Large Middle Meatal Antrostomy *vs* Undisturbed Maxillary Ostium in the Endoscopic Sinus Surgery of Nasal Polyposis

WINAI WADWONGTHAM, MD, MSc*,
SONGKLOT AEUMJATURAPAT, MD*

Abstract

Background : There is controversy of creating the drainage lumen in endoscopic sinus surgery for diffuse nasal polyposis.

Objective : To compare the patency rate of drainage lumen between large middle meatal antrostomy and undisturbed maxillary ostium in endoscopic sinus surgery for nasal polyposis.

Setting : Department of Otolaryngology, King Chulalongkorn Memorial Hospital.

Design : Randomized double-blind control trial.

Subject : Patients diagnosed at the King Chulalongorn hospital who had chronic maxillary sinusitis developed by nasal polyposis.

Method : Sixty patients who had similar degree of bilateral nasal polyps and chronic maxillary sinusitis were enrolled. The sides of which each surgical technique would be applied were randomized by simple randomization. The patients did not know which treatment technique was applied to which side of the nose. The evaluator evaluated the objective endoscopic examination from the recorded videotape of each side separately at the third month till one year after surgery without notifying the patients.

Results : The patency rate of a large middle meatal antrostomy was 71.7 per cent-85 per cent compared to 61.7 per cent-65 per cent of the undisturbed maxillary ostium. There was a statistically significant difference only in early phase evaluation between the two surgical techniques (p-value = 0.002). Thirty-six of 60 cases (60%) had good results with adequate drainage lumens, no infection and no recurrent polyps at the final evaluation. Early and small nasal polyps (grade I polyp) was the main correlation factor to the success of endoscopic sinus surgery for nasal polyposis (p-value = 0.017). The occlusion of the drainage system after surgery was mainly from recurrent polyps

Conclusion : The large middle antrostomy group had a better statistically significant patency rate than undisturbed maxillary ostium only in the early phase after surgery. Recurrent polyp was the main cause of stenosis. Early surgical intervention of the small nasal polyposis had a better result compared to large diffuse nasal polyps..

Key word : Nasal Polyposis, Endoscopic Sinus Surgery, Middle Meatal Antrostomy

WADWONGTHAM W & AEUMJATURAPAT S
J Med Assoc Thai 2003; 86 (Suppl 2): S373-S378

* Department of Otolaryngology, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

Nasal polyposis can be defined as a chronic inflammatory disease of the paranasal sinus mucosa, leading to a protrusion of benign edematous polyps from the meatus into the nasal mucosa[1]. The etiology and pathogenesis are still unknown[2]. Nasal polyps cause nasal obstruction, anosmia or hyposmia, recurrent sinusitis, chronic drainage, dry mouth and facial pressure or headache. Nasal polyps are always bilateral in nasal polyposis, and appear as smooth, pale grape-like benign masses in the nose. Obstruction at the level of the ostiomeatal complex or at the opening to any paranasal sinus by polypoid disease will almost certainly lead to blockage of mucous clearance from the dependent sinuses. Mucous stasis can result in bacterial overgrowth and subsequent infection[3].

The principle of endoscopic sinus surgery (ESS) is to improve the ventilation and the drainage of the sinus by removing the lesion obstructing the ostiomeatal complex and enlarging the maxillary ostium of sinus[4]. The success of this method depends on the normalization of diseased sinus mucosa, which is capable of decreasing ciliated epithelium damage and regenerating to normalcy[5]. Reported results of this technique have been very good, but most of them reported subjective improvement in symptoms with the probability of persistent disease by objective evaluation, especially in nasal polyposis with chronic sinusitis[6].

Until now, there are still some controversial concepts in the management or the creation of the drainage system of diseased sinuses after removing the obstructing disease. Setliff proposed that the uncinate process, not the maxillary sinus ostium became the critical anatomic factor in surgery for maxillary sinus by removing the lesion obstructing the ostiomeatal complex. The maxillary sinus mucosa in chronic sinusitis was capable of regenerating itself and the damage ciliated epithelium could return toward normalcy[7]. This leads to the concept of a minimal invasive technique in which the ostium is left undisturbed regardless of size or pathologic condition even in patients with severe polyposis. On the contrary, Levine and Jankowski recommended a large middle meatal antrostomy which included maxillary ostium [8,9]. The implication is that, as a consequence of long persistent sinusitis caused by nasal polyposis, the cilia may be damaged and the mucociliary transport system of the maxillary sinus, in which its direction is usually against gravity, may be dysfunctional. So the maxillary ostium is not adequate for drainage and it needs a large gravity dependent drainage. The effectiveness of both interventions is still questionable in the treatment of patients with chronic sinusitis developed by nasal polyp. This study aimed to compare the effectiveness of both methods for the drainage system in patients who usually have severe and long-standing nasal diseases.

MATERIAL AND METHOD

Patients

Patients who had chronic maxillary sinusitis developed by nasal polyposis were recruited to this study. The inclusion criteria were patients with the same grade of nasal polyp (staging was based on the presence of polyps confined to the middle meatus, grade 0 for no polyp seen, grade I for polyps confined to the middle meatus and grade II for those beyond the middle meatus[10]), which occluded the middle meatal complex and caused chronic maxillary sinusitis. Chronic maxillary sinusitis was evaluated by discharge from the ostium and the radiographic appearance (CT-scan assessment was graded between 0 and II; grade 0 for no abnormality, grade I for partial opacification and grade II for total opacification[10,11]). The exclusion criteria were 1) pregnancy, 2) immunocompromise host, 3) history of prior maxillary sinus surgery, 4) scar or adhesion in the nose from other treatment, 5) severe nasal septal deviation 6) asthma, cystic fibrosis and aspirin sensitivity patients, 7) tumor or mass in the nasopharynx, 8) unequal degree of sinus disease.

Selected patients in this project were started on oral prednisolone 40 mg each day beginning one week prior to surgery and were given the broad spectrum antibiotics (amoxycillin + clavulanic acid). The operations were performed under local anesthesia. Ten per cent cocaine and 1 per cent xylocaine with 1 : 100,000 adrenaline were used to block nerves (locally and through the greater palatine foramens), and to get a vasoconstriction effect during surgery.

Design of study and procedure

This was a randomized double-blind clinical trial in which the patients and the evaluator were blinded. A simple randomized technique by the EPIINFO program for allocating which side of the maxillary was sinus to be performed as a large middle meatal antrostomy while the other side did not disturb the maxillary ostium opening was applied.

Procedure

A four mm 0° and 4 mm 30° sinuscope with xenon light source and television monitor with recorder were used. All polyps in the lateral nasal wall were delicately removed by microdebrider and cup-cutting forceps to reduce tissue trauma. Then the drainage systems in the paranasal sinus were performed specifically according to the intervention techniques at the maxillary sinus ostiums.

For the undisturbed maxillary ostium side, the procedure was just removing the uncinate process and polyp that might occlude the ostium opening. For the large middle antrostomy side, the drainage opening were performed by enlarging with scissors and side-biting forceps to create a lumen of approximately 1.5 cm x 2 cm in size to the direction of posterior-inferior along the supra-inferior turbinate area[8]. The middle meatus was packed with umbilical tape and the packing was removed within 3-5 days after surgery. Saline irrigation and a nasal steroid were administered for post-operative care.

Statistical analysis

The patency of drainage lumen, recurrent maxillary sinusitis and recurrence of nasal polyps were evaluated by another otolaryngologist from the recorded videotape without notifying the patients. McNemar Chi-square test, multiple logistic regression were used to test the statistical significance. This study was conducted using different interventions in one patient, so informed consents were obtained before surgery and this study was passed by the ethical committee of Faculty of Medicine, Chulalongkorn University.

RESULTS

Sixty patients were enrolled in this study. There were 34 males and 26 females with an age range of 16-68 years. The demographic data is shown in Table 1. Endoscopic sinus surgery in all patients was performed by the same surgeon at the Department of Otolaryngology, King Chulalongkorn Memorial Hospital. The surgical time and blood loss of each surgical side were recorded separately from the first incision until packing. The mean surgical time for the large middle meatal antrostomy side and undisturbed maxillary ostium side was 49.1 min (SD = 13.2) and 46.4 min (SD = 13.2) respectively. There was no significant difference between both sides (means difference = 2.6, p-valued = 0.156). The mean volume of blood loss of the middle meatal antrostomy side and undisturbed maxillary ostium side was 71.9 ml (SD = 59.9 ml) and 68.1 ml (SD = 48.8 ml) respectively. There was no significant difference between both sides.

The patency rate of drainage lumen for large middle meatal antrostomy compared to undisturbed maxillary ostium at 3rd month, 6th month, 9th month and 1st year are shown in Table 2. There were 29 cases with good patency of lumen and surrounding tissue without infection on both sides from the beginning to the final evaluation. Ten cases had the same condition throughout the evaluation, 4 cases of which had patent large middle meatal antrostomy with occlu-

Table 1. Demographic characteristics (both groups in the same patients).

	N	%
Patients	60	100
Male	34	56.7
Female	26	43.3
Age (years) (mean, SD, (range))	36.8, 13.8, (16-68)	
Duration of nasal polyposis (months) (mean, SD)	47.9, 41.1	
Duration of sinusitis (months) (mean, SD)	5.9, 4.0	
Skin test (n = 45)		
Negative	24	53.3
Positive	21	46.7
Grading of polyps from nasal endoscope (n = 60)		
Grade 1	10	16.7
Grade 2	50	83.3
Grading of chronic sinusitis from CT-scan (n = 60)		
Grade 1	29	48.3
Grade 2	31	51.7

Table 2. The patency of drainage of the lumens after surgery (n = 60).

Evaluation period	Large middle meatal antrostomy	%	Undisturbed maxillary ostium	%	McNemar Chi-square (p-value)
3rd month evaluation	51/60	85	38/60	63.3	0.002
6th month evaluation	46/60	76.7	37/60	61.7	0.065
9th month evaluation	45/60	75	39/60	65	0.109
12th month evaluation	43/60	71.7	38/60	63.3	0.180

sion of undisturbed maxillary ostium, 1 case of undisturbed maxillary ostium patient with occlusion of large middle meatal antrostomy and 5 cases of occlusion of both undisturbed maxillary ostium and large middle meatal antrostomy. Twenty-one cases had a change of patency overtime, with both directions of changing. For the undisturbed maxillary ostium side, 8 cases had improvement of patency and 6 cases had occlusion from stenosis and polypoid change around the narrowing lumen. For the large middle middle antrostomy side, 3 cases had improved patency of lumen while 11 cases were occluded from the recurrence of polyp and adhesion band at one year after surgery. However, the overall cases had good patency of both large middle meatal antorstomy and undisturbed maxillary ostium after at least one-year follow-up accounting for 36 cases (a 60% success rate).

The correlation between the grading of polyp and the patency of both drainage lumens in 29 of 60 cases that were considered to have an excellent result was evaluated. There were 9 of 10 cases of grade I polyp and 20 of 50 cases of grade II polyp having a good result. There was a significant difference between these two groups (p-value = 0.005, Fisher's exact test). Considering the severity of sinusitis from the CT Scan grading system, 20 of 29 cases of grade I sinusitis and only 9 of 31 cases of grade II had a good result. There was a significant difference (p-value = 0.009, Fisher 's exact test). Using multiple logistic regression to adjust all factors, the only factor that influenced the success of patency was polyp grading (p-value = 0.017). Grade I polyp had more correlation to the success of drainage lumen than grade II polyp (Odd ratio = 13.5, 95% CI = 1.585-114.977).

When considering each surgical intervention, grade I sinusitis had a correlation effect on the success of patency for undisturbed maxillary ostium (p-value = 0.028), and grade I sinusitis had more correlation than grade II sinusitis (Odd ratio = 3.667, 95% CI = 1.175-11.114). But for the large middle meatal antrostomy group, the correlation was not significant.

There was no immediate or delayed major complication which included excessive hemorrhage, orbital complication and intracranial complication. One patient had delayed bleeding from the large middle meatal antrostomy side 4 days after surgery resulting from early removal of the packing and it needed repacking without blood transfusion. For the failure cases, occlusion of the drainage lumen occurred and proceeded to accumulative discharge in the maxillary cavity. The causes of blockage at undisturbed maxillary ostiums were mucosal edema of maxillary ostium (8 cases) and recurrence of polyps (14 cases). For the large middle antrostomy group, the causes of blockage were adhesion band (2 cases) and recurrence of polyps (15 cases). The areas of recurrent polyps originated from the anterior-superior ethmoidal area, middle meatus, and came out of the maxillary antrum.

DISCUSSION

The important success of endoscopic sinus surgery in nasal polyps is not only removing the diseased mucosa but also creating a drainage and ventilation system. Ostium blockage leads to chronic sinusitis *via* stagnated secretions, changes in mucosal metabolism, damaged epithelium and cilia, tissue inflammation, bacterial infection, mucosal thickening and further blockages. The problem of post-operative care for a large dependent cavity like the maxillary sinus is obstruction of the drainage lumens, revision of which must be indicated. Patency of drainage of the maxillary sinus either from the large middle meatal antrostomy or from the undisturbed meatal ostium with no evidence of discharge, inflammatory mucosa, crusting or polyps in sinonasal cavity is required[12]. The patency rate of drainage lumen in the early phase of the healing process (3rd month evaluation) seemed

to favour large middle meatal antrostomy (p-value = 0.002) but after the 6thmonth to the final evaluation, there was no statistically significant difference between the surgical techniques (p-value = 0.065, 0.019, 0.180). The patency rate of large middle meatal antrostomy dropped from 85 per cent to 71.7 per cent due to fibrosis and polypoid formation around the antrostomy. For the undisturbed maxillary ostium, the patency rate staggered from 61.7 per cent to 65 per cent due to swelling of the mucosa around the maxillary ostium area when there was upper respiratory tract infection. The result of the present study was not as good as other reports whose overall patency rates of drainage lumen from endoscopic sinus surgery were 91.4 per cent - 97.6 per cent(6,13). However, those reports included every case of chronic sinusitis from various causes. When focusing on diffuse polypoid cases like the patients in the present study, the patency rate of drainage lumen dropped to 92.6 per cent(6).

The healing process of the middle meatal area and maxillary cavity has much more effect on the patency of drainage lumen. In the early phase, edema and fibrosis were the causes of stenosis. After 6 months, the recurrence of polyp from the anterior-superior ethmoid, middle meatal and maxillary antrum was the main cause of obstruction. Usually the maxillary mucosa recovers macroscopically before the 16th week after endoscopic sinus surgery. However, local pathologic tissue in the maxillary sinus sometimes remains one year after the surgery(5,14). So, the appropriate time for revision surgery or creating a lumen depends on the cause of stenosis and underlying sinus condition. No specific time is recommended.

The severity of polyps proposed by Lund and Kenedy had a correlation to the final outcome (10). Small nasal polyps confined to the middle meatus had a good result compared to large long-standing polyps for which either surgical techniques of drainage lumen were applied. Chronic infection caused by a long-standing polyp might introduce osteitis in the middle meatus. Inadequate removal of polyps in the middle meatus, fibrosis after surgery and a rapidly recurrent polyp might occur in the osteitis cases.

SUMMARY

The large middle meatal antrostomy group had a better statistically significant patency rate than undisturbed maxillary ostium only in the early phase after surgery. A recurrent polyp was the main cause of stenosis. Early surgical intervention of small nasal polyposis has better results compared to large diffuse nasal polyps.

ACKNOWLEDGEMENTS

The authors wish to thank the Rachadapisecsompoj Fund of the Faculty of Medicine, Chulalongkorn University for supporting this project. The authors also thank the Department of Otolaryngology, Faculty of Medicine, Chulalongkorn University for their support and contributions.

(Received for publication on April 6, 2003)

REFERENCES

1. Position statement on nasal polyps (editorial). Rhinology 1994; 32: 126.
2. Norlander T, Fukami M, Westrin KM, Stierna P, Carlsöö B. Formation of mucosal polyps in the nasal and maxillary sinus cavity by infection. Otolaryngol Head Neck Surg 1993; 109: 522-9.
3. Lanza DC, Kennedy DW. Current concepts in the surgical management of nasal polyposis. J Allergy Clin Immunol 1992; 90: 543-6.
4. Kennedy DW, Zinreich ST, Rosenbeum AE, Johns ME. Functional endoscopic sinus surgery: Theory and diagnostic evaluation. Arch Otolaryngol Head Neck Surg 1985; 111: 576-82
5. Guo Y, Majima Y, Hatori M, Seki S, Sakakula Y. Effects of functional endoscopic sinus surgery on maxillary sinus mucosa. Arch Otolaryngol Head Neck Surg 1997; 123: 1097-100.
6. Kennedy DW. Prognostic factors, outcomes and staging in ethmoid sinus surgery. Laryngoscope 1992; 102: 1-18.
7. Setliff III RC 3rd. The small-hole technique in endoscopic sinus surgery. Otolaryngol Clin North Am 1997; 30: 341-51.
8. Levine HL. Functional endoscopic sinus surgery : Evaluation, surgery and follow-up of 250 patients.

Laryngoscope 1990; 100: 79-88.
9. Jankowski R, Pigret D, Decroocq F. Comparison of functional results after ethmoidectomy and nasalization for diffuse and severe nasal polyposis. Acta Otolaryngol (Stockh) 1997; 117: 601-8.
10. Lund VJ, Kennedy DW. Staging for rhinosinusitis. Otolaryngol Head Neck Surg 1997; 117: S35-40.
11. Lund VJ, Mackay IS. Staging in rhinosinusitis. Rhinology 1993; 31: 183-4.
12. Kennedy DW, Wright ED, Goldberg AN. Objective and subjective outcomes in surgery for chronic sinusitis. Laryngoscope 2000; 110: 29-31.
13. Davis WE, Templer JW, LaMear WR. Patency rate of endoscopic middle meatal antrostomy. Laryngoscope 1991; 101: 416-20.
14. Fang SY. Normalization of maxillary sinus mucosa after FESS: A prospective study of chronic sinusitis with nasal polyps. Rhinology 1994; 32: 137-40.

การเปิดรูระบายหนองขนาดใหญ่ที่ผนังด้านข้างตรงกลางของช่องโพรงอากาศแมกซิลลารีภายในจมูกกับการระบายหนองที่รูเปิดตามธรรมชาติของช่องโพรงอากาศแมกซิลลารีในการผ่าตัดริดสีดวงจมูกโดยการใช้กล้องไซนูสโคป

วินัย แวดวงธรรม, พบ, วทม, ทรงกลด เอี่ยมจตุรภัทร, พบ**

หลักการผ่าตัดริดสีดวงจมูกด้วยกล้องไซนูสโคปคือการผ่าตัดเอาริดสีดวงจมูกและสิ่งอุดตันที่ทำให้เกิดการอักเสบของช่องโพรงอากาศออกและผ่าตัดเปิดขยายรูเปิดตามธรรมชาติของช่องโพรงอากาศเพื่อการระบายหนองในภายหลัง การศึกษาที่ผ่านมาพบว่ามีข้อโต้แย้งเกี่ยวกับแนวคิดในการเปิดรูระบายหนองขนาดใหญ่ที่ผนังด้านข้างตรงกลางของ ช่องโพรงอากาศแมกซิลลารีภายในจมูกกับการระบายหนองที่รูเปิดตามธรรมชาติ

ผู้ป่วย 60 รายที่ได้รับการวินิจฉัยว่าเป็นริดสีดวงจมูกอักเสบที่ทำให้เกิดไซนัสอักเสบร่วมด้วยทั้งสองข้างของจมูกและมีความรุนแรงของโรคใกล้เคียงกันได้รับการศึกษาแบบสุ่มตัวอย่างแบบปิดสองทางเพื่อผ่าตัดโดยใช้กล้องไซนูสโคป โดยข้างหนึ่งทำการเปิดรูระบายหนองขนาดใหญ่ที่ผนังด้านข้างตรงกลางของช่องโพรงอากาศแมกซิลลารี ส่วนอีกข้างหนึ่งทำการระบายหนองที่รูเปิดตามธรรมชาติ และติดตามประเมินผลการดำรงอยู่ของรูเปิดระบายหนองของทั้งสองวิธีที่ระยะ 3 เดือน, 6 เดือน, 9 เดือน, และ 1 ปี หลังผ่าตัด ผลการศึกษาพบว่ารูเปิดของรูระบายหนองขนาดใหญ่ที่ผนังด้านข้างตรงกลางของช่องโพรงอากาศแมกซิลลารีมีอัตราการดำรงอยู่ของรูเปิดเท่ากับ 71.7%–85% เทียบกับอัตราการดำรงอยู่ของรูเปิดระบายหนองที่รูเปิดตามธรรมชาติของช่องโพรงอากาศแมกซิลลารี ซึ่งมีอัตราการดำรงอยู่ 61.7%–65% อย่างมีนัยสำคัญทางสถิติ (p-value = 0.002) เฉพาะในช่อง 3 เดือนแรกหลังผ่าตัด ผลการติดตามผู้ป่วย หลังผ่าตัด 1 ปี พบว่าผู้ป่วย 36 รายจาก 60 ราย (60%) มีผลการผ่าตัดที่ดี โดยมีการดำรงอยู่ของรูเปิดระบายหนองที่ปราศจากการอักเสบและการเกิดซ้ำใหม่ของริดสีดวงจมูก นอกจากนี้ยังพบว่าริดสีดวงที่มีขนาดเล็กและอยู่ในระยะแรกเป็นปัจจัยสำคัญต่อผลการรักษา (p-value = 0.017) และการเกิดริดสีดวงขึ้นใหม่เป็นสาเหตุสำคัญที่ทำให้เกิดการอุดตันของรูระบายหนองซ้ำภายหลังการผ่าตัด

คำสำคัญ : ริดสีดวงจมูกอักเสบ, การผ่าตัดไซนัสอักเสบด้วยกล้องไซนูสโคป, ช่องโพรงอากาศแมกซิลลาภายในจมูก

วินัย แวดวงธรรม, ทรงกลด เอี่ยมจตุรภัทร
จดหมายเหตุทางแพทย์ ฯ 2546; 86 (ฉบับพิเศษ 2): S373–S378

* ภาควิชาโสต นาสิก ลาริงซ์วิทยา, คณะแพทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพ ฯ 10330