CHAPTER 3

RESEARCH METHODOLOGY

3.1 Research Questions and Objectives

3.1.1 Research questions

3.1.1.1 Primary research question

Does large middle meatal antrostomy technique have 50 percent reduction of recurrent maxillary sinusitis compared to small-hole maxillary ostium widening technique in the FESS operation for nasal polyposis carry out in the same patient with bilateral sinusitis?

3.1.1.2 Secondary research question.

Is there any difference in the patency rate of the maxillary ostium widening technique between large middle meatal antrostomy and small-hole maxillary ostium widening technique ?

3.1.2 Research objectives

3.1.2.1 To compare the effectiveness between large middle meatal antrostomy and small-hole or minimal disturbed surgery of maxillary ostium in recurrent maxillary sinusitis prevention for chronic sinusitis caused by nasal polyposis.

3.1.2.2 To study the patency rate of the maxillary drainage lumen in both techniques by observation in the third month post-operative.

3.2 Research Hypothesis

The large middle meatal antrostomy technique has 50 percent reduction of recurrent maxillary sinusitis compared to small-hole maxillary ostium widening technique in the FESS operation for nasal polyposis carry out in the same patient with bilateral sinusitis.

3.3 Conceptual Framework

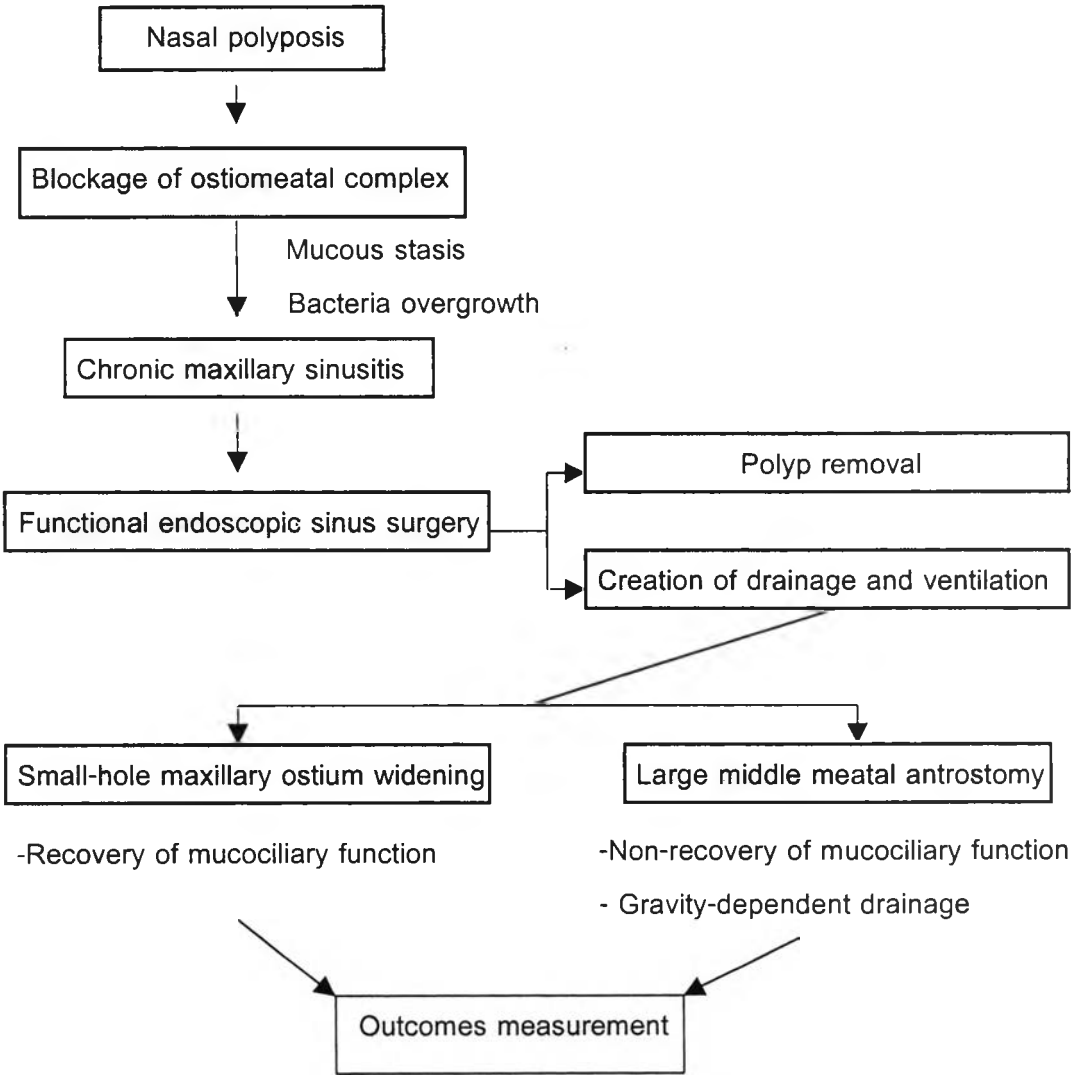


Figure 1. Proposed surgical management of chronic sinusitis caused by polyps

3.4 Keywords

Nasal polyposis, Maxillary sinusitis, Functional Endoscopic Sinus Surgery(FESS).

3.5 Operation Definition

3.5.1 Staging of the disease: The severity of nasal polyposis is evaluated by acoustic rhinometry[15] and clinical staging (Staging is based on the presence of polyps by endoscopic examination, grade 0 for no polyp seen, grade 1 for polyp or polyps confined to middle meatus and grade 2 for those beyond middle meatus).[16] The chronic maxillary sinusitis is evaluated by discharge from the ostium and the radiographic appearance (CT-scan assessment is graded between 0 and 2: 0 for no abnormality, 1 for partial opacification and 2 for total opacification).[16,17]

3.5.2 Functional Endoscopic Sinus Surgery (FESS): Patients who are undergoing functional endoscopic sinus surgery are started on oral prednisolone 40 mg each day beginning one week prior to surgery, if there is no contraindication to its use, and are given the broad spectrum antibiotics (amoxycillin + clavulanic acid). The operation is performed under local anesthesia if it is possible. Ten percent cocaine and 2% xylocaine with 1:100,000 adrenaline are used to block the nerve and for vasoconstriction effect during surgery. Four mm 0^0 and 4 mm 30^0 sinuscope with xenon light source and television monitor with recorder are used. All polyps in the lateral nasal wall are delicately removed by cup-cutting forceps to reduce tissue trauma. Then, the drainage system in all paranasal sinus are performed, especially the intervention technique at the maxillary sinus ostium and ostiomeatal complex area (ethmoidal bulla, hiatus semilunaris inferior and the

uncinate process). Packing the middle meatal area with Merocel sponge after finishing the operation is required and the packing will be removed on the next day if it is possible. Saline irrigation is performed every day.

3.5.3 Large middle meatal antrostomy technique: The ostium of maxillary sinus is enlarged with angle and back-biting forceps to create the ostium of approximately 1.5 x 2 cm in size in the direction of posterior-inferior along the supra-inferior turbinate area.[8]

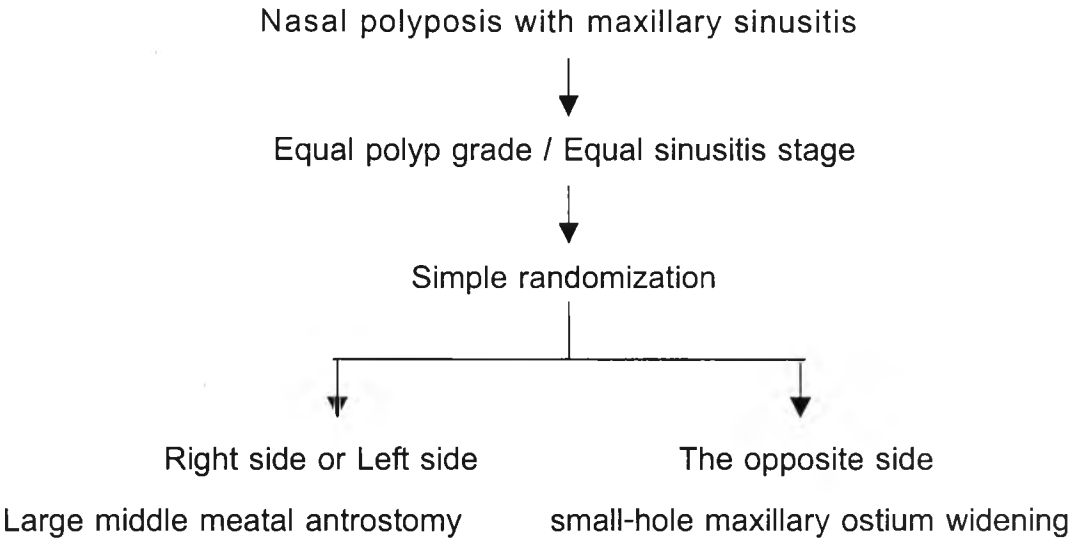
3.5.4 Small-hole maxillary ostium widening technique: The uncinate process is removed with back-biting punches. The ostium is left undisturbed or minimal removal of the obstructing polyps. The size of the opening created is no larger than 6 mm (small-hole technique,recommended by Setliff and Kennedy) [6,7]

3.6 Research Design

This was a randomized controlled clinical trial study comparing effectiveness of the cavity drainage system between large middle antrostomy and the small-hole maxillary ostium widening technique (minimal invasive technique) in patients with chronic maxillary sinusitis developed by nasal polyposis.

This trial was conducted in the same individual patients (two interventions in one person) with a similar degree of bilateral maxillary sinus disease.[12,18,19] The different techniques were performed on each side depending on randomization table.

3.6.1 Research design model



3.7 The Sample

3.7.1 Target population

The target population were all adult Thai patients with chronic maxillary sinusitis developed by nasal polyposis.

3.7.2 Sampled population

The sample group were the patients diagnosed at the King Chulalongkorn Memorial Hospital as having chronic maxillary sinusitis developed by nasal polyposis.

3.7.2.1 Inclusion criteria

(1) Patients had bilateral nasal polyposis, which occluded the middle meatal complex area and caused chronic maxillary sinusitis.

(2) Patients had bilateral signs of chronic maxillary sinusitis from radiography or persistent discharge from endoscopic examination.

3.7.2.2 Exclusion criteria

A patient with any of the following characteristics was excluded from the study:

(1) Pregnancy

(2) Immunocompromised host.

(3) History of prior maxillary sinus surgery.

(4) Scar or adhesion in the nose from chemical treatment.

(5) Severe nasal septal deviation.

(6) Asthma, cystic fibrosis, aspirin sensitivity patients.

(7) Tumor or mass in the nasopharynx.

(8) Unequal degrees of sinus disease.

3.7.3 Sample size estimation

The following formula was used for calculating sample size for dichotomous outcomes for comparing two-category match groups.

$$N = (Z_{\alpha}\sqrt{\overline{p_1q_1}} + Z_{\beta}\sqrt{\overline{p_2q_2}})^2 / (p_1 - p_2)^2$$

$Z_{\alpha} = 1.96$ (Type I error 5 %, two-tailed test)

$Z_{\beta} = 1.28$ (Type II error 10 %)

$P_1 = 0.4$ [The recurrent abnormality of small-hole maxillary ostium widening technique for nasal polyposis focus on the maxillary ostium in 42 % (Kennedy)[6]]

$P_2 = 0.2$ (the expected recurrent abnormality of large middle meatal antrostomy technique)

$$N = (1.96\sqrt{0.4 \times 0.6} + 1.28\sqrt{0.2 \times 0.8})^2 / (0.4 - 0.2)^2$$

$$= 54.18$$

Allowing for 10 % drop out rate,

Estimate sample size = 60

3.7.4 Sampling technique and evaluation

This study was conducted using two different interventions in one person. However, the severity of each side of sinus might not be equal. So to reduce bias, the severity of the disease was determined first and the patients with approximately similar degree of bilateral disease were enrolled. Then the side of maxillary ostium was randomly selected using the simple randomization method. The patients did not know which treatment technique were applied to which side of the nose. The evaluator (fully-trained in FESS operation) had evaluated the objective outcomes from the recorded video tape without notifying the patients, or the result of radiographic study.

3.7.5 Intervention

There were two interventions for drainage procedure (large middle meatal antrostomy and small-hole maxillary widening technique) in this trial. After randomly allocating the technique to be deployed in right side, the functional endoscopic sinus surgery on that side was performed. The first step had to completely remove the polyps at the lateral nasal wall and then created the drainage system technique upon random allocation. The other technique was applied to the opposite side.

3.7.6 Co-intervention

(1) Topical nasal steroid was used during the post-operative period until early outcome evaluation (3rd month). Corticosteroid had an important role in the treatment of chronic mucosal hyperactivity and edema.[20]

(2) Topical nasal decongestant agent was used for 1 week after surgery.

(3) Normal saline irrigation on each side of the nose was performed once a day for 2 weeks.

The compliance of using topical nasal steroid, topical nasal decongestant and normal saline irrigation could achieve by teaching the patients to use the medication correctly.

3.8 Outcome Measurements

(1) An assessment of the subjective outcomes were conducted by assigning different symptom scores for nasal blockage or congestion, facial pain, nasal discharge and post nasal drip in each side. The patients assessed and graded each symptom on a scale of 0-10 points (visual analog scale) with 0 for no symptom and 10 for extremely severe symptom.

(2) Endoscopic evaluation: The patients were evaluated during the preoperative, operative and post-operative periods. (post-operative during on 2nd week, 6th week, 3rd month,) by rigid nasal endoscope and their outcomes recorded for analyses by the other physicians who are board eligible, full-trained in FESS operation to evaluate the recurrent rate of maxillary sinus infection.

The endoscopic appearance included [6]

Discharge from the maxillary ostium

Recurrent polyps at the maxillary ostium area

Edema of the maxillary ostium mucosa which occluded lumen

Adhesion/scar of the maxillary ostium which blocked the lumen

Evaluation of patency rate of maxillary ostium

(3) Radiographic evaluation: Using a CT-scan, the outcome was considered only the air-fluid level shown in the maxillary sinus in which represented pus, especially in the case that showed recurrent polyps, edema, adhesion/scar at the maxillary ostium from the endoscopic evaluation.

(4) Evaluation of complications from the surgery, which included severe hemorrhage, orbital complication and intracranial complication.

3.9 Data Collection

The descriptive data was collected including sex, age, duration of symptom and severity of the disease. Patients' outcomes were observed and recorded at the third month after operation to collect early outcome data, which included the endoscopic examination of nasal cavity, symptom scores, acoustic rhinometry test and CT-scan.

3.10 Data Analysis

Descriptive statistics were used for demographic and baseline data and summarized as mean and percentage. The primary outcome variables which included all evidence of discharge from the maxillary ostium / antrostomy or any evidence of recurrent polyps, edema of the maxillary ostium mucosa or adhesion/scaring that blocked the maxillary ostium lumen with shown air-fluid level on CT-scan,which represented pus in the maxillary sinus cavity, were considered. These outcomes were categorical dichotomous data, so McNemar Chi-square test was applied. The secondary outcomes for symptom scores, an acoustic rhinometry test and the patency rate for each surgical technique, the Wilcoxon signed test, paired t-test and percentage were applied,respectively. To compare the patency rate, the McNemar Chi-square for propotion was used.

Table 1. Data summary and statistical analysis

Data	Type	Data summary	Statistics
Demographic data			
Sex	Categorical	Percentage	-
Age	Continuous	Mean, SD	-
Duration of symptom	Continuous	Mean, SD	-
Severity	Rank ordered	Percentage	-
Primary outcomes			
Discharge from the maxillary ostium or recurrent polyps, or edema of the maxillary ostium mucosa or adhesion/scar	Categorical	Percentage Proportion	McNemar Chi-square*
Secondary outcomes			
Symptom score	Rank ordered	Mean rank	Wilcoxon signed ranks test *
Acoustic rhinometry-test	Continuous	Mean, SD	Paired t-test *
Patency rate	Categorical	Percentage Proportion	McNemar Chi-square*

*P-value of less than 0.05 was considered a statistically significant difference.

3.11 Ethical Consideration

Both minimal invasive (small natural maxillary ostium widening technique) and more radical techniques (large middle meatal antrostomy technique) are used worldwide depended on the experience and preference of the surgeons. There are many published papers on the outcomes and acceptable complications of both techniques. So they are safe to performed on patients. Patients were completely free to refuse participation and written informed consents were obtained.

3.12 Limitations

This study was undertaken on the ostiomeatal complex area and maxillary ostium on each side of the same patient with similar degree of sinus disease. So the patients who were enrolled should be strictly screened by endoscopic evaluation, acoustic rhinometry and CT scanning. Because all investigations were expensive, some patients were not enrolled due to their financial constraints. The other patients who had to be excluded were those with unequal maxillary sinus disease and those could not be follow up.

3.13 Benefits of the Study

The results of both surgical techniques for treatment of nasal polyposis with chronic sinusitis will be applied to Thai patients whose severity and long-standing process of sinusitis are much worse than those of Western patients. Furthermore, the result might be applied to other ostia, such as frontal recess,

posterior ethmoid and sphenoid sinus, even though each particular ostium opening has its specific characteristics.

3.14 Obstacles

Post-operative evaluation: Patients had been evaluated closely so as to avoid loss follow-up problems, which would interfere with the principle of intention-to-treat analysis. So the addresses and telephone numbers of the patients, relatives, friends and neighbors were acquired before surgery. In this early phase of outcome measurement we did not face the problem of loss follow up but for the further evaluation, some patients might be lost.