

Outcomes of endoscopic ethmoidectomy performed on a day-case basis: a prospective bi-centric study

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Abstract Evaluation of endoscopic ethmoidectomy performed as a day-case in terms of security, quality, and satisfaction of the patient. This prospective observatory bi-centric study over 1 year included 74 patients undergoing an ethmoidectomy respecting the eligibility criteria of ambulatory care. We recorded patients' demographic data, operative details, satisfaction, postoperative course, and follow-up results. Nasal symptoms were evaluated by SNOT-22 on preoperative appointment and postoperatively at D30. No non-absorbable nasal packing was used, eventually in the case of preoperative-bleeding absorbable gelatine packing. The postoperative follow-up took place at D1 by phone call and at D10 and D30 to assess complications, Visual Analogue Scale, and state of ethmoidal corridors by endoscopic exam. Patients benefited of bilateral ethmoidectomy in 82.4 % cases associated with

septoplasty in 42 %. The majority (95 %) was discharged on the same day. Only one patient had bleeding at D0 and was kept in standard hospitalization, such as three other patients for medical or organizational reasons not related to surgery. At D1, 23 % described postoperative light bleeding but needed no revisit and pain was estimated at 1.3 (VAS). No readmission was observed, and no major complication was noted. SNOT-22 decreased successfully by 56 %, statistically related to postoperative treatment of corticosteroids and in the case of Samter triad. 97 % of patients were satisfied of the ambulatory care. These results suggest that within an experienced and dedicated day-case medical and paramedical team, ethmoidectomy can be safely performed on a day-case basis with high quality of taking care and satisfaction of patients.

Keywords Endoscopic sinus surgery · Total ethmoidectomy · Postoperative complications · SNOT-22 · Epistaxis · FESS · Day care surgery

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Introduction

There has been an increasing transition from hospital-based surgeries to ambulatory surgery center-based surgeries to increase the value of the treatment delivered to the patient. Ambulatory care setting not only allows to reduce the costs, but may also increase the quality of care, since it might allow to reduce treatment time, nosocomial infection risk and to increase patient satisfaction of patients and professionals [1–4]. However, a day-case surgery is strongly regulated and patient's eligibility criteria should be strictly defined and respected [5, 6].

Up to now, surgeries amenable to ambulatory surgery in sinonasal surgery are septoplasty, endoscopic middle

meatal antrostomy, and nasal bone fracture reduction using a direct or closed approach [5, 7]. Complication rates and unexpected postoperative admission rates after sinonasal surgery are quite low indicating the safety and effectiveness of the ambulatory setting for these pathologies [8]. To our knowledge, there are no guidelines for ethmoidectomy, which is considered as a risky procedure because of postoperative risk of bleeding [8, 9] or CSF leak due to skull base injury.

The aim of this bi-centric study in two university hospital was to evaluate ethmoidectomy performed as a day-case surgery in terms of security, quality and satisfaction of the patient.

Materials and methods

This prospective observatory bi-center study was performed over 1 year (January 2015 to January 2016) in the day surgery unit of two tertiary centers. All consecutive patients undergoing a total or partial, bilateral, or unilateral ethmoidectomy were included respecting the eligibility criteria of ambulatory care. Due to the hemorrhage risk inherent to sinonasal surgery, day-case management was not proposed to patients with hemostatic disorders or taking anticoagulant and/or antiplatelet therapy [5] nor to patients with obstructive sleep apnea or mental disorder. The referent surgeon checked that the patient had a sufficient level of understanding and would be accompanied at the time of discharge and the following night. Home distance and equipment as well as availability of a telephone were also factors to be taken into account.

Comprehensive information was provided to patient and family regarding specific risks: hemorrhagic, orbital, and neuromeningeal. At preoperative assessment, all patients had understood and agreed to all the aspects of day-case management and the study (declaration of non-opposition to the study).

We recorded anonymously patients' demographic data, operative details, postoperative course, and follow-up results (see Fig. 1). Nasal symptoms were evaluated by the French adaptation of the SinoNasal Outcome Test (SNOT)-22 [10, 11] on the preoperative assessment and postoperatively at 1 month, scale from 0 to 110.

All patients underwent endoscopic ethmoidectomy under general anesthesia. After topical decongestion with 0.05 % of lidocaine and naphazoline, endoscopic surgery consisted of a middle meatal antrostomy followed by partial or total, unilateral or bilateral ethmoidectomy. Following usual habits of referent surgeons, no non-absorbable nasal packing was used if there was nasal perioperative bleeding [day 0 (D0)] eventually an absorbable gelatin sponge (GELITA-SPON Rapid³, GELITA MEDICAL GmbH, and Eberbach

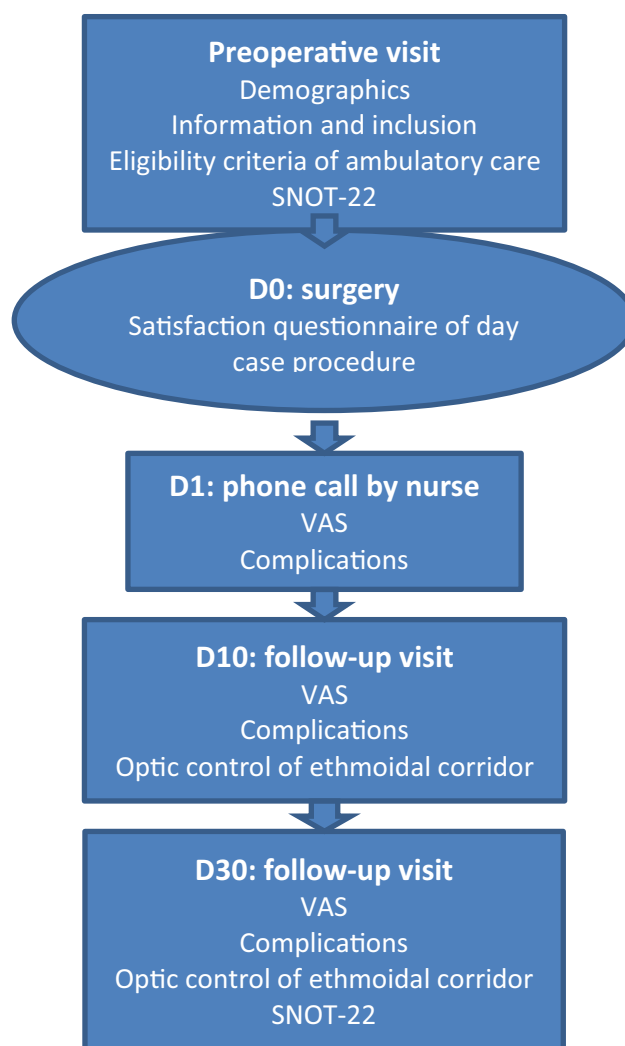


Fig. 1 Description of steps of our study: every patient was included for 1 month in the study

[12]) was used in the ethmoidal corridor (side and quantity was noted). In the case of septoplasty, a thin silastic septal splint could be used. A satisfaction questionnaire was filled out at D0 by the patient.

The nurse of ambulatory care phoned the patient at D1 to ask about eventual postoperative complications and pain [evaluated with a visual analog scale (VAS)]. Postoperative medical follow-up appointment at D10 and D30 assessed complications, pain (VAS), and status of ethmoidal corridors by endoscopic exam (free corridor, inflammatory mucosa, or the presence of synechiae with occluded corridor).

Statistics

Quantitative variables have been analyzed by *t* test or non-parametric tests in the case of non-Gaussian distribution and qualitative parameters by Chi-square test or Fisher's

exact probability test. Quantitative variables were expressed in percentage as median or average. The level of significance was determined as *p* value less than 0.05. All analyses have been made using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA).

Results

74 patients with endoscopic ethmoidectomy were included with a mean age of 49 years and a sex ratio of 2.2 (see Table 1). Mean preoperative SNOT was evaluated at 49.4/110, and the main complaints were nasal obstruction, anosmia, anterior, and posterior rhinorrhea and insomnia. Most patients were ASA 1 (36.5 %) or ASA 2 (58.1 %). Indication of ethmoidectomy was for 76 % chronic rhinosinusitis with nasal polyposis (CRSwNP) (grade II 14.9 %, grade III 37.8 %, and grade IV 17.6 %) and 20.3 % for chronic sinusitis without nasal polyps (CRSsNP). All patients were in the failure of medical treatment. No patient had hemostatic disorder or was taking anticoagulant or antiplatelet therapy. 36.5 % of patients were asthmatic and 9.5 % had Samter triad. 37.5 % of

patients received a preoperative treatment of corticosteroids (prednisolone 20 mg per day during 10 days).

Ethmoidectomy was total for 73.0 % of the patients and bilateral for 82.4 %. Endoscopic ethmoidectomy was associated to septoplasty in 41.9 %. 39.2 % of patients had undergone previous nasal surgery.

Mean operating time was 1.50 ± 0.63 h, significantly prolonged, if bilateral surgery or associated with septoplasty ($p = 0.0069$ and $p = 0.0003$). No difference was noted for revision surgery or grade of polyposis. No major perioperative complications were noted. Because of bleeding during surgery, 63.5 % of patients benefited of absorbable nasal packing. The absorbable nasal gelatin sponge was used bilaterally in 31.1 % of the cases, unilaterally in 24.4 % of cases with a median quantity of half barrette per side.

Median duration of observation in post anesthesia care units or PACU was 2 h. Postoperative pain was evaluated at a VAS of $1.3 \pm 2.0/10$. The mean delay between end of surgery and first standup was 4.37 ± 1.29 h; between end of surgery and first meal 4.06 ± 1.31 h. The majority of patients (95 %) were discharged on the same day as surgery: only one patient had a bleeding at D0 and was kept in standard hospitalization, and three other patients were kept in hospitalization for medical or organizational reasons unrelated to the surgery. 45.7 % of patients received postoperative corticosteroids (prednisolone 20 mg per day during 10 days) and 37.1 % antibiotics (amoxicillin 6 days if allergy dalacin). All patients had to perform high-volume postoperative nasal irrigation with isotonic normal saline solution.

During phone call by the nurse in charge of ambulatory care, 23 % of patients described postoperative light bleeding at D1, but needed no unplanned revisit (see Table 2). Occurrence of bleeding was significantly increased in the case of advanced grade of polyposis (IV) ($p = 0.0065$). If perioperatively a gelatin hemostat was needed to be used, due to intense bleeding, re-bleeding was significantly higher at D1 ($p = 0.0267$). No difference of bleeding at D1 was found on the type of surgery, revision

Table 1 Demographics: population of included patients for ambulatory ethmoidectomy

Demographics	
Included patients	74
Mean age (years)	48.8 ± 13.5
Sex ratio	2.2
CRSwNP	76 %
Samter triad	36.5 %
CRSsNP	20.3 %
Primary procedure	60.8 %
Total ethmoidectomy	73.0 %
Bilateral ethmoidectomy	82.4
Septoplasty	41.9 %

Table 2 Postoperative complications and VAS of ambulatory ethmoidectomy at D0, D1, D10, and D30

Day	Postoperative complications in % (number of patients)			
	D0	D1	D10	D30
Strong bleeding	1.3 % (1)	0	0	0
Light bleeding	–	23 % (16)	8.3 % (6)	0
Orbital complication	0	0	0	0
Neuromeningeal complication	0	0	0	0
Nausea	–	5.4 % (4)	0	0
Infection	0	0	1.3 % (1)	2.6 % (2)
Periorbital edema	0	1.3 % (1)	0	0
VAS 0–10 (mean)	1.3 ± 2.0	1.3 ± 1.8	1.0 ± 1.7	0

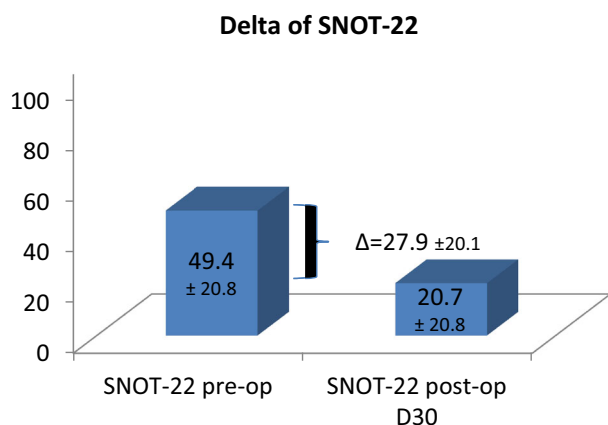


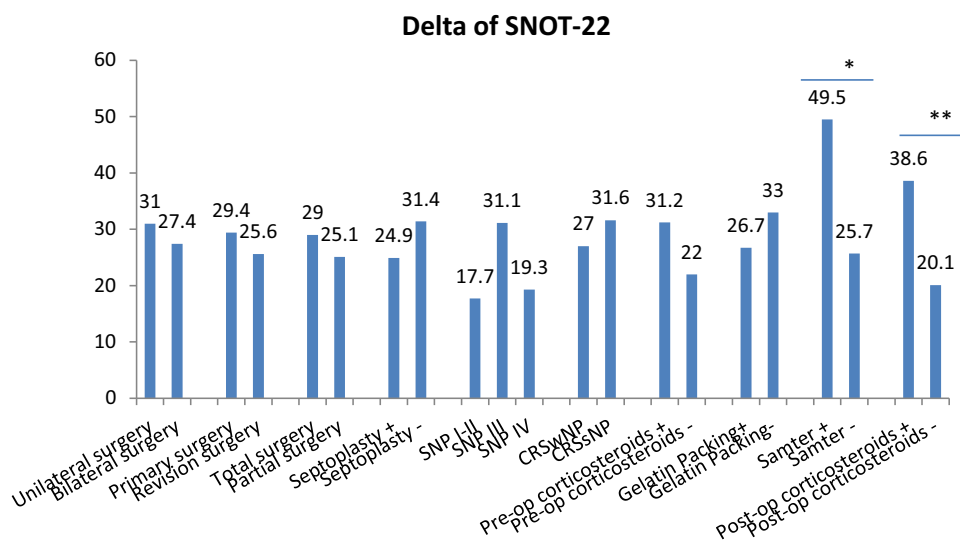
Fig. 2 Delta (Δ) of SNOT-22 [Δ = preoperative (pre-op) SNOT-22 – postoperative (post-op) SNOT-22 at 1 month], value range 0–110

surgery, associated septoplasty, preoperative or postoperative corticosteroid treatment nor postoperative antibiotic treatment. At D1, 5.7 % of patients complained about nausea, 1.4 % of patients complained about eyelid edema. Pain at D1 was estimated at 1.3 on the VAS scale (see Table 2).

To the referent surgeon at D10 visit, only 8.3 % of patients declared postoperative light bleeding. No readmission was observed, and no major complication was noted.

For 97.3 % of patients SNOT-22 decreased successfully, on average by 56 % after surgery [delta of 27.9 points/110 ± 20.1 between preoperative SNOT-22 and D30 (see Fig. 2)]. The decrease of SNOT was statically related to a postoperative treatment of corticosteroids ($p = 0.0037$) and in the case of Samter triad ($p = 0.0221$). No significant difference was found in terms of the type of surgery, associated with septoplasty, or presence of nasal packing,

Fig. 3 Representation of the delta of SNOT-22 in terms of main clinical criteria of the studied population (* and **: difference of delta statistically significant with $p < 0.05$; * $p = 0.0221$, ** $p = 0.0037$)



preoperative corticosteroids or postoperative antibiotics (see Fig. 3).

On optic examination, the ethmoidal corridors were free at D10 in 71 % cases and 70.8 % at D30. Edematous mucosa was found in, respectively, 18.3 and 26.2 %, and the ethmoidal corridor was occluded in 2.8 and 3.1 %. No significant difference in the presence of synechiae at D10 or D30 was found in terms of presence of gelatin sponge in the ethmoidal corridor. In postoperative management, 4.9 % of patients at D10 and 1.9 % at D30 required an endoscopic debridement under local anesthesia.

98 % of patients were satisfied or very satisfied of the ambulatory care and the ambulatory care suited to 97.1 % of patients.

Discussion

Our study suggests that ethmoidectomy can be safely performed on a day-case basis when controlling strictly eligibility criteria, precise information on home arrangements, social factors, and communication and understanding of patient information [5, 13].

In this study, the duration of surgery (mean 1.50 h) and delay of the first standup after the end of surgery (4.37 h) were acceptable for ambulatory care (less than 12 h of stay [5]).

Severe perioperative complications of ethmoidectomy have been recorded in the literature [9, 14]: 1.5 % orbit penetration with or without ecchymosis or subcutaneous emphysema; 2.4 % postoperative (<24 h) epistaxis requiring packing; 0.3 % orbital haematoma, loss of vision or transient or definitive diplopia; 0.3 % osteomeningeal rupture and intracranial complications; and 0.2 % postoperative hemorrhage requiring transfusion. In our series, no

major perioperative or postoperative complications were noted. Only one patient (1.4 %) had bleeding at D0 on a hypertensive crisis and had to stay overnight for observation. Large majority of patients (95 %) were discharged on the same day as surgery. In the literature, Bajaj et al. recorded 85.7 % for endoscopic sinus surgery, all types included [15].

23 % of patients described light bleeding to the nurse at D1 and 8.3 % to the referent surgeon at D10 about the postoperative period. Obviously, there was a different level of complaint to the nurse than to the surgeon. However, no revisit or readmission was needed. In the literature, readmission rate after sinus surgery varies from 1 to 13 % mainly because of bleeding [9, 16–18]. Bajaj et al. recorded 6.7 % of postoperative bleeding [15] and a meta-analysis [14] and 2.4 % of postoperative (<24 h) epistaxis requiring packing corresponding to our data. In our study, association with septoplasty did not increase the haemorrhage risk [13, 16]. Preoperative treatment with systemic corticosteroids seemed to have no relation with postoperative blood loss, but the number of patients is probably too small, and this concept seems valid only for CRSwNP [19].

Minor complications were described by patients, such as nausea (5.4 %), one eyelid oedema (1.3 %), and infections (3.9 %) requiring a visit at the general physician for antibiotics.

A retrospective Spanish study of 145 patients showed that the statistically significant predictive factor for poor outcome in endoscopic day-case surgery was revision surgery: readmission rates were 3.5-fold higher for revision than for primary surgery [5, 20]. This study did not confirm that this observation and revision surgery did not increase the bleeding risk.

In this study, the surgeons chose not to use non-absorbable nasal packing and used a hemostatic gelatin sponge in the ethmoidal corridor in the case of perioperative strong bleeding. The main advantages of this management (absence of non-absorbable nasal packing or alternatively use of a hemostatic gelatin sponge) included a higher degree of comfort during postoperative nasal breathing, and the absence of complaints due to pressure or pain confirmed by the low postoperative VAS in our study compared to the literature. No systemic side effects due to the gelatin sponge were observed. Nevertheless, hemorrhagic risk was significantly higher after gelatin sponge in the ethmoidal corridor, probably because the cases which benefited of nasal packing perioperative were those which had a more intense bleeding.

In the literature, preoperative SNOT-22 score higher than 30 points has a greater chance to achieve a clinically important difference which is obtained on average in 45 % after ESS [10, 21]. In our series, 83 % of patients had preoperative SNOT higher than 30 points and the SNOT decreased in average of 56 %. Postoperative systemic

corticoid treatment had a significant impact on clinical results of surgery at 1 month which is in line with previous reports [22]. In our study, the SNOT-22 at 1 month might have been evaluated too early.

On optic examination, inflammation was found in the ethmoidal corridors at D30 in 26.2 % and the ethmoidal corridor was occluded by synechiae in 3.1 % which is usual in this surgery as cited by Ye et al. at 4.42 % [23]. Obviously synechiae may also develop later on and our follow-up is short.

Pain was well controlled at D0 (mean VAS: 1.3), D1 (1.3), and D10 (1.0) in favor of optimal comfort of patient (9). These data are lower than those noted in the literature: Wise et al. reported about VAS at 3.62 at D1 and 1.72 at D6.

98 % of patients were satisfied or very satisfied of the ambulatory care basis. These data are higher than in other studies about satisfaction of patients about day surgery [24, 25].

Conclusion

To resume, in this study of 74 consecutive patients over 1 year, no major postoperative complications, no readmission or revisit were noted. We recorded a good bleeding control, a significant improvement of symptoms, a good control of pain, as well as a high satisfaction of patients.

To our knowledge, this is the first study about exclusive ethmoidectomy performed on ambulatory basis. Our preliminary results suggest that ethmoidectomy can be safely performed on a day-case basis with a high quality of taking care and high satisfaction of patients. The main factors for a successful outcome are a dedicated day-case experienced medical and paramedical team and a correct patient selection, in terms of general health and social circumstances.

Compliance with ethical standards

Conflict of interest No conflict of interest.

Ethical approval This study is in accordance with the 1964 Helsinki declaration and its later amendments and with the ethical standards of the institutional and national research committee: a declaration was submitted to the CNIL (Commission Nationale de l'Informatique et des Libertés, France) for each center and accepted the 7th of February 2015 under the numbers 1836375 and 1834502, respectively. The protocol was validated by the Ethic Committee with the number 2015/CE19.

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