

Outcome of Conservative Management of Traumatic Frontal Air Sinus Fractures

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Abstract

Background: An algorithm for management of isolated frontal air sinus fractures is yet to be set, however, conservative management is gaining more advocates.

Aim of Study: To review the results of conservative management of traumatic frontal air sinus fractures.

Patients and Methods: Retrospective analysis of medical records of 48 cases of frontal air sinus fractures including 22 conservative and 26 surgical cases. Data included cerebrospinal fluid (CSF) leak, morphological assessment of patient images, complications, hospital stay, and long term follow-up.

Results: Patients were predominantly young males. Traffic accidents were the most common cause (81.3%). CSF rhinorrhea was encountered in 54.5% of conservative cases. Hospital stay was significantly shorter in the conservative group ($p < 0.5$).

Conclusion: Conservative management of frontal air sinus fractures is a safe and effective modality of treatment in many cases.

Key Words: CSF rhinorrhea – Conservative, frontal air sinus fracture – Trauma.

Introduction

FRONTAL air sinus fractures represent 5%-15% of all craniomaxillofacial fractures. Classic management of frontal sinus fractures involved bifrontal craniotomy for frontal sinus cranialization and repair of any dural defects, through a major surgical procedure with a large surgical scar [1,2].

Management plans largely depend on the involved anatomic structures including anterior and posterior sinus walls. The presence of cerebrospinal fluid leakage and the cosmetic impact of the fractured bones are also important factors [3,4].

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Continuous improvement of safety adjuncts in motor vehicles have resulted in reduction of the severity of head injuries in traffic accidents. As a result, conservative measures for management of frontal sinus fractures are becoming more popular, to preserve the function of the sinus and achieve better cosmetic results. However, there is no current agreement on a single management algorithm [4,5].

Aim of the work:

The aim of this study is to review the results of conservatively managed traumatic frontal air sinus fractures.

Patients and Methods

Study design:

A retrospective study analyzing the outcome of conservatively managed cases of frontal air sinus fractures in a one-year duration. Only isolated frontal sinus fractures were included in this study, any cases with associated skull fractures or hematomas were excluded.

This study was conducted at the Trauma Unit of Kasr Al-Ainy, Cairo University Hospitals in the duration from Jan. 2022 to Dec. 2022.

Indications for conservative management:

- Patients with isolated traumatic frontal air sinus fractures and do not meet the criteria for surgical intervention.

Indications for surgical management:

- Cases with deep wounds overlying frontal air sinus fractures involving both anterior and posterior skull tables.
- Cases with persistent CSF leak despite conservative management.

- Cases with initial profuse CSF leak and involvement of posterior skull table.
- Cases with profuse CSF leak associated with massive pneumocephalus.

Conservative management consisted of watchful observation, bed rest in the semi-sitting position, avoidance of coughing and straining that would increase the intracranial pressure, while using laxatives or cough sedatives when necessary.

Medical treatment, mainly in the form of acetazolamide, furosemide and potassium, was also received by cases presenting with CSF rhinorrhea. Lumbar drain insertion was not needed in any of our cases. CT (computed tomography) scans were performed when needed.

Retrospective data analysis was performed for traumatic frontal air sinus fractures at the Trauma Unit of Kasr Al-Ainy, Cairo University Hospitals in the duration from Jan. 2022 to Dec. 2022. Collected data underwent statistical analysis to determine the outcome of conservative management of such cases.

Full medical records were collected including demographic patient data, the incidence and duration of CSF leak, incidence and management of complications, hospital stay, and outpatient follow up. Only cases with full medical records were included in our study.

Data showed a total of forty-eight (48) cases of frontal air sinus fractures admitted at Cairo University Hospital trauma unit during the aforementioned period. Conservatively managed cases comprised twenty-two (22) of the total cases, while the remaining twenty-six (26) cases were surgically treated.

Statistical analysis:

SPSS (statistical package for social sciences) was used for data management and data analysis. Mean ± standard deviation described quantitative variables and median with range when appropriate (distribution deviated from normality).

Number and percentages described qualitative data and Chi-square or / Fisher exact tested proportion independence. For comparing mean values of two independent groups, parametric or non-parametric *t*-tests were used. For comparing mean values of more than two groups, one way ANOVA test was used. A post-hoc Turkey Honest Significant Different (HSD) test was done if ANOVA test showed an overall significant difference between the groups to determine where the significance lies. Differences were considered significant if the *p*-value was less than 0.05.

Results

We reviewed data obtained from medical records of 48 patients, admitted to Cairo University Hospitals with frontal air sinus fractures and having complete medical records.

Conservatively managed cases included 22 patients, while 26 patients were surgically treated.

The mean age of the study group was 22.31±10.35 years ranging from 3 to 50 years. Males were predominant with 42 cases (87.5%) and only 6 cases were females (12.5%).

Medical co-morbidities were only encountered in 3 cases, two of which had diabetes mellitus and only one case had hypertension. However, they were all properly controlled on medical treatment.

The most common mode of trauma was road traffic accidents involving 41.7% of cases. (Table 1).

Table (1): Mode of trauma in our study group.

	Frequency	Percent	Valid percent	Cumulative percent
<i>Valid:</i>				
Motor car accident	19	39.6	39.6	39.6
Road traffic accident	20	41.7	41.7	81.3
Fall from a height	6	12.5	12.5	93.8
Direct head trauma	3	6.3	6.3	100.0
Total	48	100.0		

Analysis of CT scans showed isolated fractures of the anterior table of the frontal air sinus in 13 cases (27.1%). While 24 (50%) of the total cases had combined anterior and posterior table fractures.

Wounds overlying the fractured frontal air sinus were only found in 3 cases of the conservatively managed patients (13.6%). However, 88.5% of surgical cases had wounds overlying the fractured sinus. (Table 2).

CSF rhinorrhea was encountered in 54.5% of conservative cases at the time of initial presentation. However, it was found in 65.4% of cases receiving the surgical treatment.

The mean duration of CSF rhinorrhea was 2.09±2.29 days in the conservative group. While it was 1.85±1.83 days in the surgical group. None of our cases were complicated by any type of wound infection or meningitis.

The mean hospital stay was 5.32 ± 2.77 days in the conservative group, however, it was significantly longer at 7.5 ± 2.61 days in the surgical group.

Outpatient follow-up of cases for a period of 13 to 25 months showed no further complications except in one case of the conservative group. The patient presented 15 days after the initial trauma with secondary CSF rhinorrhea that was not associated with any signs of infection. The patient underwent surgical frontal sinus repair and the CSF leak stopped.

Table (2): Impact of the presence of a wound overlying the sinus on the choice of management.

	Type of management		Total
	Conservative	Surgical	
<i>Wound overlying frontal sinus:</i>			
<i>Yes:</i>			
Count	3	23	26
Row %	11.5%	88.5%	100.0%
Column %	13.6%	88.5%	54.2%
Total %	6.3%	47.9%	54.2%
<i>No:</i>			
Count	19	3	22
Row %	86.4%	13.6%	100.0%
Column %	86.4%	11.5%	45.8%
Total %	39.6%	6.3%	45.8%
<i>Total:</i>			
Count	22	26	48
Row %	45.8%	54.2%	100.0%
Column %	100.0%	100.0%	100.0%
Total %	45.8%	54.2%	100.0%

Discussion

Frontal air sinus fractures are not uncommon comprising up to 15% of craniomaxillofacial fractures. However, these fractures are not a homogeneous group. Classification according to the involvement of anterior and posterior skull tables as well as the presence and absence of CSF leak, associated major wounds and cosmetic disfigurement can further facilitate the choice of management protocol. Classic bifrontal craniotomy with frontal sinus cranialization and repair of any dural defects, is a major surgical procedure that is not currently required for all cases [4,6,7].

More conservative measures have been recently popularized aiming to preserve the function of the frontal air sinus and avoid major surgery, based on the increasing evidence of the validity of conservative management in indicated cases [4].

This study retrospectively reviewed conservatively managed cases of traumatic frontal air sinus

fractures at the Trauma Unit of Kasr Al-Ainy, Cairo University Hospitals in the duration from Jan. 2022 to Dec. 2022.

Our cases were predominantly young males (87.5%) of a mean age 22.31 ± 10.35 years, with no significant medical co-morbidities.

Motor car and road traffic accidents were the major mode of trauma (81.3%), which is consistent with several reports from literature as conveyed by Lopez C. et al., in their metanalysis of 53 articles [4].

Morphological analysis of the patients' images is essential for classification of frontal air sinus fractures and facilitates management decisions. This includes anterior and posterior skull table involvement, associated brain injuries and pneumocephaly. The presence of overlying wounds and CSF leakage are also important determinants of the management choice [3,4,8,9].

CT imaging analysis of our cases showed predominance of anterior table disruption (77.1%), whether isolated or associated with posterior table fractures (50%). The association of anterior and posterior table fractures especially when accompanied by an overlying deep wound is a usual indication for surgical management [4]. Our analysis showed it had a significant correlation $p < 0.05$. However, 3 of the cases in our conservative group had wounds, two of which were clean superficial wounds and the third was not associated with posterior table fracture. These cases had successful conservative management with no recorded early or late complications.

CSF leak at the time of presentation is an important determinant for the choice of management, however, 12 cases (54.5%) of our conservative group had CSF leak at presentation that did not interfere with successful conservative management. Nonetheless, it is still considered an important factor in the management decision as highlighted by several reports in literature, especially when associated with posterior table involvement [6,10-12].

The mean duration of CSF rhinorrhea was longer (2.09 ± 2.29 days) in the conservative group; however, hospital stay was significantly shorter (5.32 ± 2.77 days) when compared to the surgical group $p < 0.05$, which is associated with a reduced financial burden.

Long term follow up did not reveal any delayed complications except in a single case that required surgical repair, after experiencing secondary CSF rhinorrhea 15 days after the initial trauma. Achieving a 95.5% complication free long-term outcome for cases receiving conservative management.

Conclusion:

Frontal air sinus fractures have well established management options, however, a consensus on a management algorithm is yet to be achieved.

Conservative management is always a valid option when indicated and provides a lower morbidity, hospital stay and overall financial burden with proper patient selection.

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نتائج العلاج التحفظي لكسور الجيب الأنفي الأمامي للجمجمة

ما تزال كسور الجيوب الأنفية الهوائية الأمامية للجمجمة تحتاج لتطوير خوارزمية مناسبة للعلاج، ومع ذلك، فإن العلاج التحفظي يكتسب المزيد من المؤيدين.

تستهدف هذه الدراسة مراجعة نتائج العلاج التحفظي لكسور الجيوب الأنفية الهوائية الأمامية بوحدة طوارئ قصر العينى بمستشفيات جامعة القاهرة فى الفترة من يناير ٢٠٢٢ إلى ديسمبر ٢٠٢٢.

اعتمدت الدراسة على تحليل السجلات الطبية لـ ٤٨ حالة من كسور الجيوب الهوائية الأمامية بما فى ذلك ٢٢ حالة خضعت للعلاج التحفظي و٢٦ حالة خضعت للعلاج الجراحى. شملت البيانات محض الدراسة تسرب السائل النخاعى (CSF)، تقييم فحوصات الأشعة للمرضى، تقييم المضاعفات ومدة الإقامة بالمستشفى بالإضافة للمتابعة على المدى الطويل.

أظهرت النتائج أن أغلب المرضى من الذكور الشباب. حيث كانت حوادث المرور هى السبب الأكثر شيوعاً للكسور (٣، ٨١٪). تمت مصادفة سيلان السائل النخاعى الشوكى من الأنف فى ٥، ٥٤٪ من الحالات الخاضعة للعلاج التحفظي. كانت مدة الإقامة بالمستشفى أقصر بنسبة مؤثرة فى مجموعة العلاج التحفظي ($p > ٠,٥$).

من الممكن اعتبار العلاج التحفظي لكسور الجيوب الأنفية الأمامية طريقة آمنة وفعالة للعلاج فى كثير من الحالات.