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ORIGINAL ARTICLE

Complications of endoscopic sinus surgery in a residency training program

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KEYWORDS
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Abstract
Introduction: Endoscopic sinus surgery presents a series of complications that can vary depending on the technique used and the surgeon's experience. This technique needs a learning curve, which must be developed during the residence training program.
Methods: Descriptive and retrospective study, reviewing the medical records of endoscopic sinus surgery for nasal polyps of 192 patients who had undergone operations performed by residents at our department between January 2002 and January 2008. Patient sex, age, affectation scale and minor and major complications were described. All these procedures were performed by 3rd or 4th-year residents under the supervision of a faculty member.
Results: Of the 192 patients, 127 (66.14%) were male and 65 (33.85%) female, aged between 24 and 78 years old, with a mean age of 49 years old. Nasal endoscopy revealed polyposis of grade I, 19 (9.8%) cases; grade II, 55 (28.6%); and grade III, 118 (61.45%). There were 44 (22.9%) total complications, 40 (20.8%) minor and 4 (2.08%) major complications. The most common minor complication was synechia formation in 21(10.93%) cases, followed by bleeding without need for transfusion in 12 (6.25%). The major complication was a breach of the lamina papyracea in 4 patients (2.08%). There were no cases of blindness, cerebrospinal fluid rhinorrhea, or death.
Conclusions: Endoscopic sinus surgery in an otolaryngology residency training program is a relatively safe procedure, especially when performed under faculty supervision.

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PALABRAS CLAVE
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Poliposis nasosinusal;
Programa de entrenamiento de residentes;
Complicaciones

Complicaciones de la cirugía endoscópica nasosinusal en un programa de entrenamiento de residentes

Resumen
Introducción: La cirugía endoscópica nasosinusal presenta una serie de complicaciones que varían en función de la técnica usada y la experiencia del cirujano. Esta técnica requiere una curva de aprendizaje la cual se debe ir desarrollando a lo largo del programa de formación del residente.
Métodos: Estudio descriptivo y retrospectivo, se realizó una revisión de las historias clínicas de 192 pacientes intervenidos de cirugía endoscópica por poliposis nasosinusal, todas estas cirugías fueron realizadas por residentes de nuestro departamento, entre enero de 2002 y enero de 2008. Se describe el sexo, edad, grado de poliposis, complicaciones mayores y menores. Todos estos procedimientos fueron realizados por residentes de 3.er y 4.º año bajo la supervisión de un especialista.
Resultados: De 192 pacientes, 127 (66,14) eran varones y 65 (33,85%) mujeres, con edades comprendidas entre 24 y 78 años, con una media de edad de 49 años. El grado de poliposis por endoscopia era: grado I 19 (9,8%), grado II 55 (28,6%) y grado III 118 (61,45%). Ocurrieron 44 (22,9%) complicaciones totales, 40 (20,8%) menores y 4 (2,08%) mayores. La complicación menor más frecuente fue la sinequia en 21 casos (10,93%) seguida de sangrado sin necesidad de transfusión en 12 (6,25%) pacientes. La complicación mayor fue ruptura de la lámina papirácea en 4 (2,08%) pacientes. No se presentó ningún caso de ceguera, rinolicuorrea, o muerte.
Conclusión: La cirugía endoscópica nasosinusal en un programa de entrenamiento de residentes es un procedimiento relativamente seguro especialmente cuando se realiza bajo la supervisión de un especialista.

Introduction

The popularity of endoscopic sinonasal surgery (ESS) has increased significantly since it was created by Messerklinger in the late 1970s,[1] with a rapid proliferation since it was introduced in America in the late 1980s by Stammberger and Kennedy.[2,3] At first, endoscopic sinonasal techniques were used only for diagnosis, but they have become a very important tool in the surgical treatment, not only of inflammatory sinonasal pathologies but also of a great variety of tumours and lesions of the skull base.[4] Endoscopic approaches are used in the treatment of mucocele, benign tumours, skull base defects, optic and orbital decompression, of lachrymal duct obstructions (dacryocystorhinostomy) and of some neoplasms.

Endoscopic sinonasal surgery is a minimally invasive surgical technique used in the treatment of rhinosinusitis with polyps when medical treatment has failed.[5] It is a surgical procedure that requires a high level of training, as well as a great knowledge of the nasal anatomy and its clinical and radiological correlation. Resident doctors must be progressively and constantly instructed by a specialist during their years of training to acquire the necessary skills to perform this surgery. The goal is for them to be able to perform this surgery in its entirety as first surgeon at the end of their instruction period. Many articles have been published describing and explaining the different complications of this surgical technique.

Some publications include and describe complications in the instruction programs of residents, comparing them with the results obtained by otolaryngology specialists. There are currently few articles describing the instruction process and the development of skills in resident doctors.

The goal of this study was to describe the training and learning process leading to the development of the abilities needed to perform ESS at our centre and to describe the major and minor complications that have arisen over a period of 6 years.

Materials and methods

This descriptive study was conducted in a retrospective manner. Included was a review of the clinical histories of 192 endoscopic sinonasal surgery patients. All the operations were performed by residents at this centre during the period from January 2002 to January 2008.

A total evaluation of 6 cohorts of residents was performed, which were evaluated and described as a group. It is important to mention that different surgeons have different learning curves according to their own personal skills, but when they are all evaluated together, this acquisition of skills is described as a whole in the training of residents.

The variables of this study were age, gender, symptoms, degree of affectation according to the Lidholdt scale and major and minor complications.

All the patients were examined by resident doctors in training under the supervision of an otolaryngology specialist from the rhinology section of our service. In all cases, the study was completed with a computerized axial tomography

(CAT) scan of the paranasal sinuses. Patients underwent surgery if, after treatment with topical corticosteroids (mometasone furoate, triamcinolone acetonide or fluticasone, 200 mcg/d) and systemic corticosteroids (deflazacort 1mg/kg of weight/day initially, with decreasing doses for 14 days), a sustained response was not obtained over more than 3 months.

The clinical intervention consisted of endoscopic surgery with an extension that depended on the affected sinuses evaluated in the presurgical CAT. A bilateral unciformectomy was performed in all cases, with opening of the anterior ethmoid and maxillary antrostomy. In the cases where posterior ethmoid involvement, frontoethmoidal recess and/or sphenoid sinus were found, the surgery was extended to these zones under general anaesthesia, in a process similar to that described by Messerklinger and detailed by Stammberger in the 1990s.[6,7] After the surgery, 8 cm Merocel® nasal blockages were inserted bilaterally. All cases were operated on by residents in their 3rd or 4th year of training under the strict supervision of an expert from our rhinology section.

All patients were discharged on the day after surgery, unless they presented immediate postoperative complications after the nasal blockings had been removed.

Medical treatment with broad-spectrum antibiotics was started after discharge (amoxicillin + clavulanic acid) (or clarithromycin in patients allergic to penicillin), along with continuous nasal rinsing using saline solution every 8 hours. Postoperative cures, cleaning of crusts and debridement were carried out on a weekly basis during the first month.

Complications can be classified into major and minor as described in previous publications. Minor complications are defined as those that do not cause permanent sequelae for the patient: synechiae, minor bleeding, infections, ecchymosis or subcutaneous emphysema. The following were considered as major complications: orbital haematoma, orbital fat exposure, intracranial involvement or injury and bleeding requiring postoperative surgical action and cerebrospinal fluid fistula. Conservative measures may be taken in the last complication or surgical procedures recommended by some authors may be required, including closure with the use of different materials such as free graft mucosal flaps or fascia lata flaps, due to the risk of bacterial meningitis that reach around 30%, even after many years.[8,9]

In some cases, these complications may even result in patient death. Defining the true incidence of major or minor complications is difficult because of the variability that different authors have shown when classifying them. Those considered as major complications by some are considered as minor by others, depending on their experience; some may even view them as acceptable surgical results, consequently not even cataloguing them as complications.[10]

Results

Of the 192 patients intervened, 127 (66.14%) were male and 65 (33.85%) were female, with their ages ranging from 24 to 78 years, and a mean age of 49 years.

Of the patients in this study, 42 (21.87%) had already undergone previous surgery for nasal polyposis, through non-endoscopic endonasal polypectomy by Caldwell-Luc technique or ESS.

The predominant symptoms were: nasal respiratory insufficiency in 172 patients (89.58%), hyposmia in 64 (33.3%), rhinorrhea in 111 (57.8%) and headache in 53 (27.6%).

The endoscopic physical exploration returned the following results according to the Lidholdt scale (Figure 1): polyposis grade I was evident in 19 patients (9.8%), grade II in 55 (28.6%) and grade III in 118 (61.45%).

The total number of complications was 44 (22.9%), of which 32 were patients with polyposis grade III (72.7%), 9 with grade II (20.4%) and 3 with polyposis grade I (6.8%) (Figure 3). Among the complications, 40 (20.2%) were minor (Figure 2), of which:

- Twenty-one (10.93%) were synechiae, which were handled on an outpatient basis with section under topical anaesthesia and with nasal packing.

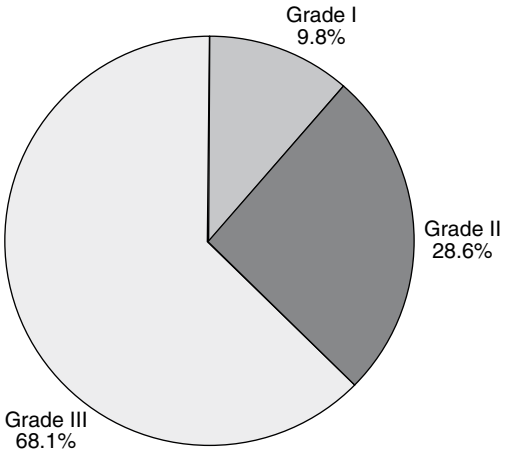

Figure 1 Degree of affectation according to the Lindholdt scale.

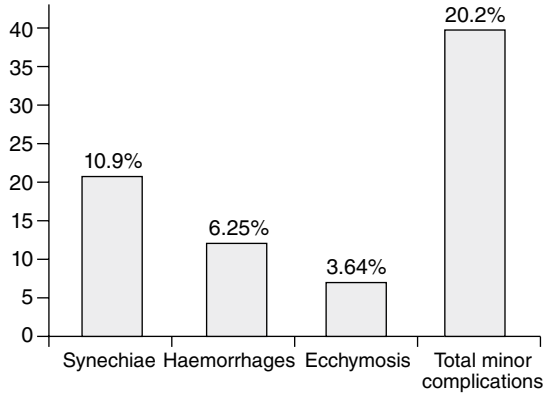

Figure 2 Minor complications.

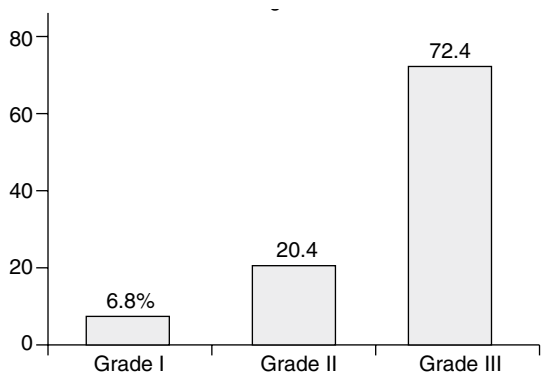

Figure 3 Percentage of total complications according to the degree of affectation.

- There were 12 cases (6.25%) of intra- and postoperative haemorrhage below 300 cc without a need for transfusions, which resolved after the placement of anterior nasal packing.
- Seven of these cases (2.64%) were ecchymosis and resolved spontaneously.

There were 4 cases (2.08%) of major complications: perforation of the lamina papyracea of the ethmoid without injury to the ocular muscles. All of them had polyposis grade III. There were no cases of orbital emphysema, blindness, cerebrospinal fluid fistula, injury of the carotid artery or death.

Discussion

Endoscopic sinus surgery is considered the treatment of choice for rhinosinusitis with polyps when medical treatment has failed. It is a difficult procedure due to the proximity of vital structures[11] and to the importance of the possible complications deriving from it. Otolaryngologists in training gradually acquire experience during their years as residents, and their progress is examined by expert surgeons so that they can gradually perform more complex surgeries.[12] In fact, many training programs initially considered ethmoidectomy to be too dangerous a technique for residents, recommending an external approach instead.[13]

Out of the 192 patients intervened with ESS for sinonasal polyposis, there was a distribution of the incidences with respect to gender, average age at diagnosis, clinical case and degree of involvement according to the Lidholdt scale, which was very similar to that described in the available literature.[14-17]

A total of 44 complications (22.9%) were found, with 40 of them (20.2%) being minor and 4 (2.08%) being major. It is important to highlight that all the major complications were found in patients with grade III polyposis. The percentage of complications in patients with grade I polyposis was low (6.08%) and all were minor. This was predictable considering the degree of involvement and the extension of the surgery performed.

In a review by Cochrane[18] that includes 3 randomized and controlled studies, 4 comparative, non-randomized studies and 35 cases series with more than 50 patients, the total percentage of complications oscillates between 0.3% and 22.4%. Minor complications ranged from 1.1% to 20.8%, with the most common being synechiae followed by re-stenosis of the middle meatus. The number of major complications oscillated between 0% and 1.5%

The published literature regarding training programs for residents describes complications that vary from 6% to 22%; major complications go from 0% to 1.4%, with synechiae being the most frequent.[19-22]

Careful, systematic surgery is the key to a good result. This requires an opening of the affected sinuses to restore natural drainage and to remove the pathological mucous membrane.[23] However, many authors maintain that the postoperative tasks of cleaning and removing crusts are almost as important as the surgical procedure itself.[24-26] This is because mucosal oedema, the formation of crusts and retention of blood secretion are present in almost all cases during the first 4 weeks. Consequently, weekly or bi-monthly postoperative cures are recommended during the first month.[27-29]

The training of residents at our centre is based on anatomical, clinical and radiological sessions, during which ESS images and videos are shown. It has been proven that residents trained with multimedia learning programs through the use of simulators and virtual reality before carrying out their first endoscopic surgery have a lower number of complications, including orbital or meningeal complications.[30-33]

This type of surgery is performed by residents in their 3rd or 4th year at our centre. Residents in their 3rd year perform endonasal polypectomies and learn the space-time and movement relations of endoscopic surgery. After carrying out polypectomy, 4th year residents perform unciformectomy, anterior ethmoidectomy and bilateral antrostomy. When necessary, they open the posterior ethmoid, frontoethmoidal recess and sphenoid. All of this is done under the supervision of the specialist, who intervenes to a greater or lesser extent in the surgery, depending on the learning curve of the resident. At the end of the year, residents will have acquired sufficient confidence and skill to be able to perform the entire endoscopic sinonasal surgery by themselves under the supervision of a specialist. We consider relevant that, while conducting this study, we found that most of the complications occurred during the first months of the resident training year, after which the number of complications decreased steadily as the end of the year was approached. The studies carried out by Stankiewicz[34,35] on learning curves show an incidence of 5% in the first 90 cases and of only 0.7% in the following 90. It is important to point out that not all authors agree that inexperienced surgeons present a higher number of complications when compared to expert surgeons, as there is no statistically significant difference when comparing the percentage of complications.[36]

In this study, we do not take into account the long term results of ESS, as this is not the goal of the study. Some authors consider that the long term results of ESS performed by residents under supervision and by specialists are comparable.[37]

Most of the publications on residents in training and their learning curves refer only to a period of time under 2 years. There are only 2 publications which analyse results over a period longer than 2 years. One of them classifies complications as minor that we considered major, presenting a total percentage of complications of 12.6%. The study that presented the highest number of total complications (22%) was a series with a follow-up period of 5 years presenting very similar results to those shown in this study. The study we present covered over 6 years, that is, 6 different groups of residents who completed their training year in endoscopic sinonasal surgery under the otolaryngology and facial and cervical pathology specialties.

Conclusion

Endoscopic sinonasal surgery is a relatively safe procedure when residents have followed a systematic learning program, with anatomical, clinical and radiological sessions and dissection workshops. This is especially true when it is done under adequate supervision, evaluating groups of surgeons as a whole during their instruction period.

A small rise in the number of total complications is predictable, fundamentally at the beginning of the instruction period, as well as in relation to the grade of involvement of the polyposis, as described in this study.

In any case, the incidence of complications decreases as the instruction period progresses, as can be observed in the studies of Stankiewicz on learning curves.

Conflict of interest

The authors declare no conflict of interests.

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