average Lund & McKay Score of frontal sinuses
	GI	GII			
Chronic Sinusitis	26	26	52	0	1.3
Nasal Polyps	10	10	16	0	2
Allergic Fungal Sinusitis	4	0	3	0	1.98
Mucocele	0	4	1	3 orbital 1 orbital and intracranial	2
Total	40	40	72	4	1.82

Table 3: Anatomical variations of sinonasal region of the 50 patients enrolled in the study

	Right	Left	Both sides	Number	%
Agger nasi	10	10	30	50	100
Frontal cell Type 1					
Type 2	2	3	6	11	22
Type 3	2	2	4	8	16
Type 4	1	1	2	4	8
	0	1	0	1	2
Concha bullosa	2	2	6	10	20
Prominent Nasofrontal bony beak	2	2	4	8	16
Paradoxical middle turbinate	1	2	5	8	16
Haller's cell	1	1	4	6	12
Pneumatization of crista galli	0	0	0	4	8
Deviated nasal septum	8	12	0	20	40

Table (4): POST-OPERATIVE SYMPTOMS ACCORDING TO ADELAIDE SYMPTOM SEVERITY SCORE GROUP I and II

POSTOPERATIVE SYMPTOM	SCORE Group I					TOTAL	SCORE Group II					TOTAL
	1	2	3	4	5		1	2	3	4	5	
NASAL OBSTRUCTION	30	4	3	1	2	40	26	3	3	4	4	40
RHINORRHEA	26	5	6	2	1	40	22	2	6	5	5	40
POSTNASAL DRIP	26	5	6	2	1	40	22	2	6	5	5	40
HEADACHE/FACIALPAIN	32	2	3	3	0	40	28	2	5	3	2	40
ANOSMIA	37	2	1	0	0	40	37	2	1	0	0	40

Table (5): Assessment of association between postoperative symptoms and MTL (N=80)

Procedure 1 (N=40)	Chi square (P value)	Spearman correlation (P value / correlation coefficient r)
Nasal obstruction	< 0.001***	< 0.001***/0.60 (moderate)
Rhinorrhea	< 0.001***	0.02*/0.36 (weak)
Post nasal drip	0.77	1.00/0.00 (No)
Headache/Facial pain	0.66	0.36/0.15 (very weak)
Anosmia	0.77	1.00/0.00 (No)
Procedure 2 (N=40)	Chi square (P value)	Spearman correlation (P value / correlation coefficient r)
Nasal obstruction	0.01*	0.002**/0.48 (moderate)
Rhinorrhea	0.006**	0.02*/0.36 (weak)
Post nasal drip	0.40	0.27/0.18 (very weak)
Headache/Facial pain	0.51	0.13/0.24 (very weak)
Anosmia	0.40	0.27/0.18 (very weak)



