

Lund-Mackay score is predictive of bleeding in ethmoidectomy for nasal polyposis*

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SUMMARY

Objectives: To assess the correlation between intraoperative bleeding during endoscopic ethmoidectomy for chronic rhinosinusitis with nasal polyps and objective parameters of disease severity.

Study design: A prospective cohort of 40 patients with nasal polyposis treated by endoscopic ethmoidectomy was analyzed from January 2007 to July 2007.

Methods: Polyp size and CT scan opacifications were noted. The surgical procedure was performed with a standardized protocol. Intraoperative blood loss was measured. The Spearman test was used to correlate these data.

Results: On nasal endoscopy, the mean polyps' size score was 2.2 (± 0.65). On CT scan, the Lund-Mackay grading was 17.2/24 (± 5.8). The rate of flow of intraoperative bleeding was 0.077%/min ($\pm 0.070\%/min$). A significant positive correlation was found between the CT scan score and the rate of flow of intraoperative bleeding for the patients who were surgically treated for the first time ($n = 23$, Spearman $Rho = 0.411$, $p = 0.05$).

Conclusion: The Lund-Mackay CT score is useful in predicting intraoperative bleeding during endoscopic ethmoidectomy. It could help to identify patients for whom specific measures like preoperative treatment with antibiotics and steroids, topical perioperative preparation of the nose or hypotensive anesthesia are required in order to reduce the risk of intraoperative complications.

Key words: chronic rhinosinusitis, nasal polyp, bleeding, complications, CT scan

INTRODUCTION

The treatment of chronic rhinosinusitis with nasal polyps (nasal polyposis) is well established. It is based on medical therapy with topic corticosteroids and intermittent systemic corticosteroids. The surgical treatment is suggested when the medical treatment has failed to improve functional complaints. Ethmoidectomy with sphenoidotomy by an endoscopic approach is the technique of choice in France. This is a nasalization of the ethmoid sinuses as recommended by Jankowski⁽¹⁾. It allows systematic eradication of the mucosa to obtain fibrous healing and it improves topical corticosteroid distribution throughout the large surgical cavities.

The endoscopic surgery requires skilled surgeons and a good view of the surgical field to avoid skull base and orbital injuries. Intraoperative bleeding in inflammatory sinus diseases is a real concern when one requires optimum surgical conditions for endoscopic sinus surgery.

Few studies have tried to establish predictive factors of intraoperative bleeding in the surgical management of chronic rhi-

nosinusitis with nasal polyps. The aim of our study was to measure intraoperative bleeding during this surgery and to correlate intraoperative bleeding with objective parameters like polyp size and CT- scan opacification. Identifying patients with a high risk of intraoperative bleeding could help the surgeon to optimise perioperative conditions (for example by using systemic corticosteroids and hypotensive anesthesia).

MATERIAL AND METHODS

Patients

A prospective study was performed from January 2007 to July 2007. Forty patients suffering from chronic rhinosinusitis with nasal polyps were included. The presence of associated asthma as diagnosed by a pneumologist on spirometry or aspirin intolerance were noted. Persistent nasal symptoms despite optimal medical treatment led to scheduling for ethmoidectomy with sphenoidotomy. The objective parameters were measured by the author using grading systems validated by the European Academy of Allergology and Clinical Immunology (EAACI). For each patient, nasal polyps were staged using the Lildholdt

classification with a mean value for both sides. The degree of nasal polyps was classified in relation to fixed anatomical landmarks in four grades (0-3) ⁽²⁾. Preoperative CT scan was performed one to five days before surgery and the sinonasal opacification was assessed with the Lund-MacKay grading system. This system relied on a score of 0-2 dependent upon the absence, partial or complete opacification of each sinus system and the ostiomeatal complex, deriving a maximum score of 12 per side ⁽³⁾. The total score of the two sides can reach a maximum of 24.

Surgery

Surgery was performed by 3 senior surgeons of the Department of Otorhinolaryngology with the same procedure. The anesthetic protocol was the same for all the patients. After preoxygenation with 100% oxygen, the anesthesia was induced by sufentanyl (Sufenta[®], Janssen-Cilag, Issy les Moulineaux, France) 0.2 µg/kg body weight and injection of propofol (Diprivan[®], AstraZeneca, Rueil-Malmaison, France) 2mg/kg body weight. After oral intubation, anesthesia was continued with desfurane (Suprane[®], Baxter Maurepas, France) and repetitive doses of 0.1mg injection of fentanyl aiming for an intraoperative blood pressure restricted to a range of 70 to 100 mmHg systolic. The pain was controlled to reduce intraoperative blood pressure fluctuations. The nasal fossae were packed with cottonoid pledgets soaked in 1/1000 adrenalin. The uncinate process and the middle turbinate were infiltrated with 1% adrenalinized xylocain (lidocaine hydrochloride 200 mg, epinephrin 0.1mg for one ampoule of 20 ml). Computer-assisted surgery (Digi-pointeur[®] 6200, Collin) was used for each patient. Ethmoidectomy with sphenoidotomy was only performed with Blakesley forceps. The powered microdebrider was never used. No preoperative treatment with oral corticosteroids was given in the month before surgery.

Measurements

Duration of the surgery (in minutes) and intraoperative bleeding (in milliliters) were measured from the first forceps use to the final nasal packing with alginate dressings. Intraoperative bleeding was calculated by the volume of aspiration after removal of the volume of intraoperative saline irrigation. The blood loss was correlated to the blood mass of the patient to define a rate of intraoperative bleeding (percentage). This rate of intraoperative bleeding was divided by the duration of the surgery. The rate of flow of intraoperative bleeding (percentage

$$\text{RFPB (\% per min)} = \frac{\text{RB (\% blood mass)}}{\Delta t \text{ (min)}}$$

Figure 1. Major criteria of judgement of the study. RFPB: Rate of Flow of intraoperative Bleeding, Δt: duration of the surgery, RB: Rate of intraoperative Bleeding.

per minute) was the major outcome criterion (Figure 1). In the postoperative course, the nasal packing was removed on the first postoperative day and the patients were discharged home on the second day.

Statistics

Data were collected with Excel Microsoft[®] software and the statistical analysis was performed with Medcalc[®] software. Non parametric tests (Kruskall Wallis test and Spearman correlation test) were used. The degree of significance was p < 0.05. The informed consent of the patients was obtained in the preoperative assessment.

RESULTS

The subject population was 23 males (57.5%) and 17 females. The mean age was 51 years (ranging from 16 to 72 years). Asthma was associated with nasal polyposis in 11 patients (27.5%). Asthma and aspirin sensitivity was found for 7 patients (17.5%). Allergy diagnosed on skin prick tests and clinical history was found in 18 patients (45%). No patient had Wegener’s granulomatosis, Churg-Strauss syndrome or cystic fibrosis.

Seventeen patients (42.5%) with a past history of nasal polypectomy were referred to our institute for radical surgery after failure of a second course of optimal medical treatment. No preoperative course of systematic corticosteroid was prescribed before surgery.

On nasal endoscopy, the mean polyps’ size score was 2.2 (± 0.65). On CT scan, the Lund-Mackay mean grading was 17.2/24 (± 5.8). The mean polyp score and the CT score were positively correlated (Spearman Rho = 0.52, p = 0.001) (Figure 2).

The duration of bilateral ethmoidectomy with sphenoidotomy was 82 min (± 26 min) and there was no significant difference between the 3 surgeons (Kruskal Wallis, p = 0.78). The rate of

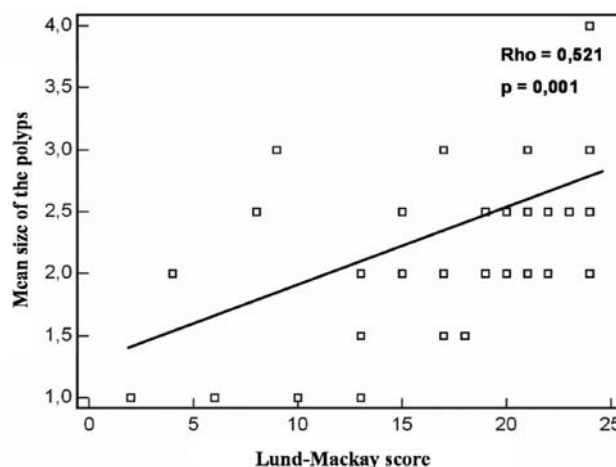


Figure 2. Positive Spearman correlation between the mean size of the polyps (Lidholdt score) and the CT scan opacifications score (Lund-Mackay score).

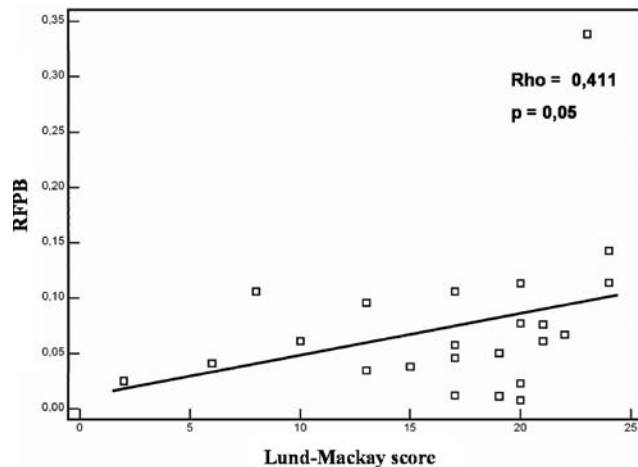


Figure 3. Positive Spearman correlation between the CT scan score (Lund-Mackay score) and the rate of flow of intraoperative bleeding (RFPB) for the patients treated surgically for the first time ($n = 23$).

intraoperative bleeding was 6.2% ($\pm 5.2\%$). Again there was no significant difference between the 3 surgeons (Kruskal Wallis, $p = 0.34$). The rate of flow of intraoperative bleeding was 0.077%/min ($\pm 0.070\%/min$). There was no significant difference between the 3 surgeons (Kruskal Wallis, $p = 0.15$).

The rate of flow of intraoperative bleeding was not correlated to age ($p = 0.74$), to gender ($p = 0.26$), to associated asthma or sensitivity to aspirin ($p = 0.28$) nor to associated allergy ($p = 0.93$). The rate of flow of intraoperative bleeding was not correlated to polyp size ($p = 0.14$). However,, a significant positive correlation was found between the CT scan score and the rate of flow of intraoperative bleeding for the patients who were surgically treated for the first time ($n = 23$, Spearman Rho = 0.411, $p = 0.05$) (Figure 3).

No major complication (orbital or intracranial complications, persistent bleeding) occurred.

DISCUSSION

Intraoperative bleeding and major risks of sinus surgery

The incidence of major complications (intracranial injuries with cerebrospinal fluid leaks, orbital damage, severe postoperative bleeding) after radical ethmoidectomy for chronic rhinosinusitis with nasal polyps is very low. Nonetheless this is a major concern when one is undertaking an operation, which is only aiming to improve quality of life of the patients⁽⁴⁾. A large prospective multicentre study carried out in England and Wales in 2000 on 2176 endonasal surgical procedures reported as major complications, cerebrospinal fluid leaks in 2 cases (0.06%), hemorrhage in 2 cases (0.06%) and periorbital hematoma or emphysema in 5 cases (0.2%)⁽⁴⁾. In order to identify the factors that are directly related to a high risk of major complications in sinus surgery, a study with more than 6000 patients would be required.

With endoscopic visualisation, excessive bleeding in the surgical field is often considered as the main factor that can make surgery hazardous to the adjacent orbit and skull base⁽⁴⁻⁶⁾. Thus, some studies about anesthetic protocols for controlled hypotension during sinus surgery used the impairment of intraoperative visibility to evaluate efficiency of drugs on intraoperative blood loss^(5,6). The intraoperative bleeding has been used as an outcome measure of endonasal ethmoidectomy in chronic rhinosinusitis with nasal polyps⁽⁷⁾. So far, few studies have correlated the intraoperative bleeding with others factors usually measured in chronic rhinosinusitis^(8,9). In this prospective study, we focused on objective parameters that could help us to predict the surgical bleeding and to point out patients for whom specific measures like preoperative treatment with antibiotics and steroids, topical perioperative preparation of the nose or hypotensive anesthesia could be required.

Intraoperative bleeding measurement - methodology

The design of our study was thought to avoid variability in the method of measuring intraoperative bleeding. The same protocols of anesthesia and nasal preparation were used. Computer-assisted surgery was performed so as not to influence surgical techniques in cases of a previous polypectomy that could alter the surgical landmarks. The primary outcome measure (rate of flow of intraoperative bleeding) was chosen to avoid bias due to the duration of the surgery, which would have obviously increased the total blood loss ($p = 0.015$, Spearman Rho = 0.38). No statistical difference in the rate of flow of intraoperative bleeding was noticed between the 3 surgeons who took part in this study.

Correlation analysis - predictive factors of peroperative bleeding

The size of the polyps and the degree of sinonasal opacification on CT scan are the most useful objective parameters to evaluate chronic rhinosinusitis with nasal polyps. The Lildholdt staging system for polyps' size is a sensible and reproducible method validated by the EAACI⁽¹⁰⁾. The mean score in our analysis was 2.2 (± 0.65), which emphasizes the severity of the mucosal pathology that reduces the efficacy of medical treatments when surgery is scheduled. The polyp score is correlated to the Lund-Mackay score in our study. This CT scan staging system is widely used in the literature due to its good reproducibility^(3,10,11). The correlation between polyp size and CT score has also been described by Kountakis on a study of 37 patients⁽¹²⁾. In our study, the rate of flow of intraoperative bleeding is correlated to the Lund-Mackay score in those patients who have never been operated on before ($n = 23$). However, this correlation was not found in the patients who had undergone a previous polypectomy ($n = 17$). This could be explained by a more fibrous nasal mucosa after polypectomy, which alters the sinonasal framework and thus changes the surgical conditions. A larger number of non-operated patients will be required to confirm our result. Meanwhile, Wang found the same result in 230 patients with chronic rhi-

nosinusitis with or without polyps even in cases of recurrent surgery⁽¹³⁾. These data have to be taken into account when endonasal ethmoidectomy is proposed to the patients who have failed optimal medical treatment. In cases of severe mucosal disease on the preoperative CT scan, the surgeon should be aware of a major risk of intraoperative bleeding and measures to reduce this have to be discussed in such cases. Thus, to reduce inflammation and polyp size, a 7-day course of preoperative systemic corticosteroid is proposed to decrease bleeding^(4,7). Sieskiewicz, in a preliminary investigation of two groups of 18 patients, outlined the beneficial impact of preoperative corticosteroid oral therapy on intraoperative blood loss⁽⁸⁾. This treatment was not used in our study to avoid misinterpretation of the potential correlation between the rate of flow of intraoperative bleeding and the objective parameters measured.

CONCLUSION

The surgery in chronic rhinosinusitis with nasal polyps is suggested to the patient when the medical treatment has failed to improve their symptoms. The endoscopic approach performed close to the skull base and the orbital wall requires a bloodless surgical field. We have shown in our study that the Lund-Mackay score measured on the preoperative CT scan is predictive of the rate of flow of intraoperative bleeding in primary surgery. Specific measures could be taken to reduce bleeding in those patients with high Lund-Mackay preoperative score. Surgery for extensive nasal polyposis can be made difficult by severe intraoperative bleeding. This should be included in the information given to the patient preoperatively.

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