Neuro-Ophthalmic Manifestations in Sinusitis Patients Who Underwent Endoscopic Sinus Surgery

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Objective: *To describe neuro-ophthalmic manifestations in sinusitis patients who underwent functional endoscopic sinus surgery*

Material and Method: *The medical records of 341 patients who underwent functional endoscopic sinus surgery (FESS) between October and January 2001 were reviewed in this retrospective study.*

Results: *Patient mean age was 37.09 years (range, 3-77) and 171(50.15%) patients had no underlying disease. Visual loss and limited ocular motility were revealed in 43 (12.72%) and 40 (11.83%) patients, respectively. Sphenoid sinus was the most commonly affected sinus in patients presenting with either visual loss (odds ratio 5.88; 95% CI 2.79-12.38) or ophthalmoplegia (OR 7.09; 95% CI 3.28-15.32). Twenty-three percent of patients with visual loss had abnormal funduscopy, while 30.23% had abnormal radiologic imaging study. After FESS, 12 (27.91%) patients had better visual acuity, but 11 (25.58%) had permanent visual loss. Isolated oculomotor and combined oculomotor with abducens nerve involvement were revealed in nine (22.50%), and 31 (77.5%) patients, respectively. Diabetes was a significant risk factor associated with ocular complications in patients with either visual loss (OR 2.98; 95% CI 1.37-6.44) or ophthalmoplegia (OR 2.56; 95% CI 1.17-5.61).*

Conclusion: *Sphenoid sinusitis significantly increased the risk of neuro-ophthalmic manifestations, particularly among diabetic patients.*

Keywords: *Optic neuropathy, Ophthalmoplegia, Sinusitis, Visual loss*

J Med Assoc Thai 2012; 95 (12): 1543-7
Full text. e-Journal: *http://jmat.mat.or.th*

Sinusitis, which affects both children[1-5] and adults[6-14], may contribute various ophthalmic findings, including eyelid edema, chemosis, proptosis, ophthalmoplegia, optic disc edema, and visual field defect[8,15-17]. Inflammation of the posterior ethmoid and sphenoid sinuses may cause intensive visual impairment[6-10,12,13]. Moreover, some asymptomatic sinusitis patients might have only decreased vision[5,7], which causes difficulties in diagnosis, treatment, and prediction of visual prognosis[10,12,13].

The purposes of the present study were to determine (a) the neuro-ophthalmic manifestations and (b) prognostic factors in sinusitis.

Material and Method

After approval by the institute ethics committee, the authors retrospectively reviewed the medical records of 382 patients who had sinusitis and underwent functional endoscopic sinus surgery (FESS) at Srinagarind Hospital sometime between January 2001 and October 2010. Forty-one patients were excluded because of (i) incomplete or incorrect diagnosis, (ii) other ocular diseases those might interfere with vision including glaucoma, dense cataract, diabetic retinopathy, retinal detachment, or (iii) history of pre-existing visual loss. The data of 341 patients were reviewed for demographic data, pre-operative and 6-month postoperative visual acuities, pre-operative and 6-month postoperative ocular motilities, and other ophthalmic findings. Affected sinuses were determined in accordance with the operative findings. The pre-operative orbital magnetic resonance imaging (MRI) study and the accompanying radiology report were reviewed.

Complete ptosis with absence excursion in adduction, supraduction, and infraduction indicated complete oculomotor involvement. Complete abducens nerve involvement indicated the absence of abduction. The incomplete form was applied for patients with

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residual motility. At least 3 Snellen lines gain was needed to confirm improvement of visual acuity, while at least a 25% gain of ocular excursion indicated incomplete improvement of ocular motility. On the other hand, at least 3 Snellen lines lost and 25% loss of ocular excursion indicated worsened visual acuity and ocular motility.

Statistical analysis was performed using STATA software version 10 (StataCorp LP, Texas) (a) the Chi-square test with Yates corrected for comparison of the baseline characteristics (b) the Fishers' exact test for the univariate analysis and (c) the log likelihood for the multivariate analysis. Odds ratio with 95% confidence interval (95% CI) from logistic regression was presented for risk association in neuro-ophthalmic manifestations. P-value of less than 0.05 was considered statistically significant.

Results

Visual loss and limited ocular motility were revealed in 43 (12.72%), and 40 (11.83%) of 341 patients, respectively. Demographic characteristics were similar between both groups (Table 1). Half of all of the patients had no underlying disease, however, diabetes was most commonly found in patients with visual loss (41.19%) or ocular motility defect (40%).

Patients with unilateral visual loss and positive relative afferent pupillary defect (RAPD) had initial visual acuities from 20/50 to no light perception and the mean duration of symptoms was 23.12 days (1-180 days). After treatment, 12 (27.91%) patients had better visual acuity, while 14 patients (32.56%) had permanent visual loss (Table 2). Twenty-nine (67.44%) patients were affected in the right eye. Funduscopic examination revealed abnormal optic nerve findings in 10 patients that included pale disc (7) and optic disc edema (3). Thirty (69.77%) patients had a normal imaging study of their visual pathway, while 13 (30.23%) had radiographic abnormalities that included optic nerve enhancement (8), optic nerve enlargement (2), optic nerve enlargement with enhancement (1), and inflammation of the orbital apex region (2).

Incomplete involvement of both the oculomotor and abducens nerves was the most common manifestation in the ophthalmoplegia group, but none had isolated abducens nerve involvement (Table 3). Thirteen (32.5%) patients had abnormal radiologic findings. They included retrobulbar fat stranding (5), enlarged extra-ocular muscles (4), and inflammation

Table 1. Baseline characteristics of all patients with sinusitis and patients with neuro-ophthalmic complications

Characteristics	All patients (n = 341)	Visual loss (n = 43)	Ocular motility limitation (n = 40)
Mean age (years)	37.09	48.33	48.48
Sex (%)			
Males	169 (49.56)	25 (58.14)	22 (55.00)
Females	172 (50.44)	18 (41.86)	18 (45.00)
Underlying diseases (%)			
None	171 (50.15)	13 (30.23)*	14 (35.00)*
Diabetes mellitus	54 (15.84)	19 (41.19)$^{+}$	16 (40.00)$^{+}$
Hypertension	33 (9.68)	8 (18.60)	9 (22.50)*
Cardiovascular	3 (0.88)	-	1 (2.50)
Dyslipidemia	6 (1.76)	-	-
Asthma	20 (5.87)	2 (4.65)	3 (7.50)
Allergic rhinitis	56 (16.42)	1 (2.32)*	3 (7.50)
HIV	3 (0.88)	1 (2.32)	1 (2.50)
Others	60 (1.76)	10 (23.25)	6 (15.00)
Not record	1 (0.29)	-	-
Affected sinus (%)			
Frontal	97 (16.06)	12 (12.77)	16 (17.58)
Ethmoid	171 (28.31)	28 (29.79)*	24 (26.37)
Maxilla	237 (39.24)	24 (25.53)*	22 (24.18)*
Sphenoid	99 (16.39)	30 (31.91)$^{+}$	29 (31.87)$^{+}$

* $p < 0.05$

$^{+}$ $p < 0.001$ versus all patients

of orbital apex (4). The remainder (27) had a normal radiograph. However, neither decreased corneal sensation nor abnormal cavernous sinus was observed. Post-operatively, complete and incomplete recoveries were revealed in four and 13 patients, respectively, but motility for six patients was not improved and three even worsened (Table 2).

Table 2. Outcomes after treatment

Outcome	Visual loss (n = 43)	Ocular motility limitation (n = 40)
Improved	12 (27.91%)	17 (42.50%)
Stable	7 (16.28%)	3 (7.00%)
Worsened	7 (16.28%)	3 (7.00%)
Not recorded	17 (39.53%)	17 (42.50%)

Table 3. Cranial nerve involvement in ocular motility limitation

Affected cranial nerve	Number (%)
Oculomotor nerve	
Incomplete	4 (10.00%)
Complete	5 (12.50%)
Abducens nerve	
Incomplete	-
Complete	-
Oculomotor and abducens nerves	
Incomplete	19 (47.50%)
Complete	12 (30.00%)

Sphenoid sinusitis resulted in a greater risk of developing neuro-ophthalmic manifestations, including visual loss (odds ratio 5.76; 95% CI 2.49-13.31) and ophthalmoplegia (odds ratio 6.12; 95% CI 2.61-14.34). Diabetes also produced more risk for either manifestations (odds ratio 2.76; 95% CI 1.20-6.35 and odds ratio 2.66; 95% CI 1.08-6.52, respectively) (Table 4).

Discussion

Paranasal sinuses are important structures surrounding the orbit in almost all directions. Their diseases, particularly sinusitis, can cause serious ocular complications[1,2]. The cause of decreased vision in sinusitis patients has many hypotheses, including (a) compressive optic neuropathy of intracanalicular or orbital apical segment, (b) optic neuritis, (c) a combination of intracanalicular edema and vasculitis causing optic nerve infarction, and (d) the spread of inflammation to the meninges, optic nerve, and optic chiasm[8,10,13]. Patients with some inflammation of the sinuses, particularly of the ethmoid and sphenoid, may manifest visual symptoms with only subtle evidence of sinusitis[5-10,12,13].

Besides visual impairment, oculomotor with or without abducens nerves involvement was commonly noticed in sinusitis patients. The orbital MRI of patients with either neuro-ophthalmic manifestation revealed inflammation along the optic nerve, extraocular muscles, and orbital apex region, supporting the hypothesis of the spreading of inflammation from the paranasal sinuses to these important orbital structures.

Table 4. Logistic regression model for risk association in neuro-ophthalmic manifestations

Variable	Visual loss		Ocular motility limitation	
	OR* (95% CI**)	p-value	OR* (95% CI**)	p-value
Frontal sinusitis	0.65 (0.26-1.60)	0.345	1.31 (0.56-3.10)	0.535
Ethmoid sinusitis	1.89 (0.85-4.20)	0.119	1.14 (0.51-2.54)	0.757
Maxilla sinusitis	0.69 (0.30-1.60)	0.389	0.78 (0.33-1.84)	0.570
Sphenoid sinusitis	5.76 (2.49-13.31)	0.000	6.12 (2.61-14.34)	0.000
Diabetes mellitus	2.76 (1.20-6.35)	0.017	2.66 (1.08-6.52)	0.033
Hypertension	1.19 (0.42-3.39)	0.743	1.97 (0.69-5.57)	0.206
Asthma	1.57 (0.31-7.98)	0.585	2.38 (0.55-10.25)	0.246
Allergic rhinitis	0.14 (0.02-1.13)	0.065	0.45 (0.12-1.71)	0.241
HIV	1.35 (0.11-16.99)	0.815	1.85 (0.15-23.18)	0.634
Others	1.38 (0.58-3.32)	0.463	0.41 (0.13-1.23)	0.110

* OR = odds ratio
** 95% CI = 95% confidence interval

Sphenoid sinusitis and diabetes were significant risk factors for developing neuro-ophthalmic manifestations; including visual loss and ophthalmoplegia in the present study. Tarazi[6] reported a higher risk of permanent visual loss from sinusitis involving the posterior ethmoid and/or the sphenoid sinus. Hence, visual acuity and ocular motility examinations are necessary among sinusitis patients, particularly in sphenoid sinusitis. On the other hand, meticulous examination and investigation for any evidence of sphenoid sinus disorder are essential in any patients manifesting with either optic neuropathy or ophthalmoplegia, particularly among diabetics.

Although the present study reviewed data of sinusitis patients who underwent FESS over a 10-year interval, incomplete medical records was a real limitation of this retrospective study, particularly regarding ocular examinations after treatment. Therefore, a prospective-designed study might be warranted to determine post-operative visual and ocular motility outcomes.

Acknowledgements

The authors want to thank Mr. Bryan Roderick Hamman and Mrs. Janice Loewen-Hamman for assistance with the English-language presentation of the manuscript.

Potential conflicts of interest

None.

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อาการแสดงทางประสาทจักษุในผู้ป่วยโพรงอากาศข้างจมูกอักเสบที่ได้รับการผ่าตัดแบบส่องกล้อง

กิตติศักดิ์ กิจทวีสิน, ตริยาภา ธีระกุล

วัตถุประสงค์: *ศึกษาอาการแสดงทางประสาทจักษุในผู้ป่วยโพรงอากาศข้างจมูกอักเสบที่ได้รับการผ่าตัดแบบส่องกล้อง*

วัสดุและวิธีการ: *ศึกษาแบบย้อนหลังเชิงพรรณนา โดยทบทวนเวชระเบียนของผู้ป่วยโรคโพรงอากาศข้างจมูกอักเสบ จำนวน 341 ราย ที่ได้รับการผ่าตัดแบบส่องกล้อง ระหว่างเดือนมกราคม พ.ศ. 2544 ถึง ตุลาคม พ.ศ. 2553*

ผลการศึกษา: *ผู้ป่วยมีอายุเฉลี่ย 37.09 (3-77) ปี โดยร้อยละ 50 ไม่มีโรคประจำตัว ตรวจพบอาการตามัวและกลอกตาไม่ได้ร้อยละ 12.72 และ 11.83 ตามลำดับ พบว่าโพรงอากาศ sphenoid มีการอักเสบบ่อยที่สุด ทั้งในผู้ป่วยที่มีอาการตามัว (odds ratio 5.88; 95% CI 2.79-12.38) และกลอกตาไม่ได้ (OR 7.09; 95% CI 3.28-15.32) ในผู้ป่วยที่มีอาการตามัว พบมีความผิดปกติของจอประสาทตาร้อยละ 39 และความผิดปกติทางภาพถ่ายรังสีร้อยละ 60.47 หลังผ่าตัดร้อยละ 27.91 มีสายตาดีขึ้น แต่ไม่ดีขึ้นในร้อยละ 25.58 พบเส้นประสาท oculomotor ผิดปกติร้อยละ 22.50 และพบร่วมกับเส้นประสาท abducens ร้อยละ 77.50 โรคเบาหวานเป็นปัจจัยเสี่ยงที่สำคัญต่อการเกิดตามัวและกลอกตาไม่ได้*

สรุป: *การอักเสบของโพรงอากาศ sphenoid เพิ่มความเสี่ยงต่อการเกิดอาการแสดงทางประสาทจักษุวิทยา โดยเฉพาะผู้ป่วยโรคเบาหวาน ดังนั้นการตรวจอย่างละเอียดเพื่อหาการอักเสบของโพรงอากาศ sphenoid อาจสำคัญในผู้ป่วยที่มาด้วยตามัว และ/ หรือ กลอกตาไม่ได้*