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ANATOMICAL VARIATIONS OF THE FRONTAL RECESS AND ITS SURGICAL IMPORTANCE IN FRONTAL SINUS PROBLEMS

By

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ABSTRACT

Background: Since the introduction of concept of endoscopic sinus surgery, it has become clear that "frontal recess" or outflow tract of the frontal sinus is the key area in pathogenesis of frontal sinusitis and frontal sinus disease still poses a significant challenge to most of the endoscopic sinus surgeons.

Objective: To study the anatomical variations of the frontal recess and to evaluate its surgical importance in frontal sinus problems.

Patients and methods: This is a clinical trial prospective study approved by ENT department of Al Hussein University Hospitals and included 50 Egyptian patients selected from ENT outpatient clinic at Al Hussein University Hospitals and Banha teaching hospital between June 2017 and January 2021. The study included patients suffered from chronic frontal sinus problems refractory to medical treatment. All patients underwent to complete history, general examination, ENT examination and multislice CT nose & PNS. The CT scan of all patients was reviewed for the following findings: Prevalence and size of Agger nasi cells, Uncinate process, Frontoethmoidal air cells and Anteroposterior diameter of frontal sinus ostium. Endoscopic frontal sinusotomy was done by uncapping egg technique (Draf type 2a) by a single surgeon for all patients. Intra-operative evaluation including: the time of frontal sinus surgery (on each side), easiness of surgery (using visual analogue scale from 1-10 score according to surgeon questionnaire), and external work (trephine or osteoplastic flap) needed or not?.

Results: In this study we found that the agar nasi cell were present in 45 patients (90%), which were further divided into bilateral sides in 35 patients (70%) and unilateral in 10 patients (20%) with total number of sides (80) in coronal, axial and sagittal cuts. The size of agar nasi cells was and classified these sizes in 3 groups. Small group ranging from < 500 mm3 found in 10 sides representing 10%. Medium sized group ranging from 500 – 3000 mm3 in 70 side representing 70%. Large agar nasi cell group with a size bigger than > 3000 mm3 found in 5 sides of this group representing 5% of all sides. On surgery, we found that in absent agar nasi cell 5 sides were easy (25%), 10 side were difficult (50%) and 5 sides were very difficult (25%). In small sized agar nasi cells we found that 3 sides were easy in operation (60%), 1 side were difficult (20%) and 1 sides were very difficult (20%). In medium sized agar nasi cells, we found that all sides were easy (100%). In large sized agar nasi cell all sides were easy (100%). These results indicated that on increase the size of agar nasi cell, surgery becomes easy and on decrease the size of agar nasi cell, surgery is more difficult. A large agger nasi cell (ANC) offers a greater potential to facilitating the approach to the frontal sinus because of the extensiveness of the frontal recess (FR).

Conclusion: The frontal recess is a potential space that is routinely occupied by a number of different frontal recess cells which can act like a "cork in a bottle" to cause frontal sinus obstruction. Endoscopic sinus surgery of frontal recess area should be undertaken by experienced and well-trained surgeons only.

Keywords: Frontal Recess, Frontal Sinus Problems, ANC.

INTRODUCTION

The frontal recess is an hourglass-shaped passage between the anterior ethmoid cells and the frontal sinus, with the frontal sinus ostium being its narrowest point. This recess is the ethmoid prechamber of the frontal sinus. Hence, any disease or stenosis in this tiny area can lead to frontal sinus infection *(Gray and Hawthorne, 2010)*.

Endoscopic examination and instrumentation, as well as high-resolution computed tomography (CT) scans, have changed the perspective for surgical anatomy in this region. In particular, CT scans has been the gold standard in the preFESS evaluation *(Lee et al., 2010)*.

The agger nasi cell (ANC) is defined as the most anterior ethmoid cell. Defining the anatomical relations between the frontal sinus drainage pathways and the ANC greatly facilitates the understanding of its anatomy and thus, the planning of surgical approaches to the frontal sinus *(Stamm et al., 2011)*.

The location, dimensions and degree of pneumatization of the ANC greatly determines the shape, size and diameter of the frontal recess *(Thanaviratananich et al., 2012)*.

The surgical approach to the frontal sinus still represents a major challenge, even for the more experienced otorhinolaryngologist. Being unfamiliar with the anatomy of the frontal recess and all its possible variations can often result in inadequate treatment of the disease or even severe complications, such as orbital, vascular and skull base injuries *(Ximendes et al., 2019)*.

The aim of the work was to study the anatomical variations of the frontal recess and to evaluate its surgical importance in frontal sinus problems.

PATIENTS AND METHODS

This is a clinical trial prospective study approved by ENT department of Al Hussein University Hospitals and included 50 Egyptian patients selected from ENT outpatient clinic (OPC) at Al Hussein University Hospitals and Banha teaching hospital between June 2017 and January 2021.

Inclusion Criteria: The study included patients suffered from chronic frontal sinus problems refractory to medical treatment.

Exclusion Criteria: Patients with massive inflammatory disease of specific infections (e.g. rhinoscleroma), diffuse polyposis, malignancy, severe nasal trauma, foreign body, previous nasal surgery, atrophic diseases or systemic diseases and patients not fit for surgery.

All patients underwent to:

I. Preoperative measures:

- History.
- General examination.
- ENT examination: complete ENT examination included endoscopic examination of the nose.

II. Radiological evaluation:

Multislice CT using slice thickness (1-3mm) and reconstruction interval (0.2-0.3

mm) and different tube current (100-300 mA). Thin slice axial CT with the patient in supine position with head hyperextended on the scanner bed had been carried out, followed by coronal, sagittal and axial cuts reformatting. In coronal cuts from anterior table of frontal sinus to posterior wall of sphenoid sinus with 1 mm slice thickness. In axial cuts upwards from upper dental arch to the roof of the frontal sinus with 1 mm thickness. Bony window was used. The three planes were evaluated using eFilm Workstation viewer.

The CT scan of all patients was reviewed for the following findings:

1. Prevalence and size of Agger nasi cells.
2. Uncinate process.
3. Frontoethmoidal air cells.
4. Anteroposterior diameter of frontal sinus ostium.

III. Operative procedure:

Anesthesia: All procedures were done under general anesthesia with hypotension. Patient was premeditated the night before surgery by Midazolam 5 mg Tab. And β. Blocker (Atenolol 50 mg Tab.). Induction of anesthesia was by 2 μg/kg I.V. Fentanyl, 2 mg/kg I.V. Propofol and then 0.5 mg/kg I.V. Atracrium to facilitate endotracheal intubation after 3 min. Maintenance of anesthesia was by 2% isoflurane with controlled ventilation. Intraoperative monitoring included pulse oximeter, Noninvasive Bl. Pressure and Capnogram.

Procedure: Endoscopic frontal sinusotomy was done by uncapping egg technique (Draf type 2a), by removing the superior part of uncinate process and removing all air cells in the frontal recess to clarify the frontal sinus ostium with clear view of the posterior table of frontal sinus. This was done using angled instrumentations and angled telescopes (30 and 70 telescopes).

VI. Intra operative assessment:

In this study we evaluated:

a. Time of frontal sinus surgery (on each side).
b. Easiness of surgery: visual analogue scale from 1-10 score according to surgeon questionnaire.
c. External work: trephine or osteoplastic flap.

	Easy	**Difficult**	**Very difficult**
Time	< 20 minutes	20 – 40 minutes	> 40 minutes
Easiness	7 – 10	4 – 6	1 – 3
External work	-	-	±

Statistical analysis:

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test ($\chi 2$) to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean ± SD (Standard deviation). Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). P value < 0.05 was considered significant.

RESULTS

There were 50 patients included in the study. They were 26 male and 24 female. In the present study, the age of patients ranged from 18 to 62 years with Mean+SD age of 40.1 + 13.2 years **(Table 1)**.

Table (1): Patients age and sex

Age: Range Mean±SD	 18-62 40.1±13.2	
	N=50	**%**
Sex: Male. Female.	 26 24	 52 48

In the present study, the agar nasi cell were present in 45 patients (90%) and absent in 5 patients (5%) which were further divided into bilateral sides in 35 patients (70%) and unilateral in 10 patients (20%) **(Table 2)**.

Table (2): Prevalence of Agger nasi cell:

		Number of Patients	%	Number of sides
Agger nasi cell	**Yes**	45	90 %	
	NO	5	10 %	
	Unilateral	10	20	10
	Bilateral	35	70	70

In the present study, the size of agar nasi cells was classified into 3 groups. Small group was found in 10 sides representing 10%. Medium sized group was found in 70 side representing 70%. Large agar nasi cell group was found in 5 sides representing 5% of all sides **(Table 3)**.

Table (3): Volume of agger nasi cell sizes:

volume of agger nasi Cell	Range	Number of sides	%
Absent		20	20
Small	<500 mm^3	5	5
Medium	500 – 3000 mm^3	65	65
Large	> 3000 mm^3	10	10

The results showed that the prevalence of Frontoethmoidal cells by examination of coronal, sagittal and axial cuts, frontal cells type (1) in 10 patients (20%). Frontal cells type (2) in 7 patients (14%). Frontal cells type (3) in 6 patients (12%). Frontal cells type (4) in 1 patient (2%) found in unilateral only. Supraorbital ethmoid cell in 3 patients (6%). Frontal bullar cell in 4 patients (8%). Suprabullar cell in 9 patients (18%). Interfrontal sinus septum cells were found in 15 patients (30%) **(Table 4)**.

Table (4): Prevalence of fronto-ethmoidal air cells

	Unilateral		Bilateral		Total	
	Pts.N.	%	Pts.N.	%	Pts.N.	%
Frontal cells type (1)	2	4	8	16	10	20
Frontal cells type (2)	2	4	5	10	7	14
Frontal cells type (3)	1	2	5	10	6	12
Frontal cells type (4)	1	2	0	0	1	2
Supraorbital ethmoid cell	1	2	2	4	3	6
Frontal bullar cell	1	2	3	6	4	8
Suprabullar cell	2	4	7	14	9	18
Interfrontal sinus septal cell	15			30%		

The anteroposterior diameter of frontal sinus ostium were classified into small sized; ranging from 3 - 6 mm existed in 13 sides (13%), medium sized; ranging from 6 - 9 mm existed in 61 sides (61%) and large sized; more than 9 mm existed in 26 sides (26%) **(Table 5)**.

Table (5): Anteroposterior diameter of frontal sinus ostium

Antero-posterior Diameter	Range	Number of Sides	%
Small	3<6 mm	13	13
Medium	6< 9 mm	61	61
Large	> 9 mm	26	26

As regarding the relationship between agar nasi cell and easiness of operations according the time of frontal sinusotomy and easiness of operation under visual analogue scale, all the results indicated that on decrease the size of agar nasi cell, surgery is difficult and on increase the size of agar nasi cell, surgery becomes easy **(Table 6)**.

Table (6): Size of agger nasi cell and operative easiness

Volume of Agger nasi Cell	N. of Sides	Easy		Difficult		Very difficult	
		N	%	N	%	N	%
Absent	**20**	5	25	10	50	5	25
Small	**5**	3	60	1	20	1	20
Medium	**65**	65	100	0	0	0	0
Large	**10**	10	100	0	0	0	0

As regarding the relationship between the superior attachment of uncinate process and operative easiness, results showed in type (1) attachment 65 sides were easy (95.6%), 2 sides were difficult (2.9%) and 1 side were very difficult (1.5%). In type (2) attachment all 11 sides were easy (100%). In type (3) attachment all 5 sides were easy (100%). In type (4) attachment 3 sides were easy (50%), 2 sides were difficult (33.3%) and 1 side was very difficult (16.7%). In type (5) attachment 5 sides were easy (55.6%), 2 sides were difficult (22.2%) and 2 sides were very difficult (22.2%). In type (6) attachment 1 side was easy (100%) **(Table 7)**.

Table (7): Superior attachment of uncinate process and operative easiness

Type of Attachment	N	Easy		Difficult		Very difficult		p. value
		N	%	N	%	N	%	
Type 1	68	65	95.6	2	2.9	1	1.5	0.001*
Type 2	11	11	100	0	0	0	0	0.001*
Type 3	5	5	100	0	0	0	0	0.001*
Type 4	6	3	50	2	33.3	1	16.7	0.740
Type 5	9	5	55.6	2	22.2	2	22.2	0.472
Type 6	1	1	100	0	0	0	0	0.001*

As regarding the relationship between the Frontoethmoidal cells and operative easiness, results showed in frontal cell type (1) and Frontal cell type (2) all sides were easy in operation (100%). In frontal cell type (3), Frontal cell type (4) and Interfrontal sinus septal are more difficult. The other types of the Frontoethmoidal cells were of different degrees of easiness and difficulty **(Table 8)**.

Table (8): Frontoethmoidal cells and operative easiness

	N	Easy		Difficult		Very difficult		p. value
		N	%	N	%	N	%	
Frontal cells type (1)	10	10	100	0	0	0	0	0.001*
Frontal cells type (2)	7	7	100	0	0	0	0	0.001*
Frontal cells type (3)	6	1	17	4	66	1	17	0.023*
Frontal cells type (4)	1	0	0	0	0	1	100	0.001*
Supraorbital ethmoid cell	3	1	40	1	20	1	40	0.740
Frontal bullar cell	4	3	86	1	14	0	0	0.001*
Suprabullar cell	9	7	86.7	2	13.3	0	0	0.001*
Interfrontal sinus septal	15	9	60	4	26.7	2	13.3	0.020*

As regarding the relationship between the anteroposterior diameter of frontal sinus ostium and operative easiness, results showed In small anteroposterior diameter of F.S.O. 5 sides were easy (38.5%), 3 sides were difficult (23%) and 5 sides were very difficult (38.5%). In medium size anteroposterior diameter of F.S.O. 51 sides were easy (83.6%), 10 sides were difficult (16.4%). In large diameter 26 sides were easy (100%). These results indicate that increased anteroposterior diameter surgery becomes easier **(Table 9)**.

Table (9): Anteroposterior diameter of frontal sinus ostium and operative easiness

A-P diameter of F.S.O.	N	Easy		Difficult		Very difficult		p. value
		N	%	N	%	N	%	
Small	13	5	38.5	3	23	5	38.5	0.001*
Medium	61	51	83.6	10	16.4	0	0	
Large	26	26	100	0	0	0	0	

With regard to alleviation of symptoms and patient's satisfaction after visual analogue scale, results showed that In the first week 25 patients were satisfied (50%), 15 were fairly satisfied (30%) and 10 patients were badly satisfied (20%). In the second week 32 patients were satisfied (64%), 12 patients were fairly satisfied (24%) and 6 patients were badly satisfied (12%). In the third week 38 patients were satisfied (76%), 7 patients were fairly satisfied (14%) and 5 patients were badly satisfied (10%). In the third month 42 patients were satisfied (84%), 4 patients were fairly satisfied (8%) and 4 patients were badly satisfied (8%) **(Table 10)**.

Table (10): Postoperative alleviation of symptoms and patients satisfaction

	Good		Fair		Bad	
1st week	25	50	15	30	10	20
2nd week	32	64	12	24	6	12
3rd week	38	76	7	14	5	10
3rd month	42	84	4	8	4	8

DISCUSSION

This study was conducted on 50 patients 26 male and 24 female their ages ranged from 18ys to 62ys with mean + SD age of 40.1 + 13.2 years. The patients selected from ENT outpatient clinic at Al Hussein University Hospitals and Banha teaching hospital between June 2017 and 2021.

In all cases we didn't need to do any trephine or external approaches.

In the present study we found that the agar nasi cell were present in 45 patients (90%), which were further divided into bilateral sides in 35 patients (70%) and unilateral in 10 patients (20%) with total number of sides (80) in coronal, axial and sagittal cuts.

In the series by *Kubota et al. (2015), Lien et al., (2010), Zhang et al., (2010), Fabian et al. (2019), Kuhn's et al. (2010), Park et al. (2010)* and *Wormald et al. (2016)*, they reported prevalence of agger nasi cell in rates of 88%, 89%, 90%, 95.2%, 95.7%, 96% and 98.5% respectively.

In the present study the Anteroposterior diameter of agar nasi cell in patients having agar nasi cell with minimum value of 2 mm and maximum value of 13 mm and with a mean + SD of 6.3 +3.2 mm. Side to side diameter was of minimum value of 2 mm and maximum value of 10 mm and mean + SD of 5 + 3.25 mm. The height (craniocaudal) diameter was of minimum value of 2 mm and maximum value of 15mm and mean + SD of 7.8 + 4.18 mm.

Fernando et al. (2013) reported the anteroposterior diameter of agar nasi cell in patients having agar nasi cell with minimum value of 2 mm left side and 3 mm right side and maximum value of 14 mm left side and 13 mm right side and with a mean + SD of 6.31 + 2.72 left side and with a mean + SD of 6.85 + 2.81 right side. Side to side diameter was of 2 mm left side and 2 mm right side and maximum value of 10 mm left side and 11 right side and with a mean + SD of 5.28 + 2.06 left side and with a mean + SD of 5.95 + 2.06 right side. The craniocaudal (height) diameter was of minimum value of 2 mm left side and 2 mm right side and maximum value of 14 mm left side and 13 right side and with a mean + SD of 7.13 + 3.08 left side and with a mean + SD of 7 + 2.52 right side.

In the present study, we calculated the size of agar nasi cells and classified these sizes in 3 groups. Small group ranging from < 500 mm3 found in 5 sides representing 5%. Medium sized group ranging from 500 – 3000 mm3 in 65 side representing 65%. Large agar nasi cell group with a size bigger than > 3000 mm3 found in 10 sides of this group representing 10% of all sides.

In the present study by examination of the coronal cuts of our patients, we revealed that superior attachment of uncinate process into the lamina papyracea type (1) in 68 sides (68%), into middle turbinate type (2) in 11 sides (11%), into skull base type (3) in 5 sides (5%), into lamina papyracea and the middle turbinate type (4) in 6 sides (6%), into lamina papyracea and the skull base type (5) in 9 sides (9%) and into middle turbinate and the skull base type (6) in 1 side (1%).

In the series by *El-Banhawy et al. (2015)* found type (1) found in 70%, type (2) found in 10%, type (3) found in 6% and type (4) found in 5%, type (5) found in 8% and type (6) found in 1%.

In the series by *Zhang et al. (2010)* found thattype (1) found in 33%, type (3) found in 10%, type (4) found in 21%, type (5) found in 31% and type (6) found in 2%.

In the present study, the prevalence of Frontoethmoidal cells by examination of coronal, sagittal and axial cuts. We found frontal cells type (1) in 10 patients (20%) and further subdivided into unilateral in 2 patients (4%) and bilateral in 8 patients (16%) with total number of sides (18). Frontal cells type (2) in 7 patients (14%) and further subdivided into unilateral in 2 patients (4%) and bilateral in 5 patients (10%) with total number of sides (12). Frontal cells type (3) in 6 patients (12%) and further subdivided into unilateral in 1 patient (2%) and bilateral in 5 patients (10%) with total number of sides (11). Frontal cells type (4) in 1 patient (2%) found in unilateral only and not found bilaterally with total number of sides (1). Supraorbital ethmoid cell in 3 patients (6%) and further subdivided into unilateral in 1 patient (2%) and bilateral in 2 patients (4%) with total number of sides (5). Frontal bullar cell in 4 patients (8%) and further subdivided into unilateral in 1 patient (2%) and bilateral in 3 patients (6%) with total number of sides (7). Suprabullar cell in 9 patients (18%) and further subdivided into unilateral in 2 patients (4%) and bilateral in 7 patients (14%) with total number of sides (16). Interfrontal sinus septum cells were found in 15 patients (30%).

In the series by *Makihara et al. (2019)*, the prevalence was 11.6% (22 sides) for type 1, 0% (0 sides) for type 2, 7.9% (15 sides) for type 3, and 0% (0 sides) for type 4. Suprabullar cells, FBCs, SOECs, and IFSSCs were identified in 45.8% (87sides), 25.3% (48 sides), 16.8% (32 sides), and 15.3% (29 sides), respectively.

In the series by *Johari et al. (2018)* frontal ethmoidal cell type 1, type 2, type 3 and type 4 comprised of 28.8%, 31.1%, 14.4% and 0% respectively. Whereas, suprabullar cell can be seen in 40.3%, supraorbital ethmoid cells 16.7%, frontal bullar cell 33.0% and inter-frontal sinus septal cells 10.8%.

In the series by *Park et al. (2010)*, they have reported a frontal cell in 32% of cases. Prevalence of different types was type I in 24.2%, type II 4.2%, type III 3.1% and type IV 0%. Supraorbital cell 3.6%, Suprabullar cells 8%, Frontal bullar cell 10% and Interfrontal sinus septal cell 38%.

In the series by *Del Gaudio et al. (2010)*, they found frontal cells in 29.6% of cases. Prevalence of different types was type I in 18.6%, type II 2%, type III 6.1% and type IV 3.1%.

In the present study, on sagittal cuts the anteroposterior diameter of frontal sinus ostium ranging from minimum value of 3mm to maximum value of 15 mm with a mean + SD of 8.1 + 3.1 mm.

In the series by *Fernando et al. (2013)* thegstgted that it ranged from minimum value of 2mm to maximum value of 14mm.

In the series by *Landsberg and Friedman (2010)*, ranged from minimum value of 2mm to maximum value of 16mm with a mean + SD of 7.22+2.78.

In the present study we classified the anteroposterior diameter of frontal sinus ostium into small sized; ranging from 3 - 6 mm existed in 13 sides (13%), medium sized; ranging from 6 - 9 mm existed in 61 sides (61%) and large sized; more than 9 mm existed in 26 sides (26%).

In the present study, found that in absent agar nasi cell, 5 sides were easy (25%), 10 sides were difficult (50%) and 5 sides were very difficult (25%). In small sized agar nasi cells we found 3 sides were easy in operation (60%), 1 side were difficult (20%) and 1 sides were very difficult (20%). In medium sized agar nasi cells, we found that 65 sides were easy (100%). In large sized agar nasi cell all 10 sides were easy (100%).

All the results indicated that on absence or decrease the size of agar nasi cell, surgery is difficult and on increase the size of agar nasi cell, surgery becomes easy and these results correlate with that of *Wormald (2010)*.

In the present study, we found the correlation between the superior attachment of uncinate process and operative easiness as follow: In type (1) attachment 65 sides were easy (95.6%), 2 sides were difficult (2.9%) and 1 side were very difficult (1.5%). In type (2) attachment all 11 sides were easy (100%). In type (3) attachment all 5 sides were easy (100%). In type (4) attachment 3 sides were easy (50%), 2 sides were difficult (33.3%) and 1 side was very difficult (16.7%). In type (5) attachment 5 sides were easy (55.6%), 2 sides were difficult (22.2%) and 2 sides were very difficult (22.2%). In type (6) attachment 1 side was easy (100%).

In the present study, the Frontoethmoidal cells and operative easiness. In frontal cell type (1) all 18 sides were easy in operation (100%). Frontal cell type (2) all 12 sides were easy in operation (100%). In frontal cell type (3), 1 side were easy in operation (9.09%), 8 sides were difficult (72.72%) and 2 sides were very difficult (18.18%). Frontal cell type (4) was in (1) side which is very difficult in operation (100%). Supraorbital frontal air cells 2 sides were easy (40%), 1 side was difficult (20%) and 1 side were very difficult (20%). Frontal bullar cells 6 sides were easy (86%) and 1 side difficult (14%). Suprabullar frontal cell we found 14 sides to were easy 87.5% and 2 sides difficult (13%). Interfrontal sinus septal cell 9 cases were easy (60%), 4 cases were difficult (26.7%) and 2 cases were very difficult (13.3%).

These results indicate that typed (3) and (4) Fronto ethmoidal cells and Interfrontal sinus septal cell are more difficult in endoscopic surgery and these results correlata with that of *Wormald (2010)*.

In the present study the anteroposterior diameter of frontal sinus ostium and operative easiness. In small anteroposterior diameter of F.S.O. 5 sides were easy (38.5%), 3 sides were difficult (23%) and 5 sides were very difficult (38.5%). In medium size anteroposterior diameter of F.S.O. 51 sides were easy (83.6%), 10 sides were difficult (16.4%). In large diameter 26 sides were easy (100%).

These results indicated that when anteroposterior diameter of F.S.O. Increased surgery becomes easier and these results correlated with that of *Wormald (2010)*.

In the present study the postoperative patency (endoscopic view). In the second week 80 sides were patent (80%) and 20 sides were not patent (20%). In the third week 90 sides were patent (90%) and 10 sides were not patent (10%). In the third month 95 sides were patent (95%) while 5 sides were not patent (5%).

In the present study, alleviation of symptoms and patient’s satisfaction after visual analogue scale. In the first week 25 patients were satisfied (50%), 15 were fairly satisfied (30%) and 10 patients were badly satisfied (20%). In the second week 32 patients were satisfied (64%), 12 patients were fairly satisfied (24%) and 6 patients were badly satisfied (12%). In the third week 38 patients were satisfied (76%), 7 patients were fairly satisfied (14%) and 5 patients were badly satisfied (10%). In the third month 42 patients were satisfied (84%), 4 patients were fairly satisfied (8%) and 4 patients were badly satisfied (8%).

CONCLUSION

The frontal recess is a potential space that is routinely occupied by a number of different frontal recess cells which can act like a “cork in a bottle” to cause frontal sinus obstruction.

Even with technological advances in image-guided surgery, frontal sinus and frontal recess (FR) surgery remains a challenge, and if surgical principles are not taken into account, damage to the nearable structures and other complications may occur.

Surgery in the frontal recess should only be performed if the surgeon possesses these characteristics: An exhaustive understanding of frontal recess anatomy and cellular structures. The ability to read the CT scans in all three planes. Proper instrumentation is mandatory.

Endoscopic sinus surgery of frontal recess area should be undertaken by experienced and well-trained surgeons only.

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الاختلافات التشريحية في التجويف الأمامى للجيب الأنفى الجبهى وأهميتها الجراحية فى حل مشاكل الجيب الأنفى الجبهى

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خلفية البحث: منذ إدخال مفهوم جراحة الجيوب الأنفية بالمنظار، أصبح من الواضح أن "التجويف الأمامي" أو مجرى التدفق من الجيوب الأنفية هو المجال الرئيسي في التسبب في التهاب الجيوب الأنفية الجبهي ومرض الجيوب الأنفية الجبهي لا يزال يمثل تحديًا كبيرًا لمعظم الجيوب الأنفية. جراحي الجيوب الأنفية بالمنظار.

الهدف من البحث: دراسة الاختلافات التشريحية للتجويف الجبهي وتقييم أهميته الجراحية في مشاكل الجيوب الأنفية الأمامية.

المرضى وطرق البحث: أجريت هذه الدراسة بمستشفى الحسين الجامعي ومستشفى بنها التعليمي على 50 مريضًا مصريًا، 26 ذكرًا و 24 أنثى تراوحت أعمارهم بين 18 عامًا و 62 عامًا بين يونيو 2017 إلى يناير 2021، جميعهم يعانون من مشاكل مزمنة في الجيوب الأنفية تستدعي العلاج الطبي ولكن لم يتم التحسن.

نتائج البحث: وجدنا في هذه الدراسة أن خلية أجار ناسي كانت موجودة في 45 مريضًا (90٪)، والتي تم تقسيمها أيضًا إلى جوانب ثنائية في 35 مريضًا (70٪) وأحادية في 10 مرضى (20٪) بإجمالي عدد الجوانب. (80) في التخفيضات الاكليلية والمحورية والسهمية. تم تصنيف حجم خلايا أجار ناسي بهذه الأحجام في 3 مجموعات. مجموعة صغيرة تتراوح من 500 مم 3 موجودة في 10 جوانب تمثل 10٪. مجموعة متوسطة الحجم تتراوح من 500 - 3000 مم 3 في 70

جانـــب تمثـــل 70٪. مجموعـــة خلايـــا أجـــار ناســـي كبيـــرة بحجـــم أكبـــر مـــن 3000 مـــم 3 وجـــدت فـــي 5 جوانـــب مـــن هـــذه المجموعـــة تمثـــل 5 ٪ مـــن جميـــع الجوانـــب. فـــي الجراحـــة ، وجـــدنا أنـــه فـــي غيـــاب خليـــة أجـــار ناســـي 5 جوانـــب كانـــت ســـهلة (25٪)، 10 جوانـــب صـــعبة (50٪) و 5 جوانـــب صـــعبة للغايـــة (25٪). فـــي خلايـــا أجـــار ناســـي صـــغيرة الحجـــم وجـــدنا أن 3 جوانـــب كانـــت ســـهلة التشـــغيل (60٪)، جانـــب واحـــد صـــعب (20٪) وجانـــب واحـــد صـــعب للغايـــة (20٪). فـــي خلايـــا أجـــار ناســـي متوســـطة الحجـــم ، وجـــدنا أن جميـــع الجوانـــب كانـــت ســـهلة (100٪). فـــي خليـــة أجـــار ناســـي كبيـــرة الحجـــم ، كانـــت جميـــع الجوانـــب ســـهلة (100 ٪). أشـــارت هـــذه النتـــائج إلـــى أنـــه عنـــد زيـــادة حجـــم خليـــة أجـــار ناســـي، تصـــبح الجراحـــة ســـهلة وعنـــد تقليـــل حجـــم خليـــة أجـــار ناســـي ، تكـــون الجراحـــة أكثـــر صـــعوبة. تـــوفر خليـــة ناســـية كبيـــرة إمكانيـــة أكبـــر لتســـهيل الاقتراب من الجيوب الأنفية الأمامية بسبب اتساع التجويف الأمامي.

الاســـتنتاج: التجويـــف الأمـــامي هـــو مســـاحة محتملـــة يشـــغلها بشـــكل روتينـــي عـــدد مـــن خلايـــا التجويـــف الأماميـــة المختلفـــة والتـــي يمكـــن أن تعمـــل مثـــل "الفلـــين فـــي زجاجـــة" لإحـــداث انســـداد فـــي الجيـــوب الأنفيـــة الأماميـــة. يجـــب إجـــراء جراحـــة الجيـــوب الأنفيـــة بالمنظـــار لمنطقـــة العطلـــة الأماميـــة مـــن قبـــل جـــراحين متمرســـين ومـــدربين تـــدريباً جيـــداً فقط.

الكلمات الدالة: التجويف الجبهي، مشاكل الجيوب الأنفية الأمامية.