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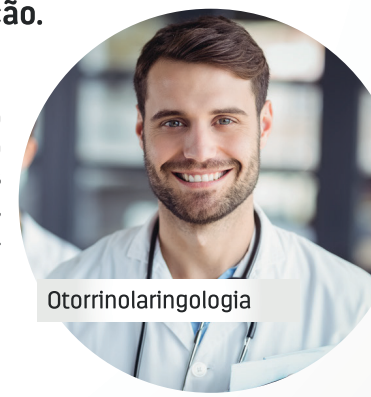

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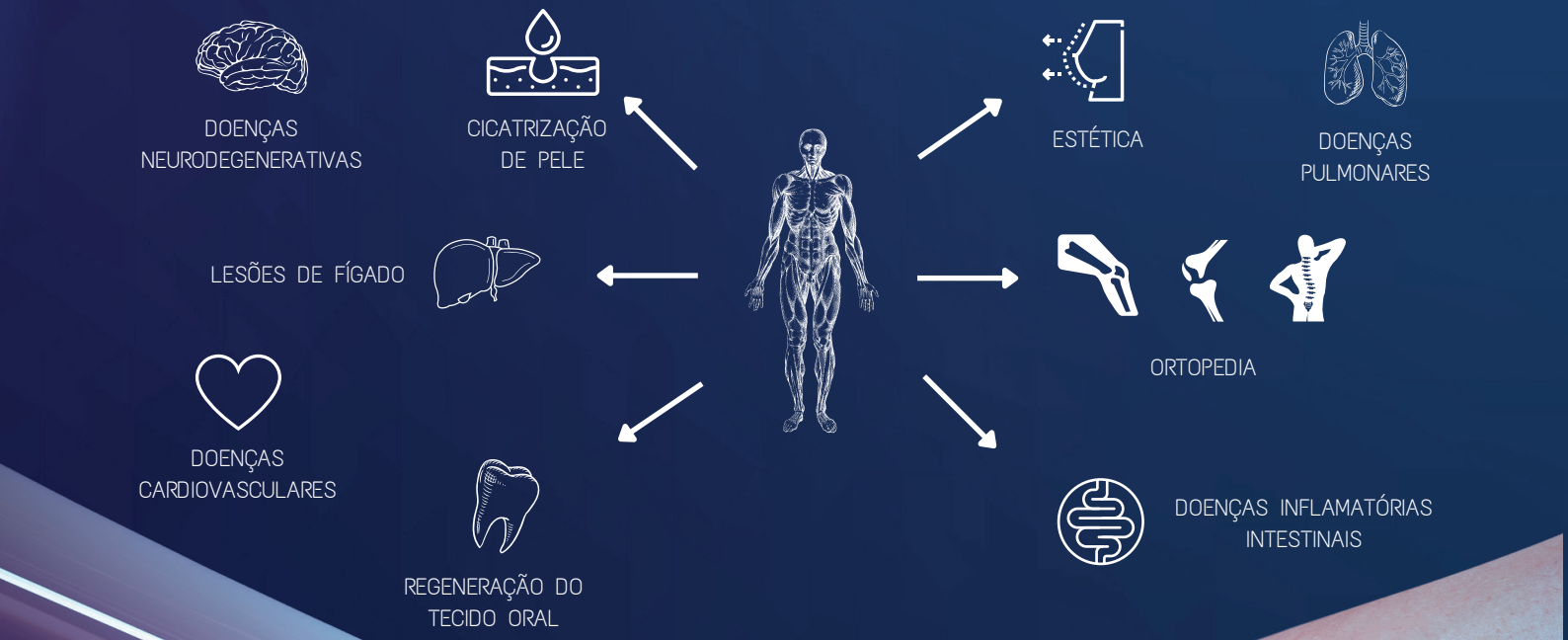

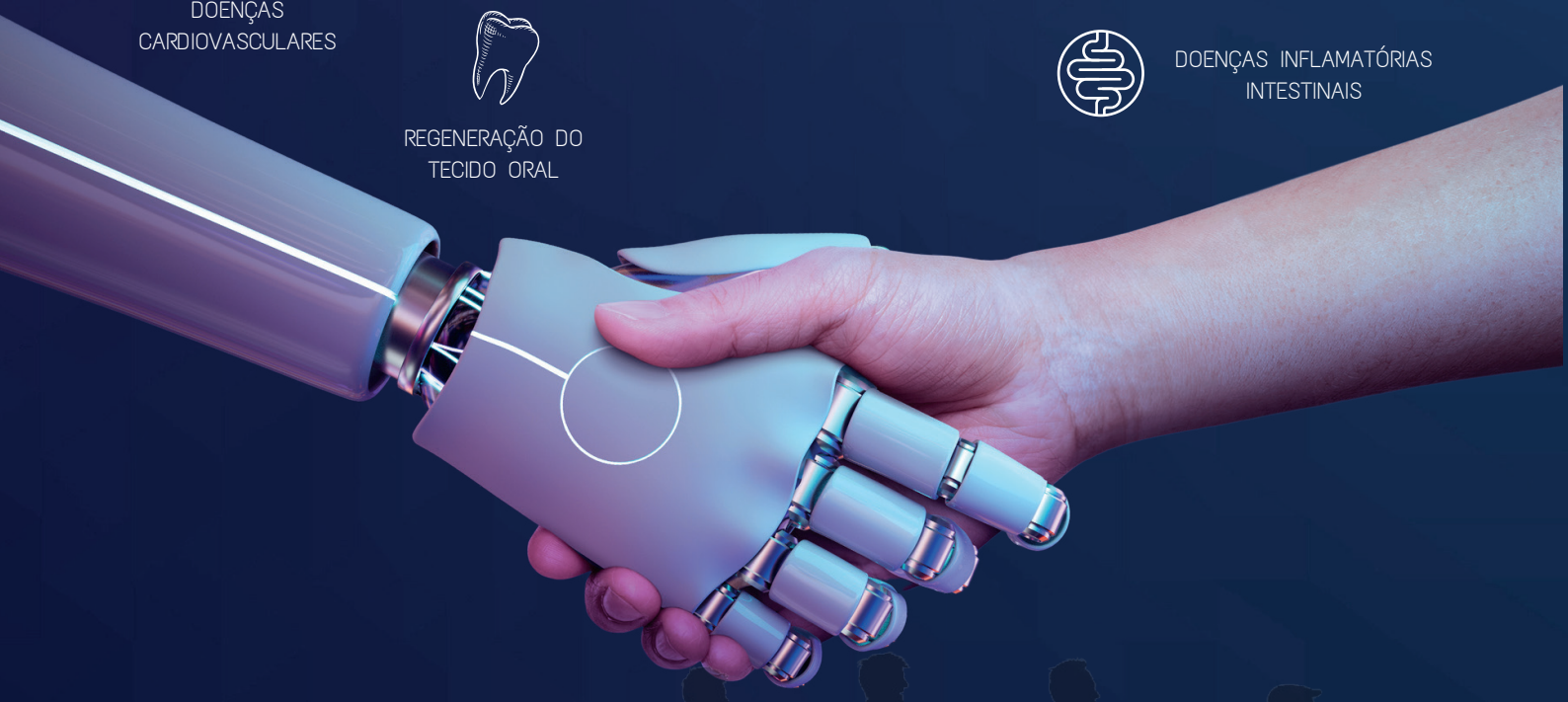

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TOMOGRAPHIC STUDY OF THE MEAN DISTANCE BETWEEN THE ANTERIOR ETHMOIDAL ARTERY AND THE MIDDLE TURBINATE AXILLA FOR GUIDANCE IN ENDONASAL SURGERIES

Camila Sá de Melo **CAMPOS**[1]

Rafael Ferri **MARTINS**[2]

ABSTRACT

The anatomical knowledge of structures such as vessels, nerves and the skull base is essential for endonasal surgeries to be performed safely. The anterior ethmoidal artery is an important anatomical landmark that has three segments: intraorbital, intranasal and intracranial. Inadvertent injuries to this structure may evolve to blindness and cerebrospinal fluid fistula. This study aims to provide the mean distance between the anterior ethmoidal artery and the middle turbinate axilla, through the analysis of the coronal section of 66 CT scans of facial sinuses in patients over 18 years of age undergoing endonasal surgery at IPO Hospital. Thirty-eight patients were male (57.57%) and 28 were female (42.42%). The mean age for males was 37 years; for females it was 38.1 years. The mean distance for males was 23.9 mm on the right side and 24.0 mm on the left side. For females, the mean was 22.7 mm on the right side and 23.9 mm on the left side. We concluded that the tomographic measurement of the anterior ethmoidal artery to the middle turbinate axilla is easy to obtain preoperatively, and it contributes for endonasal surgeries to be performed safely.

KEYWORDS

Anterior ethmoidal artery; Middle Turbinate Axilla; CT scan.

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INTRODUCTION

Endonasal surgeries are a recognized approach for sinonasal pathologies. During surgery, it is necessary to pay attention to the sinonasal anatomy and its variations due to how close the sinuses are to noble structures, such as the orbit and the brain.[1]

The anterior ethmoidal artery (AEA) passes between the superior oblique and medial rectus muscles, then leaves the orbit through the anterior ethmoidal foramen. It traverses the ethmoid roof obliquely and enters the anterior cranial fossa through the lateral lamella of the cribriform plate, the thinner and fragile segment of the anterior skull base, reaching the olfactory fossa.[2]

Surgical injury to the AEA can cause severe bleeding. The retraction of the artery into the orbit evolves into retro-orbital hematoma, which can evolve to blindness in some cases. Other complications such as cerebrospinal fluid fistula, brain infection, and intracranial bleeding are also described in the literature.[1,3]

Identification of the AEA on coronal computed tomography is performed at the retrobulbar level by utilizing a triangular evagination of the lamina papyracea between the superior oblique and medial rectus muscles, whereas the middle turbinate axilla (MTA) is identified by the angle between the anterior border of the middle turbinate and its insertion on the lateral nasal wall.[4,5]

Several studies have been developed to facilitate the identification of the AEA, such as CT scan analysis and cadaver dissection. Some landmarks for the AEA have been tested, such as the anterior nasal spine, the middle turbinate axilla, the lacrimal crest, and the frontal recess.[3]

This study aims to examine the mean distance between the AEA (eminence of the lamina papyracea) and the middle turbinate axilla (MTA), while looking at the mean of the right and left sides intra-individually, and between the sexes.

MATERIALS AND METHODS

This is a retrospective study approved by the Ethics Committee for Research in Human Beings of the IPO Hospital, under CAEE No 92663618.3.0000.5529. We assessed 66 CT scans of paranasal sinuses taken from January 2018 to October 2018 of patients over 18 years of age, of both sexes, who underwent endonasal surgeries at IPO Hospital. The images were analyzed at the diagnostic imaging center using the software Arya version 1.9.23, in coronal sections measuring 25 millimeters (mm) thick.

Exclusion criteria were: extensive nasal polyposis or severe rhinosinusitis that impeded visualization of nasal structures; previous nasal surgery with middle turbinectomy; failure to identify the anterior ethmoidal foramen.

To obtain the measurements, the anterior ethmoidal foramen was identified located on the medial wall of the orbit in coronal section (Fig 1), and a straight line was drawn up to the axilla of the ipsilateral middle turbinate, while taking the measurement in millimeters (Fig 2). Those measurements were analyzed on the right and left sides.

Data were organized in tables, while dividing patients by sex, and the measurements by laterality. Statistical analysis was performed with the evaluation of means, standard deviations, median, minimum and maximum values. For the comparison between the sex-

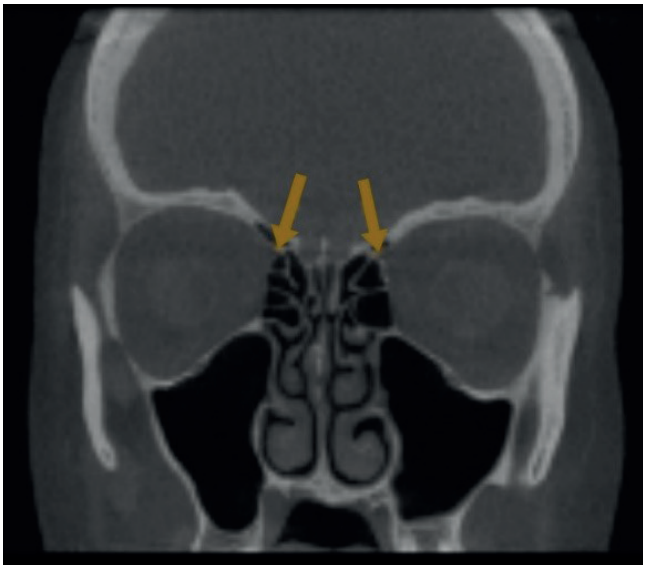

Figure 1: Anterior ethmoidal foramen.

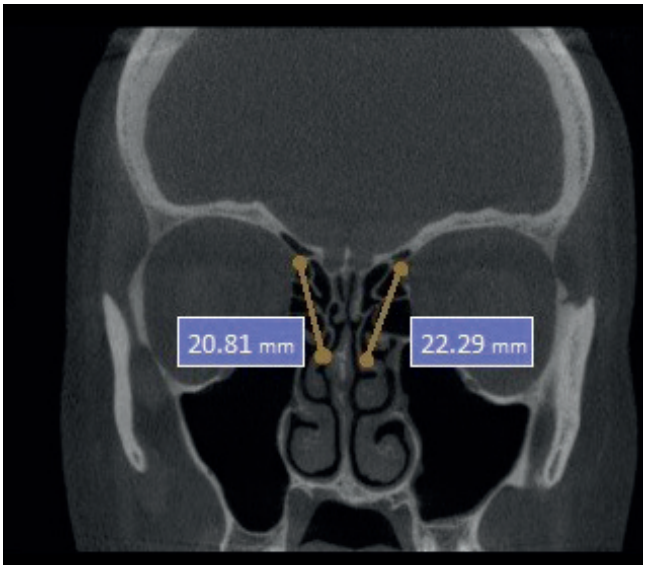

Figure 2: Measurement from the anterior ethmoidal foramen to the middle turbinate axilla.

es, regarding the distance measurement, the Student's t-test was used for independent samples. Comparison between the sides was made with the Student's t-test for paired samples. The condition of normality of the distance was evaluated by the Kolmogorov-Smirnov test. Data were analyzed using the IBM SPSS Statistics v.20.0. Armonk, NY: IBM Cor. computer program.

RESULTS

Of the 66 CT scans examined, 38 patients were male (57.57%) and 28 were female (42.42%). The mean age for males was 37 years, for females 38.1 years and the overall mean was 37.5 years (Table 1).

The mean distance between the AEA and the MTA in males was 23.9 mm on the right side and 24.0 mm on the left side. In females, the mean was 22.7 mm on the right side and 23.9 mm on the left side. There was no statistically significant difference between the sides when comparing the means for males and females (Table 2).

Table 1: Age distribution of patients.

SEX	MEAN ± SD	MEDIAN (min-max)
Male (N=38)	37,0 ± 15,5	34,5 (18 – 67)
Female (N=28)	38,1 ± 16,3	36 (18 – 70)
General (N=66)	37,5 ± 15,7	35 (18 – 70)

Table 2: Means of the distance from the AEA to the MTA according to laterality and sex.

	MALE (N=38)		FEMALE (N=28)		P* (male x fem)
	Median ± sd	Median (mín – máx)	Median ± sd	Median (mín – máx)	
RIGHT SIDE	23,9 ± 3,3	23,8 (18,8 – 31,0)	22,7 ± 2,8	22,9 (17,9 – 29,0)	0,116
LEFT SIDE	24,0 ± 3,0	23,6 (18,3 – 30,0)	23,9 ± 3,5	24,0 (17,4 – 30,8)	0,966
P** (right x left)	0,882		**0,007**		

Source: the author. *Student's t-test for independente samples, p<0,05. **Student's t-test for paired samples, p<0,05.

There was a statistically significant difference intra-individually between the means of the distance from the AEA to the MTA only for females. The right side has a lower mean for this sex (Fig 3).

In males, we detected a correlation between age and the mean distance from the

AEA to the MTA (p=0.004). In females, however, that correlation did not exist (p=0.110) (Fig 4).

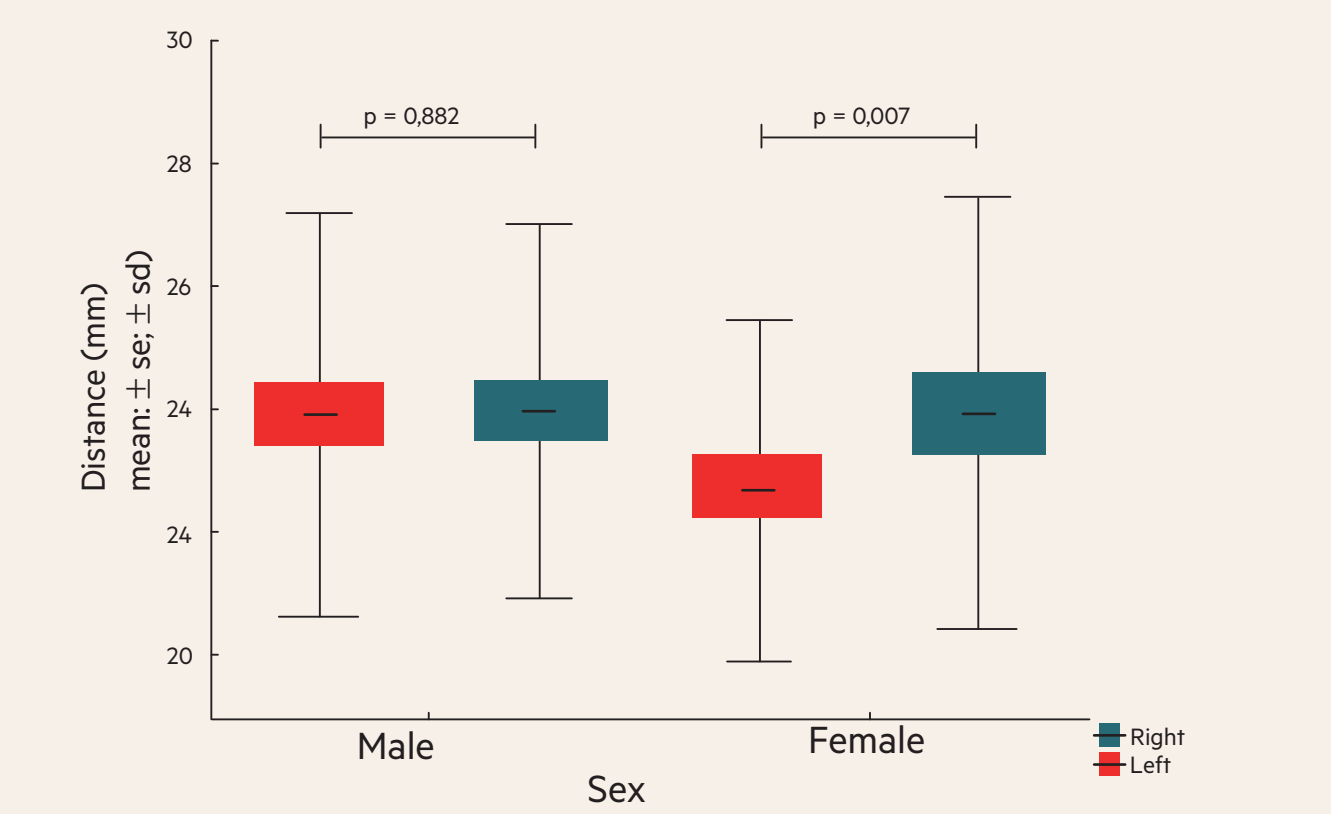

Figure 3: Comparison of the means of the distance from the AEA to the MTA according to laterality and sex.

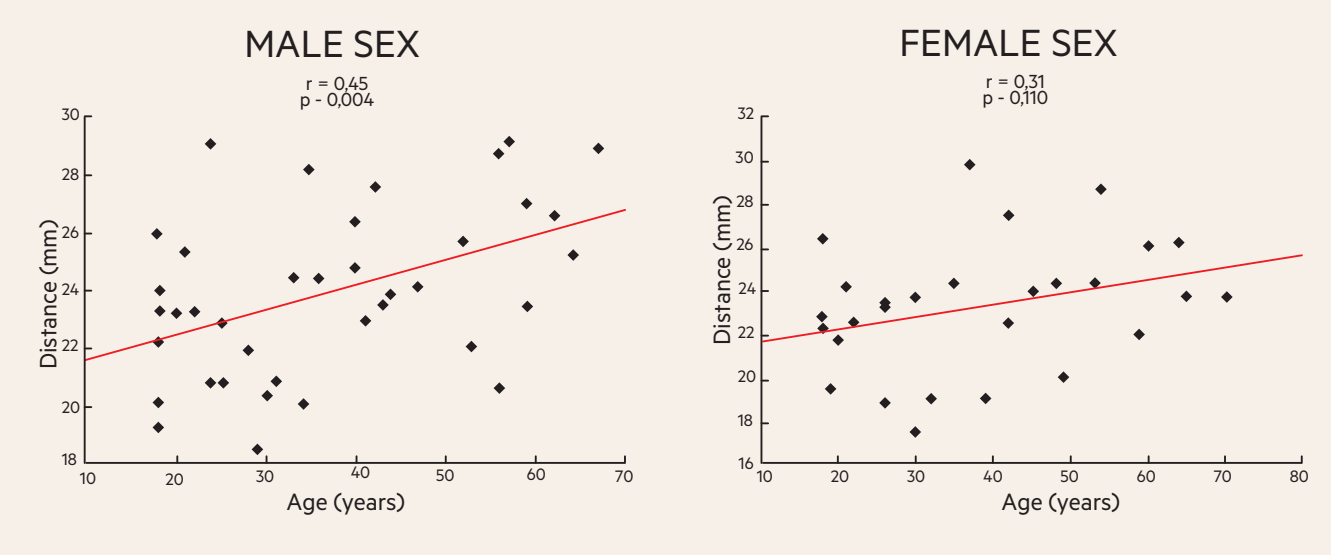

Figure 4: Correlation between sex and the mean distance between AEA and MTA.

DISCUSSION

The sinonasal endoscopic approach has become a widely accepted technique for chronic rhinosinusitis cases due to advances in the methods of imaging, endoscopes, surgical and technical instruments.[6]

Knowing the accurate location of the ethmoidal arteries is essential for a safe endoscopic surgery. Several types of surgery can correlate with those arteries, for instance, orbital trauma, medial transorbital approaches to the optic canal or anterior skull base, artery ligation in the treatment of epistaxis or for the resection of sinonasal tumors.[7]

According to Ferrari et al.[8], many studies have found large individual differences in the distance between endonasal structures, with wide anatomical variability of the ethmoidal arteries. Their identification should not depend only on intraoperative evaluation. The surgeon must locate the arteries with the help of simple coordinates on CT images and, when available, with a navigation system. This study provides the mean between the AEA and the MTA through the analysis of tomographic images in patients over 18 years old, while looking for preoperative parameters that would guide the surgeon during the endonasal procedure.

While assessing our results, we found the mean distance between the AEA and the MTA in males to be 23.9 mm on the right side and 24.0 mm on the left side. In females, the mean was 22.7 mm on the right side and 23.9 mm on the left side. Those values were close to the ones found by Filho et al.[5] who evaluated the measurement between the AEA and the MTA in 25 cadavers (10 males and 15 females) and found a value of 21.14 mm. This proximity shows that the tomographic measurement is useful when compared to the endonasal measurement. Filho et al.[5] state that the MTA is a reliable landmark for the location of the AEA, thus corroborating our hypothesis that this structure is an aid in endonasal surgeries.

While comparing the measurements between the right and left sides according to sex, we did not detect any statistical difference (Figure 3), though in the intra-individual evaluation, the female sex had a statistically significant difference with lower means on the right (Table 2). This diverges from the studies by Felding et al.[7] on orbital morphometry, which showed minimal differences between the sides; whereas in the evaluation according to sex, race and age those differences have been consistent, which highlights the importance of further studies to define those measurements.

Much like our results, Filho et al.[5] also showed no statistical difference in the measurement between the AEA and the MTA when comparing the sexes, but they describe that ethnicity and sex have been associated with anatomical differences related to the AEA.

We detected a correlation between age and the mean distance from the AEA to the MTA in males, while noticing a proportional increase in the distance with age. For females, however, there was no correlation (Figure 4). We did not find any data in the literature specifically showing this comparison, but Bortoli et al.[3], in their tomographic study with 300 patients, saw that patients aged between 4 and 12 years had significantly smaller measurements from the AEA to the ethmoid bulla, indicating that the process of paranasal sinuses growth happens in such a way that the distance from the AEA to the ethmoid bulla may continue to grow even after 12 years of age.

According to Felding, et al.[7], measurements on CT images may show more accurate distances, which are an aid to surgeons in endoscopic procedures. Though several factors are part of the AEA location, the MTA is a parameter that is easy to identify both tomographically and endonasally. With this study, we have contributed to increased anatomical knowledge on the relationship between the AEA and the MTA, while reducing the likelihood of injury to the former structure during endonasal surgeries.

CONCLUSION

The measurement evaluated in this study is easy to use in the routine of the ENT surgeon, given that CT scans are routinely performed and examined preoperatively.

With advances and innovations in endoscopic sinonasal surgery techniques we have featured another anatomical landmark to locate the AEA during endonasal procedures, while making them as safe as possible.

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I'd like to thank God, without whom nothing is possible. I'd like to thank the IPO Hospital for having trusted me to be part of this institution, and its entire team of collaborators, especially the Rhinology experts for their daily lessons. To my family, my safe haven.

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MAIN RISK FACTORS FOR THE TREATMENT OF EPISTAXIS AT IPO HOSPITAL SURGICAL CENTER

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ABSTRACT

Introduction: Epistaxis is considered one of the main emergencies within the specialty of otorhinolaryngology. It is estimated that 60% of the population has gone through or will go through at least 1 episode of epistaxis during their lifetime. Only 6%, however, require medical intervention. Still, in some cases the severity is such that patients require emergency intervention at risk of death. **Objectives:** Evaluate the main risk factors and identify the epidemiological profile - age, sex, comorbidities of patients with epistaxis who have required intervention in a surgical center. **Methodology:** This is a retrospective analytical study with a quantitative approach of patients treated in the emergency department of IPO Hospital, who required surgical intervention between January 1, 2020 and December 31, 2020. **Results:** A total of 58 medical records were reviewed according to inclusion and exclusion criteria, with 38 male patients (65.5%) and 20 female patients (34.5%). The age group of patients ranged from 10 to 88 years, the most prevalent being from 21 to 30 years, 22.4%. The predisposing factors were: recent nasal surgery (74.1%), systemic arterial hypertension (13.7%), coagulopathies (1.7%). The main procedures were: cauterization of the precise bleeding site (84.4%), cauterization of the sphenopalatine artery (10.3%) and cauterization of the anterior ethmoidal artery (5.3%). **Conclusion:** The main predisposing factors associated with epistaxis were nasal surgeries, systemic arterial hypertension and coagulopathies. Early intervention in a surgical center is indicated for patients with severe epistaxis and predisposing factors, while avoiding prolonged hospitalization and morbidities associated with nasal packing.

KEYWORDS

Epistaxis. Surgical center. Cauterization.

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2. Undergraduate student of medicine, Faculdade Pequeno Príncipe.
3. Otorhinolaryngologist, staff of the IPO Hospital Fellowship Program.

INTRODUCTION

Epistaxis is the most common emergency case within otorhinolaryngology.[1] It is estimated that it affects 60% of people during their lifetime, with only 6% of bleeding cases requiring medical attention. From an epidemiological perspective, it affects more males than females and it has a bimodal distribution, with most cases occurring before the age of 10 or between 70-79 years of age.[2]

The etiology is varied, and it can be post-traumatic, iatrogenic (nasal surgery or endoscopic procedures) and spontaneous, as a result of potential causal factors, such as local nasal factors (inflammation and infection), medication, as well as systemic factors, such as coagulation disorders, alcoholism, hereditary hemorrhagic telangiectasia and systemic arterial hypertension.[1]

In view of the clinical condition, we can classify epistaxis as anterior and posterior. Nearly 90% of epistaxis occur along the anteroinferior septal area, in the Kiesselbach's plexus or Little's area.[3] Those episodes of bleeding resolve spontaneously or require simple medical intervention for control, without the need for hospitalization.

The remaining 10% occur in the Woodruff's plexus caused by the sphenopalatine and posterior nasal arteries, the terminal branches of the internal maxillary artery, which supply blood to the lateral nasal wall below the middle turbinate, the rostrum of the sphenoid sinus, and the posterior nasal septum.[4] Bleeding from the posterior area is usually more voluminous and may cause hemodynamic complications and be potentially lethal.

A large number of epistaxis cases are associated with comorbidities, although local conditions such as digital trauma, foreign body, use of topical medication, illicit drugs, nasal trauma, septal perforation, rhinosinusitis and neoplasms are also frequently related. Systemic diseases associated with platelet and coagulation dysfunction should be investigated, including systemic arterial hypertension, genetic and acquired disorders, hematological neoplasms, liver or kidney disease, smoking and use of medications.[5]

Advances in endoscopic techniques and instrumentation have allowed fast and reliable ligation of the main arteries that irrigate the nasal mucosa, avoiding prolonged hospitalization and the morbidity sometimes associated with nasal packing.[1]

This paper aims to look at the main risk factors in patients with epistaxis who have required intervention in a surgical center and showed up at the emergency department of the Hospital studied.

MATERIALS AND METHODS

This is a retrospective analytical study with a quantitative approach of patients treated in the emergency department of IPO Hospital, who required surgical intervention between January 1, 2020 and December 31, 2020.

Inclusion criteria: all patients with a clinical diagnosis of epistaxis who underwent surgical treatment. Exclusion criteria: patients who did not require surgical treatment for epistaxis.

We selected the medical records based on the inclusion criteria. After that, sociodemographic aspects were examined (sex, age group, race/ethnicity, place

of residence), chronic diseases (systemic arterial hypertension, coronary artery disease, diabetes), use of medication (anticoagulants) and patients who had undergone nasal surgery in the previous week.

This study was approved by the Research Ethics Committee of the *Hospital Paranaense de Otorrinolaringologia* IPO, number 47197121.1.0000.5529.

RESULTS

A total of 58 medical records were examined according to inclusion and exclusion criteria, with 38 male patients (65.5%) and 20 female patients (34.5%) (Fig 1).

The age group of patients ranged from 10 to 88 years (39.6 ± 21.3 SD), with the most prevalent being from 21 to 30, 22.4% (n=13) and the least prevalent from 81 years of age onwards, 3.4% (n=2) (Table 1).

The predisposing factors were: recent nasal surgery 74.1% (n=43), systemic arterial hypertension 13.7% (n=8), coagulopathies 1.7% (n=1) and patients in which no predisposing factor was identified 8.6% (n=5) (Fig 2).

In 43 patients (74.1%), epistaxis was a postoperative complication of ENT surgery: endoscopic sinus surgery 32.7% (n=19), septoplasty associated with inferior turbinectomy 22.4% (n=13), septoplasty 13.7% (n=8) and rhinoplasty 1.7% (n=1) (Fig 3).

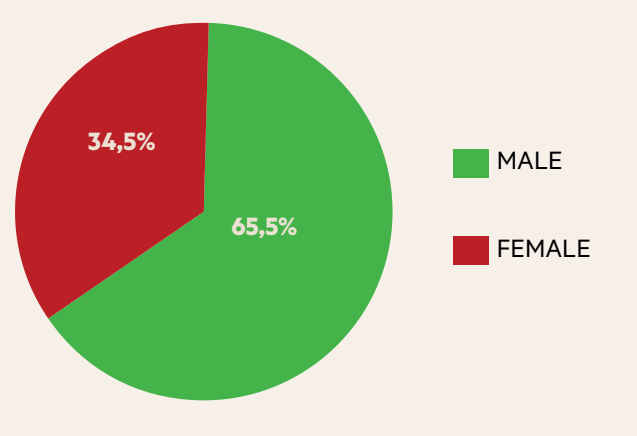

Figure 1: Distribution of patients according to sex

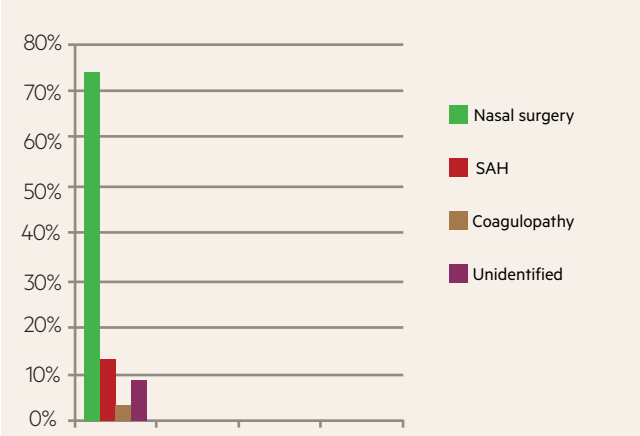

Figure 2: Prevalence of factors associated with epistaxis

Table 1: Distribution of patients according to age group

Age Group	N	%
10-20	12	20.6%
21-30	13	22.4%
31-40	11	18.9%
41-50	07	12%
51-60	03	5.1%
61-70	06	10.3%
71-80	05	8.6%
> 80	02	3.4%
Total	58	100%

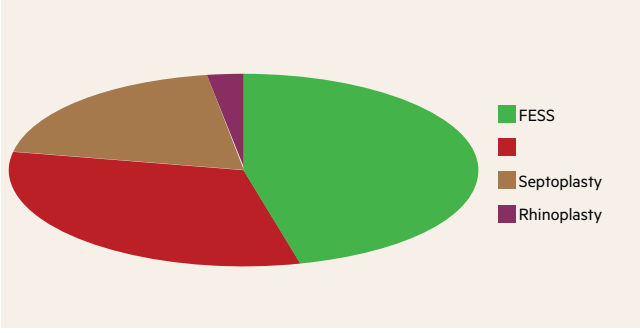

Figure 3: Distribution of epistaxis related to post-surgical procedures.

All the patients investigated in this study were refractory to clinical treatment and were referred to the surgical center for definitive treatment. There, the following procedures were performed: cauterization of the precise bleeding site 84.4% (n=49), cauterization of the sphenopalatine artery 10.3% (n=6), cauterization of the anterior ethmoidal artery 5.3% (n=3) (Table 2).

Table 2: Procedures performed in a surgical center for refractory epistaxis

Procedure	N	%
Simple cauterization	49	84.4%
SPA cauterization	6	10,3
AEA cauterization	3	5.3%
Total	58	100%

No patient had complaints or significant complications related to cauterization or vascular ligation.

DISCUSSION

Epistaxis can occur as a severe condition that requires hospitalization in some cases. It affects all age groups, and it occurs more frequently in male patients and in the elderly.[6] In our study, however, the most prevalent age group was from 21 to 30 years old (22.4%), and males.

According to data from the literature, the main cause of epistaxis is local trauma.[7] In our sample, however, 74.1% of the cases were related to postoperative complications of ENT surgery. This high prevalence related to postoperative cases is primarily due to the fact that the vast majority of cases of external trauma or polytrauma are not referred and followed up in our otorhinolaryngology care. This would proportionally increase the prevalence of epistaxis due to other causes. Also, because it is a tertiary service with high surgical demand, and with an in-service training system for physicians in the fellowship program within the specialty.

Still regarding cases of postoperative epistaxis, the main procedure was due to endoscopic sinus surgery (32.7% of the cases), possibly due to incomplete cauterization of parts more prone to postoperative bleeding, and also given that the study was performed in a reference hospital, where more complex surgeries are performed with greater manipulation of surgical focuses.

Another factor that has been widely discussed as a cause of epistaxis is the presence of systemic arterial hypertension (SAH). However, more recent studies in the literature show that there is little correlation between SAH and epistaxis. Even though we found a positive history of SAH in 13.7% of the patients, most of them did not have high blood pressure levels at the time of bleeding that would justify the severity of the epistaxis.

Some studies show that severe bleeding may be associated with coagulopathy, but the alterations are more frequent in patients with the use of acetylsalicylic acid and non-steroidal anti-inflammatory drugs, which alter arachidonic acid metabolism and platelet function, while predisposing to bleeding.[8] In this study, none of the patients used those medications.

Only one patient had blood dyscrasia, called von Willebrand disease (vWD) when there is a change in coagulogram with increased bleeding time, factor VIII deficiency and decreased platelet adhesiveness.

In our service, we try to guide the control of epistaxis towards the topography of the bleeding site. When there is the possibility of identifying a specific focus of hemorrhage, we opt for simple electrocauterization of the bleeding point, which was observed primarily in cases of epistaxis occurring in the immediate postoperative period. When bleeding is more profuse and diffuse or difficult to locate, we recommend ligation of the terminal irrigation arteries of the nasal cavity (such as branches of the sphenopalatine artery and anterior ethmoidal artery).

These data enable us to conclude that patients with bleeding in the immediate postoperative period should be examined and observed more rigorously, as they have a greater chance of surgical intervention.

In severe cases and at risk of hemodynamic instability, indications for earlier surgery could reduce the need for blood transfusion.

None of the patients had complaints or complications related to the surgical procedure to control epistaxis, which shows that this is a very safe method.

CONCLUSION

The main predisposing factors associated with epistaxis were nasal surgeries, systemic arterial hypertension and coagulopathies. Early intervention in the surgical center is indicated for patients with severe epistaxis and predisposing factors, while avoiding prolonged hospitalization and morbidities associated with nasal packing.

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ANALYSIS OF THE EFFECT OF ARNICA MONTANA ON EDEMA AND ECCHYMOSIS IN RHINOPLASTY

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Marina Serrato Coelho **FAGUNDES**[2]

ABSTRACT

Introduction: Edema and ecchymosis are the two most common complications that occur in the immediate postoperative period after rhinoplasties. *Arnica montana* is a homeopathic medicine used in wound healing and to improve edema and ecchymosis. The purpose of this study is to compare the benefit of *Arnica montana* used topically with the oral route after rhinoplasty. **Methods:** In this clinical trial, study subjects were divided into three groups. The first group received topical *Arnica montana* gel, the second group received it orally, and the third was the control group. Patients had photographs taken to analyze the edema and ecchymosis on the 1st and 7th postoperative days. The photographs were analyzed by two peer reviewers, who classified the edema and ecchymosis in degrees. **Results:** The mean age was 27.08 years, ranging from 16 to 53 years old. Female individuals predominated. For the two variables analyzed (edema and ecchymosis), results indicate there is no significant difference between the groups at both assessment times. **Conclusion:** In our prospective study, we found no significant differences between patients who underwent rhinoplasty who received the perioperative homeopathic medicine *Arnica montana* orally and topically from those in the control group.

KEYWORDS

Rhinoplasty. Arnica montana. Ecchymosis. Edema.

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INTRODUCTION

According to De Vasconcellos et al.[1], rhinoplasty is a surgery indicated to improve nasal aesthetics and function. It is a very popular cosmetic procedure and is one of the main facial cosmetic surgeries performed in the world, as reported by Koybasi et al.[2]. According to Tunkel et al.[3], it is the most common facial plastic surgery in Latin American countries. The procedure directly impacts patient satisfaction with their self-image and self-esteem, and surgical success depends on many aspects from a technical and patient satisfaction viewpoint, according to Koybasi et al.[2]. Given the increasing numbers of rhinoplasties performed, it is important to reduce surgical morbidity, promote appropriate therapy, involve the patients under care, and coordinate care effectively.[4]

Lee et al.[5] described that the complication rate regarding soft tissue occurs in 10% of the cases, leading to a lower patient satisfaction rate in comparison to other aesthetic procedures. Edema and ecchymosis are the two most common complications that occur in the immediate postoperative period, according to Mehdizadeh et al.[6]. Saedi et al.[7] show that these changes can cause anxiety for patients and doctors alike. They may also be relevant in deciding whether or not to perform the procedure, as well as for its postponement, as shown by Simsek et al.[8]. The degree of edema and ecchymosis can be influenced by several factors, such as the patient's coagulation status, surgical procedure, duration of surgery, preoperative therapies, and the presence of osteotomies.[9]

Lee et al.[5] inform us that numerous studies aim to analyze the improvement in edema and ecchymosis since the 1950s, and their results are controversial. Mehdizadeh et al.[6] cite some alternatives in the improvement of edema and ecchymosis already studied. Examples are intraoperative hypotension, head-of-bed elevation postoperatively, ice bags, medications such as corticosteroids, decongestants, tranexamic acid, and herbal agents such as Arnica montana. The type of osteotomy and open or closed access also influence improvement, according to Tatar et al.[9].

As stated by Chaiet and Marcus[10], *Arnica montana* is a homeopathic medicine used since the 16th century to wound healing and improve ecchymosis. It is extracted from dry extracts that are members of the Compositae family, found mainly in Siberia and Central Europe.

As a homeopathic medication, *Arnica montana* has no defined mechanism of action nor drug profile. It is supposedly anti-inflammatory, and has antiseptic and vasodilatory properties.[11] It has also been suggested that *Arnica montana* can modulate histamine release in the vascular endothelium and cell walls and may affect vascular permeability. Furthermore, constituents of *Arnica montana* have been described as inhibitors of human thromboxane formation and induction of collagen and platelet function.[12] However, convincing evidence of the pathophysiological mechanism that explains the effect of *Arnica montana* has not yet been established.[12] Despite the inexact mechanism, the American Society of Plastic Surgeons considers its use safe, with no reports of toxicities related to homeopathic dosage.[10] The studies on *Arnica montana* are currently controversial; positive effects have been reported when used in osteoarthritis and postoperative inflammation, but no significant effects have been seen on hematomas after saphenous vein resection.[11]

The present study aims to compare the benefits of *Arnica montana* used topically with using it via the oral route to know the effectiveness in the prevention of ecchymosis and edema in rhinoplasty's postoperative period. So far, there is no comparison between the two presentations of *Arnica montana* in a single study.

MATERIALS AND METHODS

The present study is a single-blind clinical trial in which, after researchers obtained approval from the ethics committee, 15 patients who would undergo primary rhinoplasty were selected. Study subjects were divided into three groups through a random draw. Each group had 5 patients. The first group received topical *Arnica montana* gel 200 mg/g 5 days before surgery and continued using it for 7 days after. The second group received *Arnica montana* 200 mg orally, 2 cp 8/8 hours, also for 5 days before and 7 days after surgery. The third group did not receive homeopathic medication, being the control group.

All selected patients underwent primary rhinoplasty, using the closed technique, with lateral osteotomies, under local anesthesia with sedation, and surgery duration of less than 4 hours. Smokers; and patients using anticoagulants, ginkgo biloba, omega-3, or other medication that alters coagulation were excluded.

All three groups received standard postoperative medications such as antibiotics, corticosteroids, analgesia, and topical intranasal medications.

After surgery, patients had their photographs taken, in the front and profile positions, one day and seven days after surgery (after removing the bandage). Examples of photographs are shown in Figure 1.

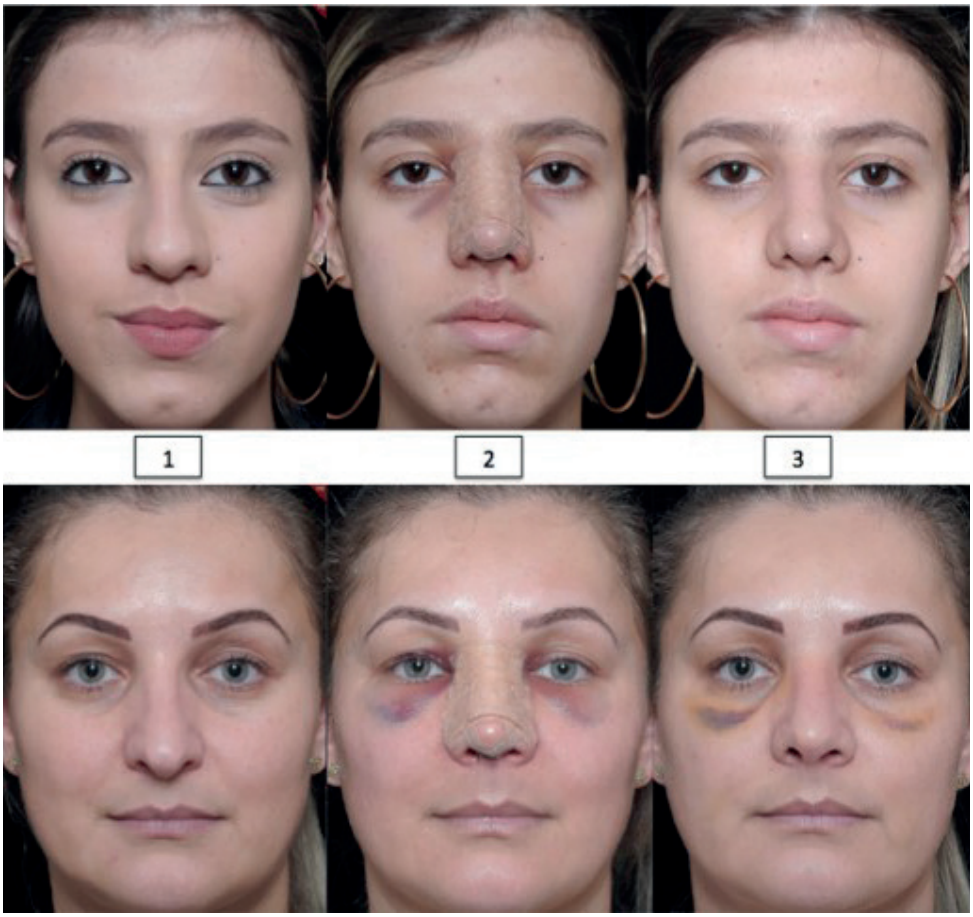

Figure 1: Photographic analysis – 1: Preoperative care; 2 – Day 1 post-op; Days 3–7 post-op.

Photographic analysis was performed by two peer reviewers and classified according to the scale for edema and ecchymosis. The ecchymosis was graded in 3 degrees: Grade 1 – one-third of the lower or upper eyelid; grade 2 – two-thirds of the lower or upper inner eyelid; grade 3 – entire lower or upper eyelid (Fig 2). Edema was classified into 4 degrees: Grade 1 – The iris is not covered by the eyelid; Grade 2 – part of the iris is covered by the eyelid, Grade 3 – complete coverage of the iris with eyelid flap, and Grade 4 – complete eye closure (Fig 3).

The results of the edema and ecchymosis assessments (degrees) were described by medians and minimum and maximum values. For the comparison of groups defined by treatment, the non-parametric Kruskal-Wallis test was used. Comparisons between the two assessment times (Day 1 PO [postoperative] and Day 7 PO) were made using the non-parametric Wilcoxon test. P-values <0.05 indicated statistical significance.

The present study was duly approved by this hospital's Research Ethics Committee under protocol number CAAE 94695518.2.0000.5529.

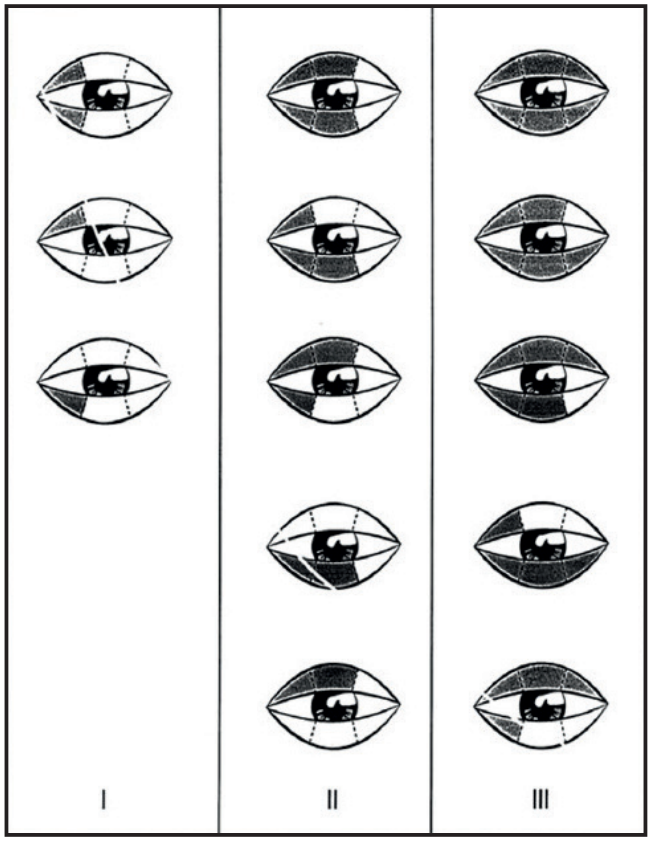

Figure 2: Extension of ecchymosis. SOURCE: Ghavimi et al.[13]

RESULTS

Demographics:

Patients were allocated into the control, topical arnica, and oral arnica groups; each had a total of 5 patients. The patients were 10 female and 5 male individuals. The distribution in the groups is shown in Table 1.

Regarding the age group, the patients had a mean age of 27.08 years, ranging from 16 to 53 years old. The distribution of the mean age in the groups is described in Table 2.

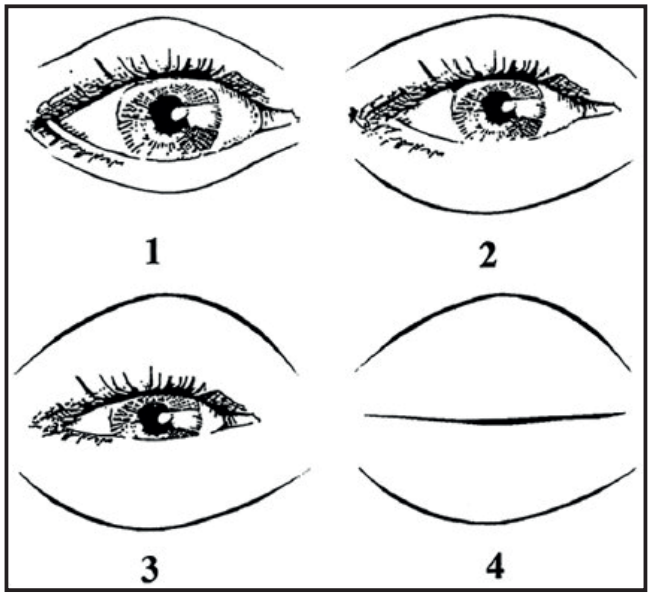

Figure 3: Extension of edema. SOURCE: Ghavimi et al.[13]

Table 1: Distribution by gender.

Sex	Group		
	Control	Topical Arnica	Oral-route Arnica
Female	3	4	3
	60%	80%	60%
Male	2	1	2
	40%	20%	40%
Total	5	5	5

Table 2: Distribution by age

Group	Age (in Years)	
	n	Mean ± Standard deviat. (min – max)
Control	5	21,2 ± 4,8 (17-29)
Topical Arnica	5	24,4 ± 8,6 (16-38
Oral-route Arnica	5	31,4 ± 13,2 (22-53)

Assessment of edema and ecchymosis:

For this analysis, the means of the results of the two reviewers' assessments were considered. Initially, for each of the variables (edema and ecchymosis), at each of the assessment times (day 1 PO and day 7 PO), the null hypothesis that the results are the same in the 3 groups was tested, versus the alternative hypothesis that the results are not equal in the 3 groups.

Then, within each group, the null hypothesis that the results are the same at the 2 assessment times was tested, versus the alternative hypothesis of different results.

Table 3 shows the median values, minimum values, and maximum values of the edema and ecchymosis assessments, by group and assessment times. The p-values of the statistical tests are also shown.

For the two variables analyzed (edema and ecchymosis), results indicate there is no significant difference between the groups at both assessment times.

The dotplot graph (Fig 4) shows the frequency of each level of edema and ecchymosis by group.

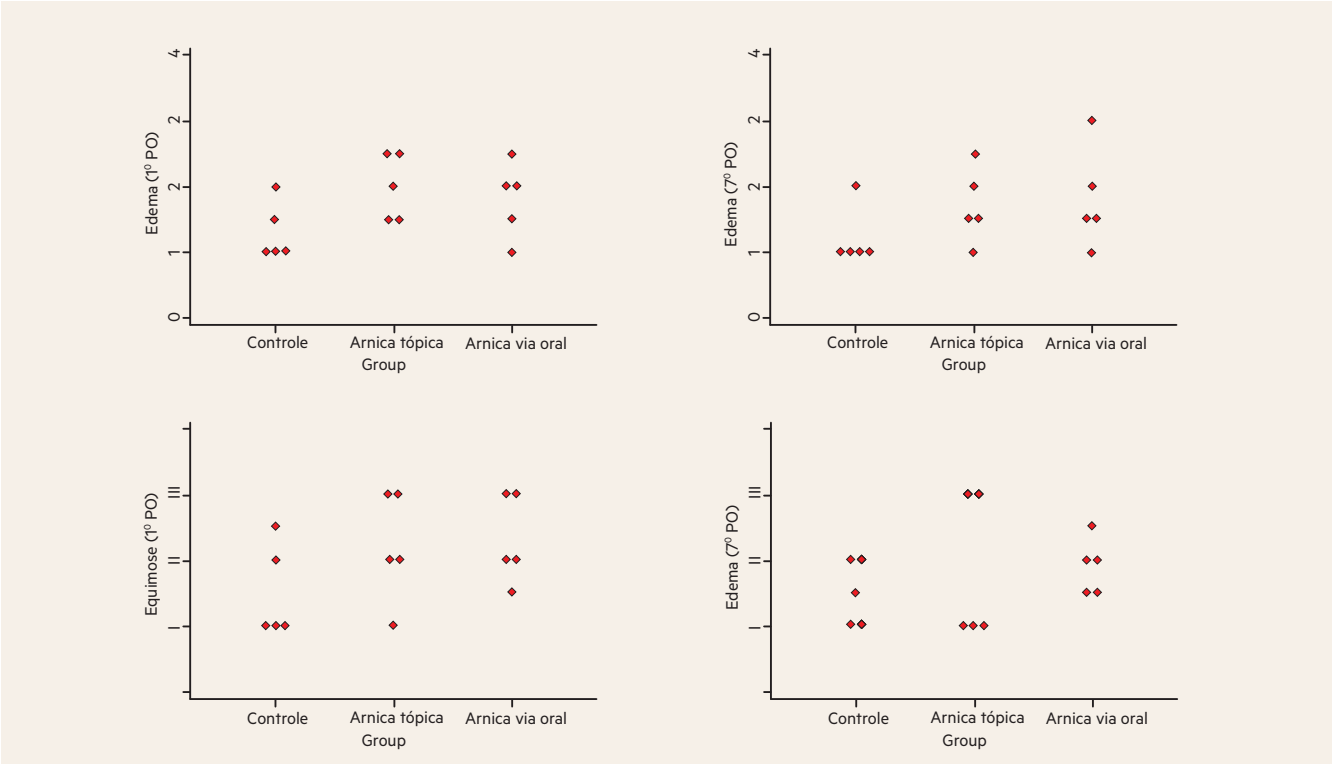

Figure 4: Dotplot.

Table 3: Edema and ecchymosis analysis

Variable	Assessment	Grupo			
		Control Median (min-max)	Topical Arnica Median (min-max)	Oral-route Arnica Median (min-max)	P* (control x arnica x via oral
Edema	1º PO	1 (1-2)	2 (1,5-2,5)	2 (1-2,5)	0,126
	7º PO	1 (1-2)	1,5 (1-2,5)	1,5 (1-3)	0,199
	P** (1º PO x 7º PO)	-	0,109	-	
Ecchymosis	1º PO	1 (1-2,5)	2 (1-3)	2 (1,5-3)	0,226
	7º PO	1,5 (1-2)	1 (1-3)	2 (1,5-2,5)	0,574
	P** (1º PO x 7º PO)	-	-	0,345	

*Kruskal-Wallis. non-parametric p<0,05. **Wilcoxon. non-parametric test. P<0,05.

DISCUSSION

There is no common consensus on the decrease of ecchymosis and edema after rhinoplasty. However, it is known that a swift postoperative decrease in ecchymosis and ecchymosis is important for patients to come back to their social life sooner.[9] Although the natural healing history after rhinoplasty surgery typically involves bruising for 1 to 2 weeks, patients and medical doctors are searching for ways to cause less postoperative ecchymosis and hasten its resolution.[10]

Studies look at many different methods to reduce postoperative edema and ecchymosis, such as steroids, decongestants, various surgical techniques, and different approaches to lateral osteotomy.[9]

Regarding studies that used *Arnica montana* for improvement of edema and ecchymosis in plastic surgery, Kotlus et al.[14] used this drug in patients undergoing blepharoplasty and observed that there was no statistical difference compared to placebo. *Arnica montana* was used orally and compared with placebo. The authors suggest that surgeons continue to seek methods of controlling the body's response to trauma, especially the ones of an iatrogenic nature.

Trial[15] assessed the use of *Arnica montana* orally after rhytidectomy, and found no subjective differences between patients receiving the homeopathic *Arnica montana* perioperatively and those who received a placebo. Objectively, they found no significant difference in the degree of ecchymosis, measured by the extent of the color change found. However, a smaller area of ecchymosis was found in relation to the placebo group between day 1 and day 7 PO but not on day 5 and day 10 PO.

Simsek et al.[8] conducted a study that compared the use of *Arnica montana* with mucopolysaccharide polysulfate after rhinoplasty, both used topically. It showed improvement in edema and ecchymosis compared to placebo with statistical significance. They justify this improvement, as it was previously demonstrated that arnica was able to modulate the onset of acute inflammation in rats by reducing edema and local blood flow. Also, mucopolysaccharide polysulfate has anti-inflammatory properties by inhibiting the production of inflammatory cytokines.

Totonchi and Guyuron[16] performed a comparison between the use of *Arnica montana* orally, intra and

postoperative corticosteroid therapy, and placebo in post-rhinoplasty patients. The results of the study shown that there was no difference between the patients who received arnica and the control patients in terms of the extent and intensity of ecchymosis. However, they had significantly less edema compared to the control group during the immediate postoperative period.

Lee et al.[5] conducted a meta-analysis in which they assessed studies that used *Arnica montana* orally and cold compresses, among other resources for the improvement of edema and ecchymosis. As for the use of Arnica montana, there was an improvement in both edema and ecchymosis in the postoperative period, with significance in relation to placebo. They justify that it is effective in the treatment of several conditions including post-traumatic and postoperative pain, edema and ecchymosis. They report that it is well-established that the *Arnica montana* inhibits the release of histamine in mast cells, neutrophil elastase and NF-κB, which are part of the inflammatory cascade. However, they suggest more rigorous studies.

Chaiet and Marcus[10] performed the comparison between *Arnica montana* and the control group. They analyzed edema and ecchymosis after three postoperative days, and there was a statistical difference between the two groups. It suggests there are benefits of *Arnica montana* compared to placebo.

In the present study, we compared the use of *Arnica montana* orally and topical *Arnica montana* with the control group. The analysis of those two ways of presenting *Arnica montana* were not analyzed together in any study prior to this one.

In the analysis of our sample, no statistical difference was observed between the analyzed groups. The reason for this can be commonly seen due to variation related to intrinsic and extrinsic factors, such as anatomical variances and dietary differences. Moreover, different subjects may have varying responses to pharmacologic agents and herbs due to genotypic differences. Although some studies, such as that of Simsek et al.[8], Lee et al.[5] and Chaiet; Marcus,[10] have shown benefits in improving edema and ecchymosis using Arnica montana, our study showed no benefits, in agreement with studies by Kotlus et al.[14], Trial[15] and Totonchi; Guyuron.[16]

CONCLUSION

In our prospective study, we found no significant differences between patients who underwent rhinoplasty receiving the perioperative homeopathic medicine *Arnica montana* orally and topically when compared with the control group. For the future, further studies with larger numbers of patients are needed to reaffirm this information.

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STUDY OF THE HEIGHT MEASUREMENT OF THE SUPERIOR NASAL CONCHA IN RELATION TO THE SKULL BASE IN PATIENTS WHO UNDERWENT ENDOSCOPIC NASAL SURGERY AT IPO HOSPITAL

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ABSTRACT

The nasal conchae are able to increase the volume of the nasal mucosa and regulate the respiratory flow. In embryology, while the inferior turbinate is a separate structure, the middle, superior, and supreme turbinates originate from the uppermost portion of the septum. In surgical access to the posterior sinuses, especially the sphenoid sinus, and in the access to the skull base, the identification of the superior turbinate is very important, as this structure is connected superiorly to the skull base and is in front of the anterior wall of the sphenoid sinus. Based on this premise, in this study we investigated the measurement of the height of the superior nasal concha in relation to the skull base, in the intraoperative period and CT scans of facial sinuses, in 20 patients who underwent endoscopic nasal surgery at the IPO Hospital. Then, we averaged and compared those data. We concluded that tomographic measurements do not adequately predict intraoperative measurements. Therefore, we must consider the mean intraoperative measurement of the height of the superior nasal concha in relation to the skull base as an important parameter in order to avoid complications during the surgical procedure — an unprecedented data in the medical literature to date.

KEYWORDS

Superior nasal concha. Skull base. Endoscopic nasal surgery.

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INTRODUCTION

Nasal anatomy plays a significant role in the physiology of the nose. The structures in the nasal walls affect the air currents in the nasal cavity.[1] The three nasal conchae are attached to the lateral wall of this cavity. They are able to increase the volume of the nasal mucosa and regulate the respiratory flow. They are related to several functions, including olfaction, humidification, lubrication of the upper airways, regulation of airflow and temperature, as well as filtration. Their position and relation to other anatomical landmarks is extremely important, especially in non-invasive endoscopic skull base surgery and otorhinolaryngological (ENT) surgical procedures.[2] In embryology, while the inferior turbinate is a separate structure, the middle, superior, and supreme turbinates originate from the uppermost portion of the septum. The superior turbinate belongs to the ethmoid bone. Usually, it is about half the length of the middle turbinate.[3] The drainage ostium of the sphenoid sinus is located medially to the superior turbinate, which is an important anatomical reference point for performing the approach to the sphenoid sinus. Therefore, the superior turbinate serves as an essential landmark during endoscopic posterior ethmoidectomy and sphenoidectomy surgery.

The superior nasal concha may undergo a rare anatomical variation becoming bullous, which may cause cephalalgia due to increased contact with the nasal mucosa and hyposmia/anosmia due to obstruction of the olfactory cleft.[4,5] Knowledge of the anatomical variants will influence directly the success of diagnostic and therapeutic management of paranasal sinus diseases.

The superior turbinate is difficult to identify with nasal endoscopy, and a computed tomography (CT scan) of the face is necessary when there is surgical interest.[6] This anatomical structure of the nose, besides having a nasal-sinus physiological function, is of important knowledge for otorhinolaryngologists and neurosurgeons alike, especially for accessing the skull base. Therefore, the correct location of the superior concha must be recognized, thus avoiding complications such as cerebrospinal fluid (CSF) fistulas and hyposmia, depending on its handling during the surgical procedure.[7]

In our study, as a primary objective, we measured the height of the position of the superior nasal concha on the lateral wall of the nose cavity in relation to the skull base, in the intraoperative period, using a millimeter ruler. As a secondary objective, we measured the height of the position of the superior nasal concha on the lateral wall of the nose cavity in relation to the skull base on CT scans of the paranasal sinuses.

MATERIALS AND METHODS

A prospective experimental study was conducted. In it, 20 patients who underwent endoscopic nasal surgery at IPO Hospital from May to August 2018 were assessed.

The height of the position of the superior nasal concha on the lateral wall of the nasal cavity in relation to the skull base in the intraoperative period was measured (Fig 1).

Next, the height of the position of the superior nasal concha on the lateral wall of the nasal cavity in relation to the skull base in CT scans of the paranasal sinuses (Fig 2) was measured. For intraoperative measurement, a millimeter ruler (Fig 3) sterilized according to norms set forth by health surveillance authorities was used.

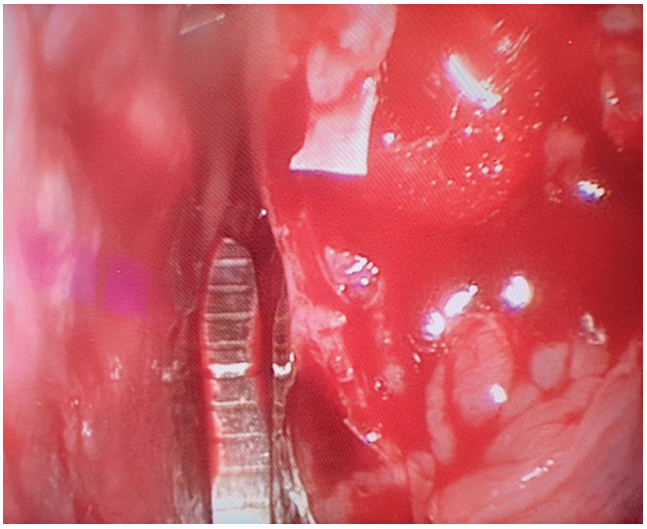

Figure 1: Intraoperative measurement of the height of the position of the superior nasal concha on the lateral nasal wall in relation to the skull base (left nasal cavity).

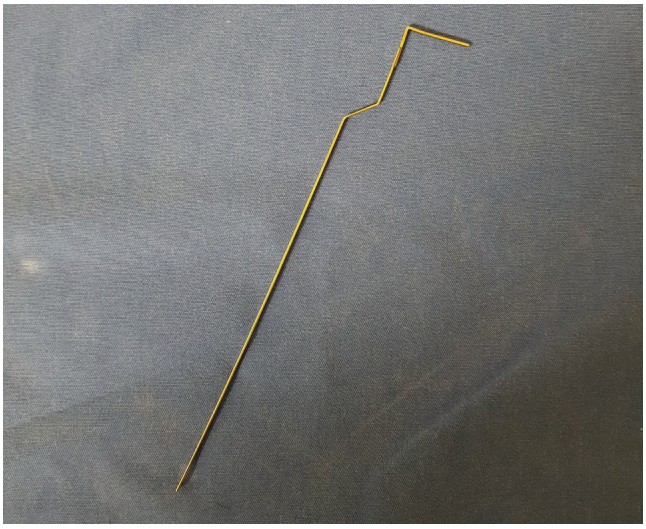

Figure 3: Millimeter ruler used for intraoperative measurement.

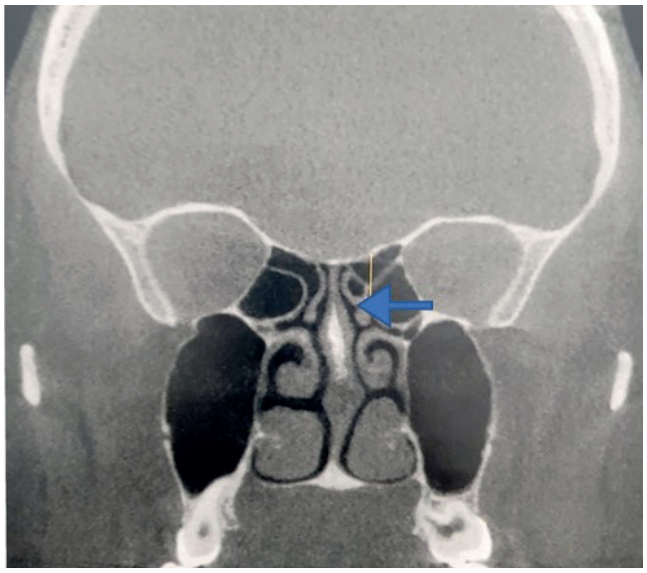

Figure 2: Tomographic (CT measurement) of the height of the position of the superior nasal concha on the lateral wall of the nasal cavity (blue arrow) in relation to the skull base

Subsequently, evaluation, statistical results, and comparison of the data collected were carried out.

The measurement results were described by means, medians, minimum values, maximum values, and standard deviations. Student's t-test for independent samples was used to compare the intraoperative measurements with the tomographic measurements. The evaluation of the association between the two measurements was performed by estimating Pearson correlation coefficients. P-values <0.05 indicated statistical significance. Data were analyzed using the computer program IBM SPSS Statistics v.20.0. Armonk, NY: IBM Corp.

Patients of both genders, aged 18 to 65 years, with an indication for endoscopic nasal surgery were included in the study. An informed consent form was handed out to all study subjects. Excluded from the study were: Patients who during the intraoperative period were identified as having an absent superior turbinate, either due to previous endoscopic nasal surgery or for any other associated reason, patients who did not return for follow-up, and other conditions considered by the investigating physician as reasonable for disqualifying the individual from being a subject in the study.

This study was approved by the Human Research Ethics Committee of the Instituto Paranaense de Otorrinolaringologia (IPO), under the Certificate of Ethical Approval (CAAE, for its acronym in Portuguese) No. 91702518.4.0000.5529.

RESULTS

The analysis shown below was performed using data from 20 patients, measured by both CT scans of the facial sinuses and during surgery, concerning the position of the superior concha on the lateral wall of the nasal cavity in relation to the skull base. Measurements were taken on the right and left sides.

Initially, for each side, the null hypothesis was tested that the mean of intraoperative measurements is equal to the mean of CT measurements, versus the alternative hypothesis of different means. Table 1 shows descriptive statistics of the measurements in millimeters according to the side and the measurement method. The p-values of the statistical tests are also shown.

Statistical tests showed that there is no significant difference between right and left sides upon comparing them.

Then, for each side, the null hypothesis was tested that the correlation coefficient between the intraoperative measurement and the CT measurement is equal to zero (there is no correlation between the two measurements), versus the alternative hypothesis that the correlation coefficient is different from zero (there is correlation between the two measures).

Table 1: Descriptive statistics of measurements in millimeters according to the side and the measurement method.

Variable	n	Mean	Median	Min	Max	Stand. Dev.	p*
Right Nasal Cavity INTRAOP	20	12,0	12,0	10,0	15,0	1,7	0,693
Right Nasal Cavity CT SCAN	20	11,8	11,7	9,0	14,1	1,2	
Left Nasal Cavity INTRAOP	20	12,0	12,0	9,0	16,0	2,0	0,737
Left Nasal Cavity CT SCAN	20	11,8	11,6	10,0	14,1	1,0	

*Student's t-test for paired samples, p < 0.05

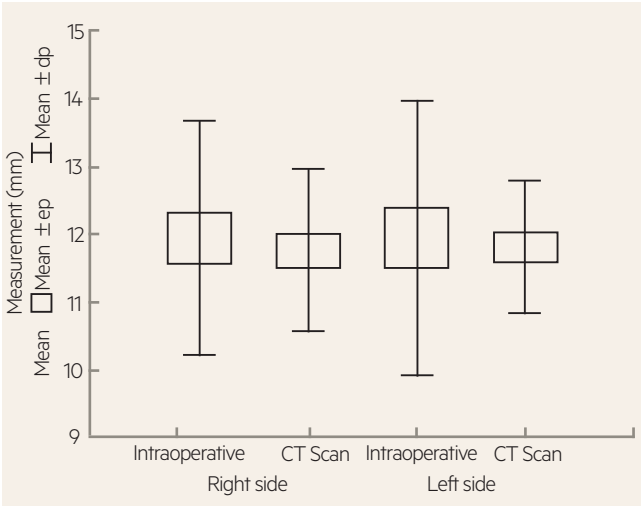

Figure 4: Mean in mm of tomographic (CT) and intraoperative measurements of both nasal cavities.

Right side: The estimated Pearson's correlation coefficient was equal to 0.01, with no statistical significance (p=0.979). It indicates that there is no significant correlation between the two measurements.

In Figure 5 (dispersion plot), the coordinates of each point correspond to the two measurements of each patient (20 points). It can be observed that there is no linear outline of the points, that is, based on the CT results, we cannot accurately estimate the results of intraoperative measurements.

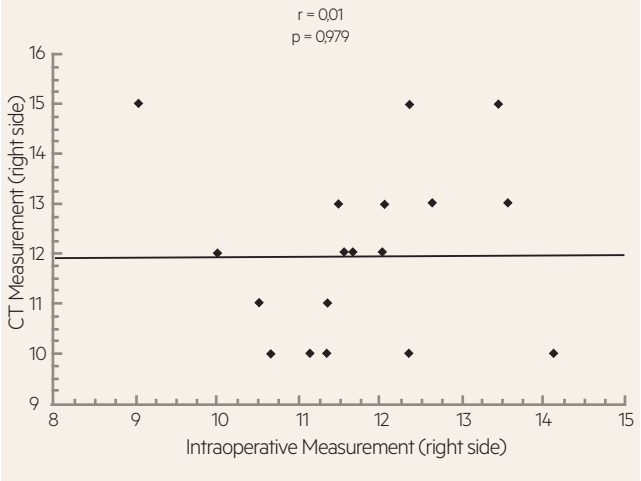

Figure 5: Scatter plot showing the correlation between CT and intraoperative measurements on the right side of the nasal cavity.

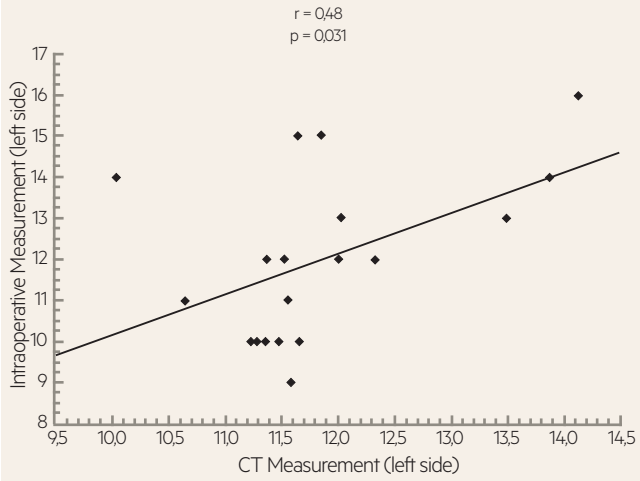

Figure 6: Scatter plot showing the correlation between CT and intraoperative measurements on the left side of the nasal cavity.

Left side: The estimated Pearson correlation coefficient was equal to 0.48, with statistical significance (p=0.031). It indicates there is a significant correlation between the two measurements; however, the correlation is weak.

In Graph 3 (scatter plot) the coordinates of each point correspond to the two measurements of each patient (20 points). It is observed that there is a linear outline of the points but the points are quite dispersed around this line.

When fitting a linear regression model, the equation of the estimated line is:

Measurement of nasal cavity - intraoperative (estimated) = 0.3344 + 0.9832 (measurement of nasal cavity - CT scan)

The coefficient of determination for that fit

is equal to 23%. The result indicates that only 23% of variations in intraoperative measurement are explained by variations in CT measurement.

DISCUSSION

The nose is an organ with multiple functions, that should be carefully preserved or improved in any surgical modification while maintaining a balance between its form and function.[8]

Knowledge of the nasal-sinus anatomy and its anatomical variants is paramount for an adequate surgical procedure. The nasal turbinates — like the paranasal sinuses, which arise from the cartilaginous nasal capsule -, may undergo important anatomical variations. Those variations can lead to cases of recurrent rhinosinusitis, mainly due to obstruction of the ostiomeatal complexes, and also to cases of rhinogenic headache.[2]

The superior concha is a small bony projection on the lateral wall of the nose.[1] It forms the upper boundary of the superior meatus and contributes to forming the sphenoethmoidal recess.[9] Hence, it plays a significant role in draining the ethmoidal and posterior sphenoid sinuses. The location of this structure does not

change considerably, regardless of gender or race. The main anatomical alteration happens when it becomes bullous.[7] Therefore, we consider the anthropometric measurement of its size to be of great importance, mainly to avoid complications and guide surgeons in their proposed objective.

When surgically accessing the posterior sinuses, especially to the sphenoid sinus, and in the access to the skull base, identifying the superior turbinate is essential, regardless of whether it is a transethmoidal or transanal approach, due to the fact that the superior turbinate is connected superiorly to the skull base and it is in front of the anterior wall of the sphenoid sinus.[3] Identifying this structure properly, knowing precise information about it, helps to prevent complications during surgery, such as CSF fistulas.

Considering figures 5 and 6 and analyzing the results obtained, it can be said that, on average, intraoperative measurements do not differ significantly from CT measurements. Although the linear correlation between measurements was statistically significant (r=0.48; p=0.031), it was identified that only 23% of variations in intraoperative measurements are explained by CT measurements. It is a result that would lead to a prediction model with a significant uncertainty in the estimation of the intraoperative measurement based on CT measurement.

Table 1 and Figure 4 show the mean intraoperative measurement of the height of the insertion of the superior nasal concha in relation to the skull base on the right (12 mm) and left (12 mm) sides. To date, there is no comparative data in the medical literature that evaluates this distance and makes a correlation analysis similar to the one presented in this study. Therefore, we consider the data relevant and that it will help surgeons during endoscopic nasal surgery, especially in accessing the posterior sinuses and skull base, thus contributing to preventing surgical complications.

CONCLUSION

Considering the results shown, it can be said that tomographic (CT) measurements do not properly predict the intraoperative measurements of the height of the insertion of the superior concha on the lateral wall of the nasal cavity in relation to the skull base. Therefore, we should consider the mean of the intraoperative measurement as an important parameter in order to avoid complications during the surgical procedure. Such data has never been reported in medical literature to date. The measurements performed in this study contribute to an anatomical knowledge of great relevance, which can serve as a parameter in the surgery of the most posterior paranasal sinuses and access to the skull base. The more scientific knowledge about the superior turbinate and its adjacent structures, the less likely it is to cause inadvertent harm to patients. However, those measures should not be used alone intraoperatively. It should be noted that CT scanning of paranasal sinuses plays a very important role in diagnosis and surgical treatment planning.

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ASSESSMENT OF NASAL IRRIGATION WITH XYLITOL IN THE POSTOPERATIVE ENDOSCOPIC SURGERIES OF PARANASAL SINUSES

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ABSTRACT

Chronic rhinosinusitis is a condition of nasal inflammation that requires multifactorial treatment, including surgery, with indication of nasal irrigation to reduce nasal symptoms. Xylitol can be associated with nasal irrigation due to its therapeutic effect. Our study aims to assess the relationship between the effects of nasal irrigation with saline solution compared to xylitol through clinical questionnaires (visual analogue scale, NOSE and SNOT-22). Fifty-two patients, divided into two groups (26 in the "Xylitol" group and 26 in the "Saline" group) answered validated questionnaires in Portuguese about their nasal symptoms (nasal obstruction, runny nose, need to blow out sneezes, among others), and general symptoms, before and after endoscopic endonasal surgery, after a period of 30 days of nasal irrigation. The "Xylitol" group showed significant improvement in pain symptoms and nasal symptoms after surgery and irrigation using a xylitol solution. The "Saline" group also showed improvement in symptoms, but to a lesser extent. Our study suggests that xylitol solutions can be used in the postoperative period of endoscopic endonasal surgery, as it leads to a greater reduction in nasal symptoms without incurring higher costs to patients.

KEYWORDS

Sinusitis. Nasal polyps. Therapeutic irrigation. Xylitol. Endoscopy.

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INTRODUCTION

Chronic rhinosinusitis (CRS) is a condition of nasal and paranasal sinuses inflammation with symptomatology longer than 12 weeks.[1] It can be divided into chronic rhinosinusitis with (CRSwNP) or without nasal polyps (CRSsNP). Polyps are the final stage of hyperplastic growth of the nasal mucosa due to intense activity of T-lymphocyteshelper type 2 (Th2), eosinophils and immunoglobulin E (IgE).[1]

Associated bacterial infections play an important role in the pathophysiology of CRS. Despite several theories, the presence of bacteria interferes with the mucociliary clearance, innate immunity and cellular immunity.[2] The relationship between CRS and biofilms was described in 2004 and several therapies have been proposed to eradicate these entities in the search for symptom control and reduction of disease severity.[3] Among the various treatments, we mention: oral corticosteroids, antibiotics (macrolides and non-macrolides), antifungals and leukotriene antagonists.[1]

Nasal irrigation is commonly recommended, both pre and postoperatively, to improve the *clearance* mucociliary, reduce edema, reduce the concentration of inflammatory mediators and reduce the amount of mucus accumulated in the cavities, in addition to preventing the formation of crusts.[4] Recently, some studies have demonstrated the effectiveness of xylitol associated with nasal irrigation due to its antibacterial, bactericidal and anti-adhesive characteristics.[4,5] Xylitol (1,2,3,4,5-pentahydroxypentane) is a polyalcohol with an open structure and five hydroxyl groups,[6] non-toxic and safe according to the *Food and Drug Administration*. It has a sweetening power similar to sucrose - with 40% fewer calories - and is metabolized by the liver into glucose and glycogen or pyruvate and lactate.[7] It is extremely well tolerated and there are no established maximum doses. It is believed that the ingestion of more than 60 g/day can cause a laxative effect, but some studies have shown dosages of up to 400 g/day being well-tolerated, with no side effects.[7] In children, good tolerability has been demonstrated at a dosage of 45 g/day.[8] Healthy volunteers who used xylitol at a dosage of 60 to 70 g/day, for two years, did not show adverse effects.[9]

Xylitol is used with several therapeutic objectives and the most established are caries prevention[10] and stabilization of glycemic levels, as it does not depend on insulin for its metabolization.[11] In the respiratory system, xylitol may have the following therapeutic effects:

a) Bacterial toxicity

The xylitol molecule is not metabolized by the bacteria, having to be eliminated from the cell. This promotes a cycle of energy expenditure without nutritional gain which, together with the toxic accumulation of xylitol phosphate inside the cell, triggers bacterial death;[12]

b) Bacterial adhesion

Extracellular xylitol acts as an analogous receptor for the host cell, interfering in the adhesion process;[13]

c) Increased innate airway surface defenses

The antibacterial activity of several of these agents is salt-dependent, that is, an increase in salt concentration will inhibit their action both alone and synergistically. Some authors believe that this change in salt concentration is one of the reasons why patients with cystic fibrosis are more prone to colonization and bacterial infection[14]

d) Nitric oxide

Nitric oxide produced by activated macrophages is important in the antimicrobial immune response.[15] 5% xylitol has been shown to stimulate the production of nitric oxide by macrophages infected by L. amazonenses, decreasing the infection after 72 hours[16]

e) Biofilm

Xylitol has been shown to be effective in inhibiting the formation of bacterial biofilm in the oral cavity, mainly in studies related to the formation of bacterial plaque and cavity formation.[17]

Previous clinical studies have demonstrated the effectiveness of xylitol in reducing nasal symptoms, without associated surgery (by visual analogue scale and by the SNOT-22 questionnaire[18,19]). However, how much of its concentration and volume is needed to reduce nasal symptoms in the postoperative period of endoscopic endonasal surgery (FESS) and the comparison of the effectiveness of this type of nasal lavage and saline lavage is still not well established.

Therefore, we question whether there is superiority in the use of xylitol solution, when compared to the traditional 0.9% physiological saline solution, for nasal lavage in the postoperative period of patients undergoing endoscopic surgery of the paranasal sinuses? In an attempt to obtain answers to this question, the present study aims to analyze, through clinical parameters, in a comparative way, the effectiveness of large volume nasal lavage with xylitol solution and 0.9% saline solution in the postoperative period of patients submitted to endoscopic surgery of the paranasal sinuses.

MATERIALS AND METHODS

Population studied

Fifty-two patients diagnosed with CRS, with or without nasal polyps (CrSwNP or CRSsNP, respectively), who met the criteria for difficult-to-treat CRS, i.e., did not have proper clinical control after using topical nasal corticosteroids in spray and up to two cycles of oral antibiotics and/or corticosteroids in the last year, followed up in a specialized clinic, and who underwent endoscopic endonasal surgery.

The diagnosis of CRS was defined according to the research criteria suggested by the EPOS 2012.[1]

Patients younger than 18 years old or those who did not wish to participate in the study were excluded. The study was approved by the Research Ethics Committee of the Institution under number 266/2019.

Study design

Prospective study of uncontrolled intervention in patients with difficult-to-control CRS. The intervention under study was topical therapy with high-volume nasal irrigation with xylitol solution.

Patients in the "Xylitol" group were instructed to use the solution as follows: each sachet of 6 grams of xylitol diluted in 360 ml of filtered or boiled water. Patients were instructed to use this volume of 360 ml within a period of 1 day, irrigating each nostril with a continuous jet of 60 ml of the solution every eight hours, during a period of thirty days.

The patients in the "Saline" group were instructed to use 360 ml of 0.9% saline solution in the period of 1 day, irrigating the nasal passages with 60 ml of the solution in each nostril every eight hours, during the period of 30 days.

Patients were assessed before and after 30 days of topical irrigation therapy. The subjective outcomes evaluated were: Subjective improvement and degree of satisfaction after topical irrigation therapy. At the end of the topical irrigation therapy, the patients were asked whether their clinical condition had improved (total improvement, partial improvement, no improvement, worsening) and whether they were satisfied with the degree of this subjective improvement (satisfied or dissatisfied). Therapeutic success was considered when the patient presented satisfactory subjective improvement.

Objective outcomes evaluated were: visual analogue scale (VAS) scores for pain sensation (before and after surgery), NOSE questionnaire scores,[20] and SNOT-22,[21] both validated for the Portuguese language. These outcomes were evaluated quantitatively and qualitatively. Quantitative assessment of objective outcomes involved statistical calculations comparing pre and post topical irrigation therapy.

Statistical analysis

The results of the scores obtained from the application of the visual analogue scale (VAS), NOSE and SNOT-22 questionnaires were described by means, medians, and minimum and maximum values. For each of the questions in the questionnaires, frequencies and percentages were presented. Comparison of groups defined by treatment ("Saline" or "Xylitol"), in terms of scores, was performed using the non-parametric Mann-Whitney test. For the comparison of evaluation moments (before and after), within each group, the non-parametric Wilcoxon test. p-values <0.05 indicated statistical significance. Data were analyzed using the computer program Stata/SE v.14.1 (StataCorpLP, USA).

RESULTS

The analysis presented below was performed based on the responses obtained from 52 patients, of which 26 used saline solution ("Saline" group) and another 26 used xylitol solution ("Xylitol group") after the surgical procedure.

Comparison of treatment-defined groups in terms of pain assessment results (VAS scale)

Table 1 presents descriptive statistics of the VAS score and p-values of statistical tests.

Table 1: Comparison of groups regarding pain assessment results.

Assessment	Group	EVA score			p*
		n	Mean	Median (min-max)	
Before	Saline	26	8.2	8 (6-10)	0.779
	Xylitol	26	8.1	8 (6-10)	
After	Saline	26	4.5	5 (2-7)	<0,001
	Xylitol	26	2.6	3 (1-4)	
Decrease	Saline	26	3.7	4 (2-6)	<0,001
	Xylitol	26	5.5	6 (3-7)	

*Mann-Whitney non-parametric test, p<0.05

The results indicate homogeneous groups in pain assessment before surgery (p=0.779). Afterward, a significant difference was found between them (p<0.001). Likewise, when comparing the groups regarding the reduction in the VAS score, a significant difference was found between them (p<0.001).

The "Xylitol" group showed an average reduction of 5.5 points, greater than this reduction for the "Saline" group (mean of 3.7 points). Then, within each group, VAS scores before surgery were compared with those after surgery. For both groups, a significant difference was found between the two VAS assessments ("Saline" group: p<0.001 and "Xylitol" group: p<0.001).

Comparison of groups defined by treatment in relation to the results of the functional assessment of nasal obstruction symptoms (NOSE SCALE)

Table 2 shows the frequencies and percentages of patients according to the treatment ("Saline" or "Xylitol") for each evaluated condition, for evaluations before and after surgery. "The "normal" and "mild" classifications and the "marked" and severe classifications were grouped together". For each patient, the total NOSE score was calculated as the sum of the points for each question. This sum was multiplied by 5 to obtain a score between 0 and 100 (the higher, the more intense the problem caused by the evaluated condition).

Results indicate homogeneous groups in pain assessment before surgery (p=0.921). Afterward, a significant difference was found between them (p<0.001). Likewise, when comparing the groups regarding the reduction in the NOSE score, a significant difference was found between them (p=0.002). The "Xylitol" group showed an average reduction of 45.6 points, greater than this reduction for the "Saline" group (average of 31.7 points; Table 3). Then, within each group, pre-surgery and post-surgical NOSE scores were compared. Therefore, the null hypothesis that the results are the same in both evaluations was tested versus the alternative hypothesis of different results. For both groups, a significant difference was found between the two NOSE assessments ("Saline" group: p<0.001 and "Xylitol" group: p<0.001).

Table 2: Descriptive results for each of the NOSE questions.

Condition	Assess	Saline (n=26)			Xylitol (n=26)		
		Normal/ light	Moderate	Prominent/ severe	Normal/ light	Moderate	Prominent/ severe
Nasal congestion	Before	4 (15.4)	8 (30.8)	14 (53.8)	2 (7.7)	4 (15.4)	20 (76.9)
	After	11 (42.3)	15 (57.7)	-	23 (88.5)	3 (11.5)	-
Nasal obstruction	Before	-	8 (30.8)	18 (69.2)	1 (3.8)	5 (19.2)	20 (76.9)
	After	11 (42.3)	11 (42.3)	4 (15.4)	17 (65.4)	9 (34.6)	-
Difficulty passing air through the nose	Before	3 (11.5)	1 (3.8)	22 (84.6)	2 (7.7)	3 (11.5)	21 (80.8)
	After	14 (53.8)	7 (26.9)	5 (19.2)	22 (84.6)	3 (11.5)	1 (3.8)
Nasal obstruction during sleep	Before	-	2 (7.7)	24 (92.3)	1 (3.8)	5 (19.2)	20 (76.9)
	After	4 (15.4)	19 (73.1)	3 (11.5)	18 (69.2)	8 (30.8)	-
Nasal obstruction during exercise	Before	-	3 (11.5)	23 (88.5)	3 (11.5)	1 (3.8)	22 (84.6)
	After	3 (11.5)	16 (61.5)	7 (26.9)	17 (65.4)	8 (30.8)	1 (3.8)

Table 3: Comparative analysis of NOSE scores.

Assessment	Group	NOSE score (0 to 100)			p*
		n	Mean	Median (min-max)	
Before	Saline	26	76.7	75 (40-100)	0.921
	Xylitol	26	75.4	80 (25-100)	
After	Saline	26	45.0	45 (15-70)	<0,001
	Xylitol	26	29.8	30 (10-55)	
Decrease	Saline	26	31.7	27.5 (5-65)	0.002
	Xylitol	26	45.6	45 (5-65)	

*Mann-Whitney non-parametric test, p<0.05

Comparison of groups defined by treatment in relation to the results of the assessment of quality of life by the SNOT-22 questionnaire

In tables 4 and 5, for each evaluated problem or condition, frequencies and percentages of patients are presented according to treatment ("Saline" or "Xylitol"), for evaluations before and after surgery.

Table 4: Descriptive results of each of the SNOT-22 questions (Problem).

Specified	Aval	Saline (n=26)			Xylitol (n=26)		
		None/ very light	Light/ discreet	Serious/ very serious	None/ very light	Light/ discreet	Serious/ very serious
Need to blow the nose	Before	2 (7.7)	19 (73.1)	5 (19.2)	5 (19.2)	17 (65.4)	4 (15.4)
	After	4 (15.4)	22 (84.6)	-	22 (84.6)	4 (15.4)	-
Sneezing	Before	2 (7.7)	21 (80.8)	3 (11.5)	4 (15.4)	20 (76.9)	2 (7.7)
	After	11 (42.3)	15 (57.7)	-	22 (84.6)	4 (15.4)	-
Running nose	Before	-	21 (80.8)	5 (19.2)	8 (30.8)	16 (61.5)	2 (7.7)
	After	12 (46.2)	14 (53.8)	-	19 (73.1)	7 (26.9)	-
Cough	Before	4 (15.4)	11 (42.3)	11 (42.3)	6 (23.1)	7 (26.9)	13 (50)
	After	7 (26.9)	17 (65.4)	2 (7.7)	11 (42.3)	15 (57.7)	-
Secretion sensation	Before	2 (7.7)	8 (30.8)	16 (61.5)	4 (15.4)	8 (30.8)	14 (53.8)
	After	13 (50)	12 (46.2)	1 (3.8)	18 (69.2)	8 (30.8)	-
Thick phlegm in the nose	Before	1 (3.8)	20 (76.9)	5 (19.2)	6 (23.1)	16 (61.5)	4 (15.4)
	After	18 (69.2)	8 (30.8)	-	22 (84.6)	4 (15.4)	-
Muffling in the ear	Before	11 (42.3)	12 (46.2)	3 (11.5)	8 (30.8)	15 (57.7)	3 (11.5)
	After	21 (80.8)	5 (19.2)	-	26 (100)	-	-
Dizziness	Before	24 (92.3)	1 (3.8)	1 (3.8)	20 (76.9)	5 (19.2)	1 (3.8)
	After	24 (92.3)	1 (3.8)	1 (3.8)	26 (100)	-	-
Earache	Before	11 (42.3)	13 (50)	2 (7.7)	19 (73.1)	6 (23.1)	1 (3.8)
	After	23 (88.5)	3 (11.5)	-	25 (96.2)	1 (3.8)	-
Pain or pressure in the face	Before	2 (7.7)	10 (38.5)	14 (53.8)	5 (19.2)	1 (3.8)	20 (76.9)
	After	11 (42.3)	15 (57.7)	-	8 (30.8)	18 (69.2)	-
Difficulty falling asleep	Before	10 (38.5)	8 (30.8)	8 (30.8)	4 (15.4)	11 (42.3)	11 (42.3)
	After	14 (53.8)	7 (26.9)	5 (19.2)	8 (30.8)	17 (65.4)	1 (3.8)
Waking up in the middle of the night	Before	10 (38.5)	5 (19.2)	11 (42.3)	3 (11.5)	20 (76.9)	3 (11.5)
	After	13 (50)	11 (42.3)	2 (7.7)	12 (46.2)	14 (53.8)	-

Table 5: Descriptive results of each of the SNOT-22 questions (Continued from the previous table).

Specified	Aval	Saline (n=26)			Xylitol (n=26)		
		None/ very light	Light/ discreet	Serious/ very serious	None/ very light	Light/ discreet	Serious/ very serious
Lack of a good night's sleep	Before	9 (34.6)	10 (38.5)	7 (26.9)	4 (15.4)	18 (69.2)	4 (15.4)
	After	12 (46.2)	12 (46.2)	2 (7.7)	18 (69.2)	7 (26.9)	1 (3.8)
Wake up tired in the morning	Before	6 (23.1)	11 (42.3)	9 (34.6)	6 (23.1)	17 (65.4)	3 (11.5)
	After	13 (50)	11 (42.3)	2 (7.7)	24 (92.3)	2 (7.7)	-
Tiredness/fatigue throughout the day	Before	6 (23.1)	11 (42.3)	9 (34.6)	6 (23.1)	16 (61.5)	4 (15.4)
	After	15 (57.7)	9 (34.6)	2 (7.7)	23 (88.5)	3 (11.5)	-
Decreased productivity	Before	11 (42.3)	11 (42.3)	4 (15.4)	9 (34.6)	14 (53.8)	3 (11.5)
	After	17 (65.4)	9 (34.6)	-	25 (96.2)	1 (3.8)	-
Decreased concentration	Before	10 (38.5)	14 (53.8)	2 (7.7)	11 (42.3)	12 (46.2)	3 (11.5)
	After	17 (65.4)	9 (34.6)	-	24 (92.3)	2 (7.7)	-
Frustrated	Before	13 (50)	9 (34.6)	4 (15.4)	14 (53.8)	9 (34.6)	3 (11.5)
	After	19 (73.1)	7 (26.9)	-	24 (92.3)	2 (7.7)	-
Sad	Before	21 (80.8)	2 (7.7)	3 (11.5)	21 (80.8)	2 (7.7)	3 (11.5)
	After	23 (88.5)	3 (11.5)	-	26 (100)	-	-
Embarrassed	Before	18 (69.2)	5 (19.2)	3 (11.5)	22 (84.6)	2 (7.7)	2 (7.7)
	After	25 (96.2)	1 (3.8)	-	25 (96.2)	1 (3.8)	(0)
Perception of smell or taste	Before	5 (19.2)	9 (34.6)	12 (46.2)	3 (11.5)	2 (7.7)	21 (80.8)
	After	7 (26.9)	19 (73.1)	-	7 (26.9)	18 (69.2)	1 (3.8)
Blocked/stuffy nose	Before	2 (7.7)	2 (7.7)	22 (84.6)	2 (7.7)	3 (11.5)	21 (80.8)
	After	2 (7.7)	24 (92.3)	-	8 (30.8)	18 (69.2)	-

The classifications "no problem" and "very mild problem", the classifications "mild or discreet problem" and "moderate problem" and the classifications "serious problem" and "very serious problem" were grouped together.

For each patient, the total SNOT-22 score was calculated as the sum of the points for each question. The score could vary between 0 and 110 points (the higher, the more intense the problem and the worse the patient's quality of life)

The results indicate homogeneous groups in the assessment of quality of life by the SNOT-22 before surgery (p=0.863). Afterward, a significant difference was found between them (p<0.001). Likewise, when comparing the groups regarding the reduction in the SNOT-22 score, a significant difference was found between them (p=0.001). The "Xylitol" group showed a mean reduction of 32.9 points, greater than the reduction for the "Saline" group (mean of 21.3 points).

Then, within each group, pre-surgery SNOT-22 scores were compared with those after surgery. For both groups, a significant difference was found between the two SINOT-22 assessments ("Saline" group: p<0.001 and "Xylitol" group: p<0.001; Table 6).

Table 6: Comparative analysis of SNOT-22 scores.

Assessment	Group	SNOT-22 score (0-110)			p*
		n	Mean	Median (min-max)	
Before	Saline	26	51.8	50 (17-101)	0.863
	Xylitol	26	51.7	53.5 (13-110)	
After	Saline	26	30.5	29.5 (11-52)	<0,001
	Xylitol	26	18.8	19 (2-34)	
Decrease	Saline	26	21.3	20 (6-60)	0.001
	Xylitol	26	32.9	31.5 (10-99)	

*Mann-Whitney non-parametric test, p<0.05

DISCUSSION

The present prospective study demonstrated that the group of patients who used xylitol solution in the postoperative period of endoscopic endonasal surgery showed a significant improvement in pain symptoms (through the visual analogue scale) and nasal symptoms (through the NOSE and SNOT-22). Weissman et al.[18] demonstrated the effectiveness of xylitol irrigation in improving nasal symptoms in patients with CRS.[18] However, the treatment was carried out for only 10 days. Lin et al.[19] also demonstrated the superiority of nasal irrigation with xylitol solution over saline solution among patients with CRS. The xylitol solution was prepared with a concentration of 5% and both groups used their respective solutions for a period of 30 days.[19] Xylitol is a non-toxic and well-tolerated substance with safe daily doses without presenting already established adverse effects.[7,9] Xylitol has several therapeutic effects, interfering with the growth of *Streptococcus pneumoniae* It is *Haemophilus influenzae*,[5,22] and bacterial adhesion[5,12,23,24], increased innate immunity,[14] increased production of nitric oxide,[16,25] and inhibition of biofilm formation.[17,26] Ammons et al.[26,27] conducted out a series of studies in which they demonstrated the ability of xylitol to dissolve the biofilm structure of *Pseudomonas aeruginosa*. The biofilm of this bacterium has high clinical relevance in humans (highly prevalent in cases of CRS) and is one of the most resistant to common antimicrobials.[26] In an earlier study, Masako et al.[28] had already demonstrated the effectiveness of xylitol (at a concentration of 5%) in inhibiting the formation of the biofilm of *Staphylococcus aureus*, mainly by inhibiting the formation of the glycocalyx.[28] Several experimental studies have shown the beneficial potential of xylitol, reduction of adhesion of the *S. pneumoniae in vitro*,[29] reduction in biofilm formation by pneumococcus,[30] and reduction in the concentration of *P. aeruginosa* in maxillary sinuses of inoculated rabbits.[2] The therapeutic effects of xylitol on the airway can be identified in short periods of time. Zabner et al.[14] demonstrated an increase in the activity of the immune system in the nasal mucosa of 21 healthy subjects who used a solution with xylitol for only four days.[14] Similarly, Weissman et al.[18] and Lin et al.[19] observed satisfactory results with short periods of use of xylitol nasal solution.[18,19] This characteristic leads us to think that the use of xylitol solution can be guided and prescribed for a short period of time, increasing patient adherence and quality of life.

In the present study, the time interval for using the xylitol solution (30 days) was chosen randomly. We believe, however, that further studies to assess the ideal minimum time interval to obtain the highest degree of patient satisfaction are still necessary.

Several other forms of nasal irrigation have already been proposed for the same purpose. Giotakis et al.[31] randomized the use of saline solution among 174 subjects undergoing FESS and observed a significant improvement in nasal symptoms among subjects in the group that systematically used nasal irrigation (0.9% saline solution only). More interestingly, they observed that after 3 months of nasal irrigation, the beneficial effects were no longer different between the two groups.[31] Kosugi et al.[32] found a significant improvement among 16 subjects instructed to perform nasal irrigation with high-volume budesonide (1mg of budesonide diluted in 500 ml of saline solution every two days) in the scores of the SNOT-22 questionnaire and endoscopic Lund-Kennedy classification, after 3 months of therapy.[32] A study by Low et al.[33] assessed the symptoms and mucociliary clearance in 74 adult subjects submitted to FESS and instructed to perform nasal irrigation with saline solution (at 0.9%), lactated Ringer's or hypertonic saline solution (at 2.7%). They observed that all groups showed improvement in clinical scores (SNOT-20 and VAS) and endoscopic appearance of the nasal mucosa after the sixth postoperative week with nasal irrigation, but without impacting on the improvement of mucociliary clearance.

observed, still, significant improvement of symptoms with the use of lactated Ringer.[33] Xylitol, used in the present study, proved to be effective in significantly reducing nasal symptoms (as observed by the NOSE and SNOT-22 scores).

Limitations

The present study had some limitations. First, the sample obtained was small. Although we included 52 patients, other studies available in the literature had almost 200 participants (despite not comparing the effects of nasal irrigation with xylitol, specifically).

Second, the period of time that the subjects included in the present study presented symptoms of CRS may have exerted some influence on the results presented. That is, a subject diagnosed with CRS for a longer time may have had less therapeutic success with nasal irrigation with xylitol. Third, factors external to the research project could have had effects on the results. For example, occupation, place of residence, type of residence, associated comorbidities, other medications in use, among others.

Finally, the present study used subjective assessments of symptoms (answered by the subjects included in the study). The lack of objective parameters (tomographic comparisons before and after surgery and nasal irrigation, for example) could be considered a bias in the present study. However, it should be noted that the performance of postoperative images is not covered by health insurance plans in Brazil. As it would be an ethical infraction to financially burden the subjects included in the study, we decided not to perform the radiological procedure after the analyzed period.

CONCLUSION

The present study showed that the use of xylitol in nasal irrigations in the postoperative period of FESS was able to significantly reduce the nasal symptoms of the subjects involved. The xylitol it can be used in the postoperative period of FESS without

causing side effects, as it leads to a greater reduction in nasal symptoms and without entailing higher costs for the patient. Future studies, with a larger number of subjects included, randomized according to the type of nasal irrigation and with objective measurements through imaging exams, may help to improve the treatment of CRS.

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DEVELOPMENT OF A MOBILE APPLICATION TO MONITOR THE CLINICAL RESPONSE TO IMMUNOTHERAPY IN PATIENTS WITH ALLERGIC RHINITIS AT A REFERENCE CENTER IN SOUTHERN BRAZIL

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ABSTRACT

Allergic rhinitis (AR) is a worldwide public health problem as it affects the quality of life of patients. There is great concern with its correct diagnosis, as well as with the development of suitable instruments for its monitoring. The use of apps on smartphones and tablets has had a profound impact on medicine. A natural trend of modern medicine is to empower patients, while encouraging and educating them so that they are able to better understand and treat their condition. This is an original study aimed at the development of a specific application to monitor the clinical response to immunotherapy in patients with allergic rhinitis. Based on studies already validated in the literature, such as the ISAAC and ARIA questionnaires, three questionnaires were included in the developed application with simple and accessible questions for patients. Through the data collected by the application, stratification will be possible regarding allergic and non-allergic symptoms, age group at the onset of the disease, triggering factors for AR, environmental context, comorbidities, in addition to factors related to the use of immunotherapy, frequency of use, adverse events, and need for rescue medication.

KEYWORDS

Allergic rhinitis. Immunotherapy. Technology in medicine.

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INTRODUCTION

Allergic rhinitis (AR) is a worldwide public health problem as it affects the quality of life of patients.[1] It is estimated that AR affects approximately 400 million people worldwide, with a higher prevalence in developed countries.[2] There are extensive differences, however, in the prevalence of AR among nations and regions within the same country. Brazil is in the group of nations with the highest prevalence rates of asthma and AR in the world. A study performed in 20 Brazilian cities using the ISAAC methodology (The International Study of Asthma and Allergies in Childhood) showed the average prevalence of allergic rhinitis among schoolchildren aged 13 to 14 years varied from 7.8% to 21.1%.[3]

The impact of AR on patients translates primarily into a decrease in quality of life, adversely impacting physical and social performance, as well as sleep quality.[4] These symptoms are magnified by the presence of comorbidities such as asthma and rhinosinusitis.[5]

Allergic rhinitis is a chronic inflammatory disease of the upper airways, triggered after exposure to allergens, and IgE-mediated. From a clinical point of view, it mostly affects young individuals, with 80% of cases diagnosed before the age of 20.[5] It is characterized by repeated episodes of sneezing, rhinorrhea, obstruction, as well as nasal and/or ocular itching.[6]

At rhinoscopy, signs of AR are identified, including pallor, inferior turbinate hypertrophy and hyaline secretion. Those signs are associated with epithelial dysfunction, dysfunction of the glands, vessels and nerves, as well as infiltration by inflammatory cells, inflammatory mediators and cytokines, which impair the process of heating, humidification and filtration of inspired air.[7]

AR is a disease whose pathophysiology involves genetic and environmental factors, while being closely linked to asthma and atopy. Atopy is an abnormal trend to develop specific IgE response against innocuous environmental allergens.[1] Diseases linked to atopy include asthma, allergic rhinitis, eczema and food allergies, and have a familial trend, as they are linked to several genes. Other associated factors are ethnic origin, high socioeconomic level, environmental exposure, climate variation, maternal smoking in early life, among others.[2]

Clinical control of allergic rhinitis consists of the use of anti-allergy medication and nasal corticosteroids, as well as immunotherapy in selected cases. There is great concern with its correct diagnosis, as well as with the development of suitable instruments for its monitoring.[8]

Even so, data on the prevalence of asthma and allergic rhinitis, as well as atopy, are still scarce in our field. The ISAAC questionnaire was developed in order to maximize epidemiological research on asthma, allergic rhinitis and eczema, while determining the prevalence and severity of their symptoms in different countries.

The ARIA study (Allergic Rhinitis and its Impact on Asthma) was established during a workshop in 1999[10] with the aim of achieving the control of AR at a global level. AR was reclassified into mild/moderate-severe and intermittent/persistent. This classification reflects the patient's needs, and underlines the close relationship between rhinitis and asthma. ARIA is currently widespread in more than 60 countries around the world.[11]

The Allergies in America study was developed in the United States and addressed questions about the diagnosis, symptoms, comorbidities, impact on quality of life and treatment of AR.[12] In the study, they investigated the sentiment towards treatment expectations and educational aspirations, with most questions being answered in a dichotomous way: "yes or no". Participants were interviewed by telephone call in July 2006, with patients answering 73 items, whereas physicians 55 items. Keith[13] performed a similar study by adapting the Allergies in America questionnaire to Canada, and found that most patients were dissatisfied with their treatment. He concluded, then, that both physicians and patients were in need of treatment and education.

Even though the use of applications on smartphones and tablets has impacted the field of medicine profoundly, there is still no data in the literature about their effect on monitoring the clinical response of patients to immunotherapy and their quality of life.[14] As a result, it is hypothesized that the closer the doctor-patient relationship is, the higher the success rates of clinical management will be.

A natural trend of modern medicine is to empower patients, while encouraging and educating them so that they are able to better understand and treat their condition.

By defining specific objectives, it is possible to monitor the current pattern of the disease and treat it appropriately, while helping patients make a decision to achieve high success rates. Therefore, this study aimed to create an application to monitor the clinical response of patients undergoing immunotherapy.

MATERIALS AND METHODS

2.1 Methodological Design of the Study

This is an original study focused on the development of a specific application to monitor the clinical response to immunotherapy in patients with allergic rhinitis.

Ethical Aspects

The ethical principles and research regulations on human beings found in Resolution CNS/MS 466/2012 were observed according to the Brazilian Health Council, while adhering to the ethical principles of beneficence, non-maleficence, justice and autonomy.

There was no need to create and apply a free and informed consent form, as this study was not applied on human beings.

Development of the application

The application in question was developed for mainstream operating systems (iOs, Android and Windows), in Portuguese, with a user-friendly interface.

Questionnaires used

Three questionnaires were included with the purpose of obtaining information about patients undergoing immunotherapy. Those questionnaires were based on studies already validated in the literature, such as the ISAAC, ARIA and Allergies in America.

Symptom Impact and Symptom Questionnaire

» Q1: What's your Individual Taxpayer Registration Number (CPF)?

»CPF:

» Q2: What symptoms of allergic rhinitis do you have? More than one answer is accepted.
  »Runny nose
  » Sneezing
  » Nasal itching
  » Nasal congestion
  » Eye redness
  » Lachrymation
  » Ocular itching
» Q3: How do the symptoms of rhinitis impact your life?
  » They limit my daily activities
  » They limit my participation in school and at work
  » They impact my sleep
  » They are uncomfortable
  » They don't limit me at all
» Q4: At what age group did you start having symptoms of allergic rhinitis?
  » 0-7 years
  » 8-14 years
  » 15-30 years
  » 31-65 years
  » 66-85 years
» Q5: Have you ever been diagnosed with the following conditions?
  » Atopic dermatitis
  » Asthma
  » None of the above conditions
» Q6: Do you have any of the following pets at home? More than one answer is accepted.
  » Cat
  » Dog
  » I don't have any pets
» Q7: In which months of the year do you have more symptoms of rhinitis?
  » January
  » February
  » March
  » April
  » May
  » June
  » July
  » August
  » September
  » October
  » November
  » December
» Q8: Which of the following items make your rhinitis symptoms worse? More than one answer is accepted.
  » Dust
  » Mold
  » Insects
  » Strong smells
  » Cigarette
  » Air conditioning
  » Pollution

2.4.2 Questionnaire to investigate the use of Immunotherapy.

» Q1: What's your Individual Taxpayer Registration (CPF)?
  »CPF:
» Q2: Have you ever had a reaction to the use of immunotherapy? Please mark below.
  »Itchy mouth
  » Tongue/lip swelling
  Gastrointestinal disorders (diarrhea)

» Q3: Has your rhinitis condition gotten worse even when using Immunotherapy?
  » Yes
  » No
» Q4: Was the frequency of immunotherapy use followed correctly, as prescribed by the doctor?
  » Yes
  » No
» Q5: From Zero (none) to Ten (complete improvement) what was your level of improvement after starting treatment with immunotherapy?
  »Answer on scale from Zero to Ten
» Q6: Did you need rescue medication concomitantly with immunotherapy to stop an attack?
  » Yes
  » No
» Q7: If yes to the previous question, how many days did you use the medication when you had an attack?
  » 1 day in the week
  » 2-3 days in the week
  » 4-5 days in the week
  » I did not have an attack (this question does not apply to me)
» Q8: If yes to the previous question, what medication did you use to stop the attack? Please write in the box below.
  »Answer:

2.4.3: Questionnaire to investigate allergic attack.

» Q1: What's your Individual Taxpayer Registration Number (CPF)?
  »CPF:
» Q2: What triggered the allergic attack?
  » Dust
  » Mold
  » Contact with cat
  » Contact with dog
  » Weather variation (climate)
  » Strong smell
  » Air conditioning
  » Pollution
  » Other (specify)
» Q3: What were you doing when the attack was triggered? Please write in the box below.
  »Answer:
» Q4: How much did this rhinitis attack interfere with your daily activities?
  » 1 (nothing at all)
  » 2 (a little)
  » 3 (moderately)
  » 4 (a lot)

RESULTS

With an intuitive interface, we developed an application capable of monitoring the clinical response of patients to immunotherapy, while also guiding them on their condition and optimizing their treatment.

On its home page (Fig 1), there are the following items: ImunoApp (questionnaires to investigate the monitoring of the clinical response of patients to Immunotherapy); Scheduling (where they can schedule an appointment with a specialist);

About Us (explaining what the app is about and its mission); Link to social media (keeping the patient updated about their condition) and Hospital Contact.

The developed application will show its main session (ImunoApp) with questions from the questionnaires (Fig 2) to be administered to patients for their

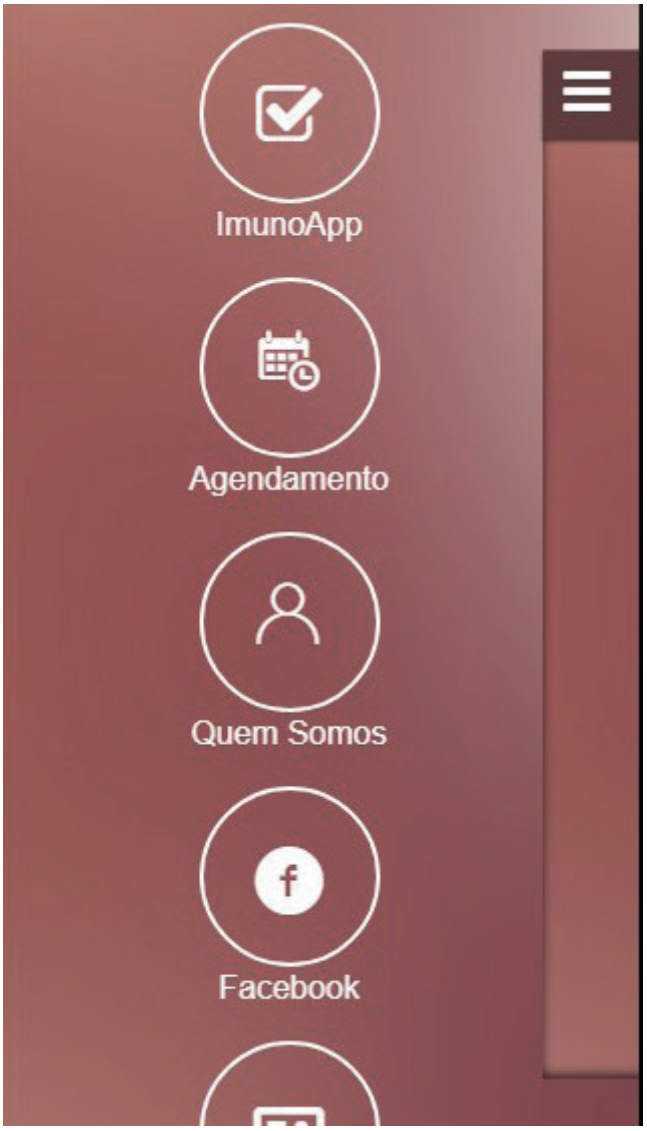

Figure 1: ImmunoApp Application homepage.

Figure 2: Icons that include the questionnaires to monitor patients undergoing Immunotherapy.

proper monitoring. The Symptom Impact and Symptom Questionnaire will be found in the icon "*Pesquisa*" [Research]; the icon "*Imunoterapia*" [Immunotherapy] includes the Questionnaire to investigate the use of Immunotherapy, and in the icon "*Crise Alérgica*" [Allergic Attack], the questions on how the allergic attack interferes with quality of life can be found.

The questions in the questionnaires were laid out to be marked in a simple and quick way (Figure 3 and Fig 4). The responses will be stored in the cloud and encrypted.

It will also be possible to schedule appointments at IPO Hospital (Fig 5) via the app, in addition to obtaining information about the purpose of the application and brief information on allergic rhinitis in the icon "*Quem Somos*" [About Us] (Fig 6).

On the Facebook icon (Fig 7), it will be possible to keep the patient updated on the latest information on allergic rhinitis and immunotherapy, while informing them about their condition.

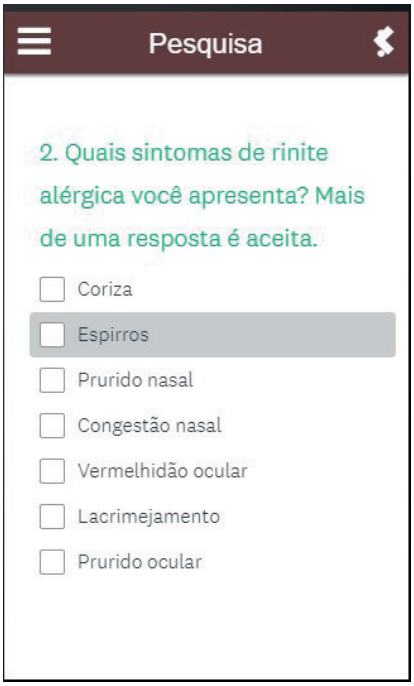

Figure 3: Example of the design of questions responded, in this case multiple choice responses.

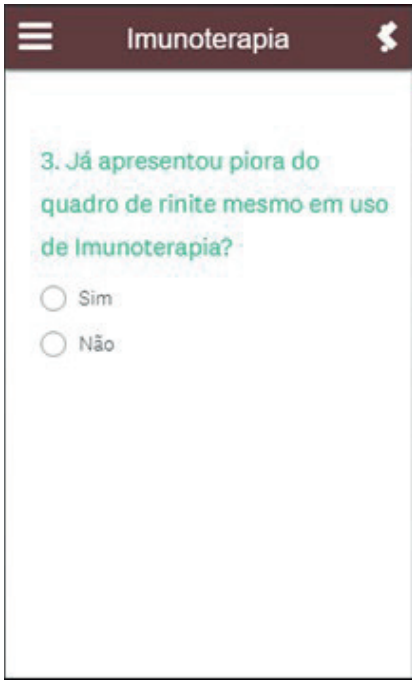

Figure 4: Questionnaire question exemplifying the clear way in which it is presented.

Figure 5: Online appointment scheduling.

Figure 6: "*Quem somos*" [About Us], describing the purpose of the application and its functionality.

Figure 7: Social media page integrated into the application.

DISCUSSION

The systematic collection of information via cell phones enables patients to quantify and qualify their symptoms[15]. In the long term, this makes it possible to monitor the patient with a more reliable follow-up. However, there is still not enough data in the literature as to the implementation of applications to monitor the clinical response of patients to immunotherapy. There are many factors that can create bias arising from the patient's own use and engagement with the application. That bias will be minimized with long-term studies applied to patients, while improving data collection.

There is no application in the literature that is completely focused on immunotherapy with the approach to side effects, for example, and this is an original study that integrates several parameters for a global assessment of patients. The questionnaires used in this study need validation before they can be administered to patients.

MACVIA-ARIA, an innovative study from 2015 proposed the development of an application to diagnose, stratify and improve the management of patients with AR, with the aim of greatly impacting public health strategies and planning.[16]

With this application, we intend to assess the quality of life of patients undergoing immunotherapy with simple and accessible questions to them. Through each patient's Individual Taxpayer number, data will be collected as to stratification regarding allergic and non-allergic symptoms, age group at the onset of the condition, triggering factors, environmental context and comorbidities, in addition to factors related to the use of immunotherapy, frequency of use, adverse events and need for rescue medication.

Through monitoring, we intend to guide the patient's treatment according to the symptoms reported at a certain time of the year. It will be possible, for example, to identify patients affected by pollen allergy, while anticipating their treatment with consultations near the moment of greatest symptomatology.[17]

We also intend to advise on the creation of immunotherapies according to the symptoms reported by the patient, while continuously assessing their clinical improvement and responses.

Additionally, we will be able to identify patients who would not benefit from immunotherapy, i.e., non-allergic ones with rhinitis triggered by other factors, while ensuring better patient satisfaction with the proposed treatment.

The results of our study are significant as they illustrate future prospects and may provide baseline data for future research.

CONCLUSION

It was possible to develop an application to monitor allergic rhinitis in patients undergoing immunotherapy.

However, it is necessary that this study be effectively applied to patients so that it proves to be successful. In addition, the validation of its original questionnaires is essential, so that potential adjustments and comparisons can be made.

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PROFILE OF PATIENTS WHO UNDERWENT CATARACT SURGERY AT THE HOSPITAL *PARANAENSE DE OTORRINOLARINGOLOGIA* – IPO, IN THE YEAR 2022

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Michel Risnic **RUBIN**[2]

ABSTRACT

Cataract is the name given to any opacity of the crystalline lens, and is the leading cause of treatable blindness in developing countries. Its main cause is related to aging. This study intends to provide a survey of patients' profile data regarding age, gender, operated eye, onset of symptoms, level of visual impairment and risk factors of patients who underwent cataract surgery at the *Hospital Paranaense de Otorrinolaringologia* - IPO between September and October 2022. A descriptive and prospective study was conducted upon approval by IPO's Research Ethics Committee, based on the analysis of 103 patients indicated for cataract surgery, totaling 154 eyes. The most affected age group was 60- to 69-year-olds, comprising 39 (37.9%) patients; the female gender was 57 (55.3%); the most affected eye was the right one in 80 (51.9%) patients; the onset of symptoms was of 2.2 years on average; the number of eyes already presenting some level of visual impairment was 147 (95.45%); among the systemic diseases the presence of arterial hypertension was found in 56 (54.36%) patients and diabetes mellitus in 30 (29.12%); the use of corticoids was from 3 (2.9%) of the patients. According to the study data and the literature, there was major similarity between the two, especially in there being a predominance of the female gender, mostly elderly, being unilateral or bilateral. Almost all patients had some degree of visual impairment. The most prevalent diseases in the patients studied were arterial hypertension and diabetes mellitus, and some patients used corticosteroids.

KEYWORDS

Cataract. Phacoemulsification. Senility.

1. Student at the Fellowship Course in Cataract, *Hospital Paranaense de Otorrinolaringologia* (IPO).
2. Under the supervision of Professor Michel Rubin.

INTRODUCTION

Cataract is the name given to any opacity of the crystalline lens that does not necessarily affect vision. It is the leading cause of treatable blindness in developing countries.[1] According to data from the World Health Organization (WHO), cataracts are responsible for 51% of cases of blindness in the world, affecting mainly people over 50 years old, which represents 20 million individuals. As reported by the Brazilian Society of Ophthalmology (SBO), there are about 550 thousand new cases in Brazil every year.[2]

They can be classified according to their origin: Congenital (early or late), and acquired, in which we include all other forms of cataract, including age-related ones.[1]

The causes have not yet been well-defined; however, epidemiological studies reveal an association of cataract with age.[2]

Therefore, two main mechanisms seem to act in its pathogenesis: Photo-oxidative stress (from UVA and UVB radiation) and oxidative stress (licit and illicit drugs, diabetes, smoking, alcoholism).[1] It can be observed that the most expressive isolated risk factor is advanced age, due to the longer time of exposure to all these factors.[3]

Risk factors include advanced age, use of substances such as corticosteroids and nicotine (toxic), endocrinopathies (diabetes mellitus, galactosemia, hypocalcemia, hyperthyroidism), nephropathy, trauma, radiation, ophthalmopathies (myopia, uveitis, pseudoexfoliation), history of intraocular surgery (antiglaucomatous fistula, posterior vitrectomy), infection during pregnancy (toxoplasmosis, rubella), nutritional status-malnutrition.[1] The main risk factor for the development of cataracts is aging.[4]

Besides Low Visual Acuity (LVA), the most common signs and symptoms of patients with cataract are: Photophobia, which consists of increased sensitivity and lower tolerance for light, altered color vision, dimming or blurring of the image, and diplopia, which means double vision.[5]

Also, according to the affected site, it may be nuclear, cortical, or subcapsular.[1] The Lens Opacity Classification System (LOCS III) is a standardized system for classification, which is widely used and scientifically valid and has been used in many studies to classify the type and severity of cataracts, as well as their progression. The classification is based on comparison with photographic patterns of different degrees of opacity, for three characteristics: Nuclear opacity, cortical opacity, and posterior subcapsular opacity.[6] It should be noted that a patient may have one or more associated types of cataract.[7]

According to the degree of opacity, it can be classified as immature (partially opaque crystalline lens), mature (completely opaque crystalline lens), hypermature (an anterior capsule contracted and wrinkled due to water leaking out of the crystalline lens), or morganian (which is a hypermature cataract in which the total liquefaction of the cortex allowed the nucleus to sink inferiorly).[8]

According to the World Health Organization (WHO), the incidence of cataract is estimated at 0.3%. That would represent, in Brazil, about 550,000 new cases of cataract per year.[9] The prevalence of senile cataract is 17.6% before the age of 65; 47.1% in the group between 65-74 years old and 73.3% in individuals over 75 years old. It is estimated that, in addition to the repressed demand, due to the aging of the population, there are 120,000 new cases/year (AVILA, 2015). It makes cataract surgery one of the most performed surgical procedures.[7] According to estimates, 25% of women have cataract, while in men it is around 15%.[10]

However, despite the significant number of surgeries, it is low to meet the annual demand for new cases, which, added to the deficit already accumulated over the years, allows classifying cataract as a major public health problem.[11]

Indications for surgery may be to improve distance vision, which is the most common indication for cataract surgery, although needs vary from person to person. Surgery is indicated only if and when the cataract develops to a sufficient degree that it makes it difficult to perform essential daily activities. Medical indications are those where the cataract is adversely affecting eye health. Another rare indication is the aesthetic indication, when a mature cataract is removed from an eye that is already blind, only to restore the black pupil.[8]

The surgical treatment of the disease allows the restoration of vision and rehabilitation of patients, enabling their reintegration into society, including the return to some work activities.[12]

When indicated, surgical treatment, with removal of the opaque crystalline lens and implantation of an artificial intraocular lens. The surgery, in general, allows for a short stay in hospital and has excellent results, with effective visual recovery.[13]

Cataract surgery, called facectomy, can be performed using several techniques or methods. The best known are phacoemulsification and programmed extracapsular cataract extraction. For both, the use of the surgical microscope is mandatory.[1] The techniques and results of cataract surgery have faced many changes in recent years, especially after the introduction of phacoemulsification by Kelman. Also, the first publication of in vivo crystalline lens extraction made by him occurred in 1967.[14]

PHACO (phacoemulsification) is the most used technique in most developed countries, due to the possibility of swift visual recovery and the reduced rate of pre- and postoperative complications.[15]

It is a disease that is curable through relatively simple, low-cost, surgery, which has been safely performed for many years. the degree of visual impairment from cataracts is an important indicator of the quality of a public health system.[16]

The present study aims to provide a data survey of patient profiles, patient age, patient gender, symptom onset, operated eye, level of visual impairment, risk factors, and comorbidities.

MATERIALS AND METHODS

A descriptive and prospective research project with a quantitative approach was conducted from the analysis of medical records of patients from the *Hospital Paranaense de Otorrinolaringologia* - IPO indicated for cataract surgery, from September to October 2022 in the institution's ophthalmology service.

The sample consisted of patients who underwent surgery from September to October 2022. To select the patients, we used medical records through which we collected the data via a structured questionnaire (Exhibit I) containing patient demographics (gender and age), in which eye the procedure was performed, level of visual impairment, causes of cataract, and risk factors. The collected data were entered into EXCEL version 2013 software for descriptive statistical analyses.

Data were collected at the first postoperative day visit of the participants who had undergone cataract surgery at IPO Hospital, in which data were obtained according to the questionnaire, and participants filled out an informed consent form.

For age and time of symptom onset, mean, standard deviation, median, minimum and maximum were provided. For (categorical) variables, frequency and percentage were presented. The data were organized in an Excel® spreadsheet and analyzed with the IBM SPSS Statistics v.28.0 computer program.

The ethical aspects of this research project comply with Resolution 466/2012 of the Brazilian National Health Council (CNS, 2012).

The research project was developed only after clearance by the Ethics Committee.

At the end of the study, a report was given to the area involved, explaining the study's conclusions.

RESULTS

The analysis presented below was performed on data from 103 patients who underwent cataract surgery (phacoemulsification) unilaterally (n=52) or bilaterally (n=51), for a total of 154 eyes.

The tables below show descriptive statistics of variables related to the patient and variables related to the eyes.

For age and time of symptom onset, mean, standard deviation, median, minimum and maximum are provided. For the other variables (categorical) frequency and percentage are presented.

All patients had their cataract diagnosis confirmed through careful evaluation with complementary exams.

Regarding the age of patients surveyed, the mean was 67 years, ranging from patients aged 39 to 93 years (Table 1). It is important to realize that elderly patients, that is, over 60 years old, account for approximately 79 patients (76.69%).

Looking at Table 2, one can notice that, for both male and female subjects, the most affected group is the one of 60- to 69-year-olds, with about 39 patients (37.9%).

Table 1: Age (years) and time of symptom onset (years).

Variable	n	M	SD	Md	Min	Max
Age	103	67	10	67	39	93
Time of symptom onset	103	2.2	1.3	2.0	0.5	5.0

Caption: N: Number; M: Mean; SD: Standard Deviation; Md: Median; Min: Minimum; Max: Maximum.

Table 2: Age group by gender.

Age group (years)	Gender		Overall
	Female	Male	
≤ 39	0 (0%)	1 (2.2%)	1 (1%)
40 to 49	2 (3.5%)	0 (0%)	2 (1.9%)
50 to 59	10 (17.5%)	11 (23.9%)	21 (20.4%)
60 to 69	19 (33.3%)	20 (43.5%)	39 (37.9%)
70 to 79	15 (26.3%)	12 (26.1%)	27 (26.2%)
80 to 89	10 (17.5%)	2 (4.3%)	12 (11.7%)
≥ 90	1 (1.8%)	0 (0%)	1 (1%)
Total	57 (100%)	46 (100%)	103 (100%)

Female subjects in the study had a slightly higher prevalence of cataract surgeries than male ones (55.3%) - Table 3.

In tables 4 and 5, which show the affected eye and laterality, respectively, it can be observed that of the 154 surgeries performed in the period, there was a slight difference between the right eye and the left eye, which was 6 surgeries. Also, 49.5% of patients underwent bilateral surgery. Some of the patients surveyed may have undergone or will undergo surgery on the contralateral eye on another date outside the research period or previously at another ophthalmological service.

Table 6 shows that among patients with cataracts who underwent surgery, 07 patients had normal vision in the affected eye (20/12 to 20/25) — that is, they did not have a visual impairment; 64 patients had a close-to-normal vision (20/30 to 20/60); 28 patients had a moderately low vision (20/70 to 20/160); and 23 patients had a severely low vision (20/200 to 20/400). A further 8 patients were classified as having deeply low vision (20/500 to 20/1000) - Table 6.

Some already had severe visual impairments, and it was not possible to classify them according to the Snellen Chart. Of these, 6 patients had the vision to count fingers at 1 meter (CF at 1 meter), 2 patients had the vision to count fingers at 2 meters (CF at 2 meters), 7 could only perceive the movement of the examiner's hands (MH), and other 9 patients only have light projection (LP) vision.

Notably, 95.45% of the patients were classified as having some degree of low visual acuity.

Among the systemic diseases investigated in the preoperative appointment of patients with cataracts, systemic arterial hypertension (SAH) appeared in 56 (54.36%) of them, and diabetes mellitus (DM) occurred in 30 patients (29.12%). Besides, 20 patients (19.41%) had both comorbidities together (Table 7).

Another risk factor for the development of cataracts is the use of excessive medications such as corticosteroids. The survey showed only 3 patients (2.9%) who used these drugs in excess (Table 7).

Table 3: Gender.

Variable	Classif	n	%
Gender	Female	57	55.3%
	Male	46	44.7%

Table 4: Affected eye

Eye	n	%
OD	80	51.9%
OS	74	48.1%
Total	154	100.0%

Table 5: Laterality

Variable	Classif	n	%
Laterality	Unilateral	52	50.5%
	Bilateral	51	49.5%

Table 6: Vision acuity (Snellen Chart)

Visual acuity	OD		OS		OD + OS	
	n	%	n	%	n	%
Normal	5	6.3%	2	2.7%	7	4.5%
Cl NL	28	35.0%	36	48.6%	64	41.6%
LM	16	20.0%	12	16.2%	28	18.2%
LS	14	17.5%	9	12.2%	23	14.9%
LD	4	5.0%	4	5.4%	8	5.2%
NC	13	16.3%	11	14.9%	24	15.6%
Total	80	100%	74	100%	154	100%

Caption: Cl NL: Close to normal; LM: Low vision, moderate; LS: Low vision, severe; LD: Low vision, deep; NC: Not classified.

Table 7: Comorbidities/Corticosteroid Use.

Variable	Classif	n	%
Comorbidities	No	37	35.9%
	SAH	36	35.0%
	DM	10	9.7%
	SAH, DM	20	19.4%
Corticosteroid use	No	100	97.1%
	Yes	3	2.9%

DISCUSSION

Senile cataract is not considered a disease, but a normal aging process, with a higher incidence in the population over 50 years old (KARA, 2008). The gradual increase in life expectancy has led to a consequent increase in the prevalence of this disease in recent decades. Its prevalence is estimated at 2.5% among 40 and 49-year-olds, 6.8% between 50 and 59-year-olds, 20% between 60 and 69-year-olds, 42.8% between 70 and 79-year-olds, and 68.3% in people over 80 years old.[17]

Older persons are most often defined as elderly when they reach the age of 60, regardless of their biological, psychological, and social situation.[18]

With the aging process, the onset of cataracts leads older adults who see poorly to increase their risk of falling, being run over, misusing medication, or using the wrong dosage, resulting in major complications and even risk of death. Low vision often leads to isolation and depression, distancing individuals from socializing, transforming them from an ally into a burden in the face of the family's needs.[19]

Our study, in accordance with the literature, shows a higher prevalence of cataracts in the elderly population (over 60 years old) and, with it, all the adversities that low visual acuity causes for this vulnerable public.

Cataracts can occur unilaterally or bilaterally and vary in severity. It has a gradual progression, being initially asymptomatic, but as it evolves, especially after the fourth or fifth decade of life, cataracts mature, which makes the crystalline lens completely opaque to light and ends up interfering with daily activities.[20]

Research has shown that there are patients with unilateral or bilateral cataracts and in variable forms, as it is a progressive disease and sometimes asymmet-

rical in relation to its development. Thus, the patient may have low visual acuity in one eye at the time and only a few years later develop it in the other eye.

Cataracts, usually bilateral, approaches one eye at a time. Surgeries are scheduled two to four weeks apart, and are individualized for each patient.

The higher prevalence of women in this study stands out, mainly due to the majority of this gender in all populations, especially in the elderly. Also, there is greater demand from this population for health services in relation to men.

That higher prevalence of cataracts in the female population is due to the greater longevity of women, the majority of whom are in more advanced age groups.[16] Besides, the prevalent female use of health services, whether outpatient or hospital, is well established in the literature. While male demand for outpatient services is described, for the most part, as generated by work or social security, female demand is essentially voluntary, revealing a greater propensity for women to seek health care spontaneously.[21]

In Brazil, in 2006 the National Congress stipulated that blindness is defined by visual acuity equal to or less than 0.05 in the better eye, less than 20/400, with the best optical correction.[22]

In the present study, the vast majority of patients already had some degree of visual difficulty in the best correction, and a significant portion of them already had visual acuity levels close to blindness or was already blind.

SAH and DM are considered risk factors for the development of cataracts.[23] Also, it is worth remembering that the leading causes of cancellation of phacoemulsification are clinical, such as systemic arterial hypertension and diabetes mellitus.[24]

Besides causing cataracts, diabetes mellitus can affect the crystalline lens's refractive index and its range of accommodation. Age-related cataracts occur earlier in diabetes mellitus. Nuclear opacities are common and tend to progress rapidly.[8]

Therefore, older persons diagnosed with arterial hypertension and/or diabetes deserve more attention due to their vulnerability to cardiovascular, nephropathic, and neuropathic complications, caused not only by underlying diseases but also by other risk factors that accumulate throughout the age group change.[25]

The SAH and DM comorbidities investigated in this study were present in most patients, correlating with the literature as risk factors and important causes of surgery cancellations when decompensated.

Regarding the use of corticosteroids, the higher the dose and time of use of these medications, topical, inhaled, or systemic, the greater the possibility of developing cataracts. They are usually posterior subcapsular opacities, discoid, in the visual axis.[26]

Few patients in the study used corticosteroids, but this is always an essential factor for research, especially in the development of cataracts in a younger population.

CONCLUSION

Analyzing that the Brazilian scientific literature is insufficient in data that reflect on the epidemiological profile of patients who undergo cataract surgery and the tendency of this population to be constantly increasing in the country, this study proposes to evaluate the epidemiological profile of patients who undergo cataract surgery at the *Hospital Paranaense de Otorrinolaringologia* – IPO from September to October 2022.

It is concluded that due to the increase in the normal aging process of the population, combined with the expansion of diagnostic tools and treatments for numerous diseases, cataract has become one of the most performed procedures in the world, with great success and resolution. With the study, it is possible to observe that the average age of the patients who had this intervention was 67 years, and the elderly population (over 60 years) represents more than 76.69% of the studied population.

Regarding patient gender, although women are the ones who seek medical help more than men, in the study, there was a slight difference between women (55.3%) and men (44.7%).

The onset of cataract symptoms varied from 6 months to 5 years, with a mean of 2.2 years.

Regarding the affected eye, it can be observed that there is a small difference between the right eye and the left eye of 6 patients only.

In terms of visual impairment, 95.45% of the patients were classified as having some degree of low visual acuity. Patients close to blindness or blind totaled 35.71%.

Regarding cataract-related factors, there was a high prevalence of systemic arterial hypertension in affected patients — approximately 54.36% — probably due to the great propensity that older patients have to have other comorbidities. Another pathology commonly found was diabetes mellitus, with 29.12% affected. It is always worth noticing that diabetes is a risk factor for developing cataracts and can cause ocular complications, further worsening patients' vision. An important risk factor observed in the literature is the use of corticosteroid drugs, which was seen in approximately 2.9% of the surveyed patients.

Today, cataract surgery (phacoemulsification) is known as the most performed procedure in the world among the specialties. Therefore, we believe that, with research, it is important to delimit the epidemiological profile and risk factors for cataracts. First, there is a global demand for high-quality cataract surgery due to an aging population, particularly in developing countries, where the leading cause of treatable blindness is cataracts. Second, it is essential at all levels of healthcare, especially the primary, to correctly refer patients with this type of alteration as early as possible to cataract surgery so that through it patient's visual acuity is restored, providing an improvement in the quality of life and avoiding blindness.

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EVIDENCE OF THE VALUE OF USING THE BUTTERFLY AND SPREADER GRAFT TECHNIQUES IN FUNCTIONAL RHINOPLASTY FOR THE CORRECTION OF INTERNAL NASAL VALVE COLLAPSE: A 32-YEAR SYSTEMATIC REVIEW IN ENGLISH

Julio **HEINICHEN**[1]

ABSTRACT

Nasal obstruction due to internal nasal valve collapse is relatively common. This paper systematically reviews the existing literature that supports the efficiency and value of using the traditional spreader graft and butterfly graft techniques in functional rhinoplasty for the correction of internal nasal valve incompetence.

KEYWORDS

Spreader graft. Butterfly graft. Internal nasal valve. Rhinoplasty.

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INTRODUCTION

There are multiple etiologies for nasal obstruction. A major cause is the collapse of the internal nasal valve. This may be due to congenital deficiencies, post-traumatic deformities or previous nasal surgery. The internal nasal valve is formed by the junction of the upper lateral cartilage and the nasal septum. This valve is the narrowest part of the nasal airway, averaging from 10 to 15 degrees. The nasal valves are the narrowest part of the nostrils, where they create a turbulent flow. The external nasal valve is limited by the moving alar side walls. The internal nasal valve corresponds externally to the middle nasal vault, and it is located between the septum, the caudal part of the upper lateral cartilages and the lower turbinates, while forming an angle of approximately 10-15 degrees. The narrowing of that angle results in functional nasal airway obstruction with sidewall collapse upon inspiration. Poiseuille's equation states that the narrowing of the blood vessel radius will decrease airflow exponentially to the fourth power. This narrowing of the valve is a major cause of functional nasal airway obstruction.[1]

Even when a satisfactory cosmetic rhinoplasty is performed, if nasal functionality is overlooked, significant problems can arise. Therefore, when rhinoplasty is performed, excessive dorsum reduction or cephalic resection must be avoided. Patients with short nasal bones, previously narrow internal nasal valves, and/or aggressive dorsal hump reduction are at high risk of developing postoperative internal nasal valve collapse.[2] It is necessary to perform a prophylactic reconstruction of the nasal valve to avoid significant cosmetic and functional deformity postoperatively in the middle nasal vault. In addition, lateral osteotomies can cause a narrowing of the nose leading to inadequate airflow and clinical nasal obstruction. Also, the intercartilaginous incision must be carefully placed to avoid postoperative cicatricial adhesion formation and stenosis.

The internal nasal valve is the narrowest part of the airflow and it often requires surgical treatment to improve nasal obstruction. This can be performed by using several techniques.

A very common technique is the use of spreader grafts made of septal or costal cartilage; conchal cartilage can also be used to create butterfly grafts, while being a useful tool to manage the middle nasal vault[3]. It can also be used to create spreader grafts, but it is not recommended, as it tends to have more curvature and less strength.

First described by Sheen, the spacer or spreader graft is the gold standard technique used to restore the internal nasal valve.[4] The original spreader graft is a matchstick-shaped graft that is secured between the upper lateral cartilage and the septum, while extending from the osteocartilaginous junction to the anterior septal angle. They can be unilateral, bilateral, identical or asymmetric, depending on the problem at hand. Spreader grafts can be placed via an endonasal or open approach.

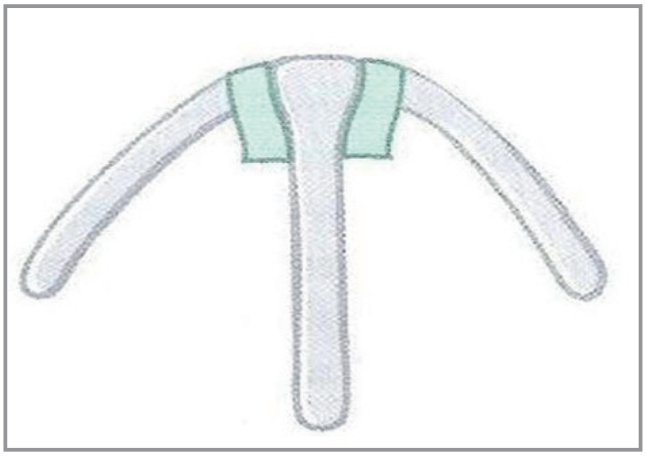

Figure 1: Spreader graft. Source: Babak Azizzadeh et al.[2]

Spreader grafts have proven useful in the correction of a deviated nose, where they can be used to help hold the septum straighter. They can be used in primary rhinoplasty to secure the upper lateral cartilages to the dorsal septum, which helps improve the structural integrity of the roof of the middle nasal vault and prevents postoperative collapse and inverted V deformity. The use of spreader grafts in functional rhinoplasty has been described to treat internal nasal valve collapse. The spreader graft is most often formed from a straight piece of septal cartilage, though any straight piece of cartilage or other graft materials can be used. When the endonasal approach is used, precise mucoperichondrial flaps are elevated along the dorsal septum, and the grafts are placed into those pockets. The graft is 1-4 mm wide and 3-6 mm deep; the length should be close to that of the upper lateral cartilages, so that the graft extends from the osteocartilaginous junction to just past the anterior septal angle. By using the external approach, the graft is placed under direct visualization between the dorsal septum and the upper lateral cartilages. It is important to position the graft so that the dorsal margin of the graft is level with the dorsal septum and no contour irregularity is visible. A polydioxanone suture is used to secure the graft in place with a horizontal mattress suture through bilateral grafts and the dorsal septum. If necessary, a straight 27-gauge needle can be placed from side to side to hold the grafts in place while suturing. Papel describes suturing the caudal edge of the upper lateral cartilage to the septum to provide traction and prevent buckling of the upper lateral cartilage[5]. Depending on the deformity being corrected, slightly wider grafts or stacked multiple grafts can be used unilaterally to achieve more symmetrical results or to help keep the crooked dorsal septum with a straighter shape.

When spreader grafts are used with flaring sutures, it is possible to obtain measurable improvements in the area of the nasal valve and nasal airway.[6]

Described by Claus Walter in Germany in 1977 and later popularized by Clark and Cook in 2002, the butterfly graft is a useful tool to resolve the middle nasal vault collapse.[3] It is an oval-shaped cartilage that is placed so that it lies on the dorsal surface of the upper lateral cartilages. It resolves both the dynamic and static collapse by opening the angle between the upper lateral cartilages and the septum, and providing support for weak upper lateral cartilages against the negative forces generated by inspiration. The conchal cartilage is the ideal material to use as a butterfly graft. The graft is harvested via an anterior approach, by elevating skin and the perichondrium of the conchal bowl. A curved piece of cartilage measuring at least 3 centimeters long by 1 centimeter wide is harvested, and the donor site is closed using an absorbable suture, with a bolster placed to prevent hematoma formation. Donor site morbidity and deformity are generally minimal.

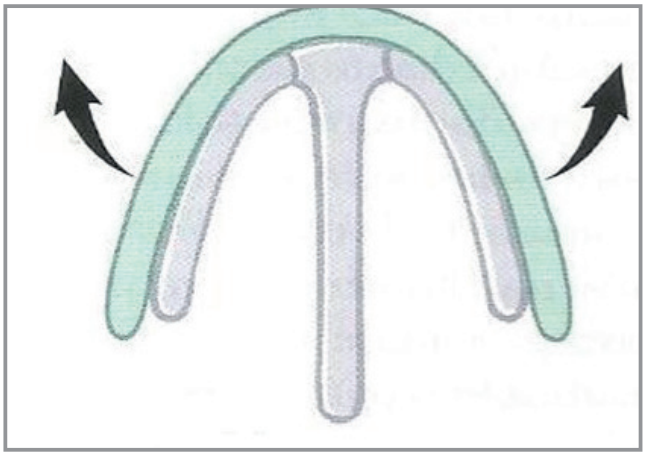

Figure 2: Butterfly graft. Source: Babak Azizzadeh et al.[2]

The graft is shaped so that any irregularities are minimized and the ends are tapered to smooth the skin over the graft. The graft can be placed by the creation of a pocket via either the endonasal or the external approach. The endonasal approach to create a pocket must be carefully done, so as not to allow any shifting of the graft. Through the external approach, the graft may be sutured to the lower lateral cartilages with a permanent monofilament suture.

The butterfly graft provides good results for patients with nasal airway obstruction. Sometimes, there's some complaining about the graft broadening the dorsum, which can cause some supratip fullness. Those potential pitfalls can be mitigated by shaping and placing the graft appropriately, while also resecting some septal cartilage to create a bed for the graft.

Nasal valve impairment as the main cause of nasal airway obstruction has been well described in modern literature. The current evolution of rhinoplasty techniques has led to many articles examining the effectiveness of various surgical maneuvers to correct the impairment of the nasal valve, mostly in the form of prospective and retrospective observational case series. Judgement on the quality of existing evidence should be based on a systematic review of the relevant research. Unlike narrative reviews, systematic reviews make the review process transparent and it should be possible for readers to replicate the process.[7] Systematic reviews are also important to demonstrate the areas where evidence is insufficient and to potentially make recommendations for future studies. There is only one systematic review article to date, supporting the evidence of functional rhinoplasty in the restorative treatment of internal nasal valve incompetence or collapse.[8]

Therefore, the aim of this study was to systematically review the evidence supporting the value of the spreader and butterfly graft techniques in functional rhinoplasty for the correction of internal nasal valve collapse in the treatment of nasal obstruction.

MATERIALS AND METHODS

Search strategy and inclusion criteria

We performed a literature search of articles published in English spanning across 32 years, between February 1984 and December 2016, in the electronic databases PubMed/MedLine, Scielo, Science Direct, and Scopus. We used an extensive search strategy to avoid duplicate publications, including only articles evaluating the efficiency of functional rhinoplasty in the treatment of internal nasal valve incompetence. This systematic review of the literature for the specific objective was carried out while following the instructions of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).[9]

Exclusion Criteria

We excluded from the search the articles not written in English or for which it was not possible to retrieve the full text. Articles that did not contain any data or with insufficient data as to the proposed objective were also excluded.

Articles from the same institution or written by the same group of authors were assessed for overlap of study time interval: if repeated information, duplicate data were excluded, and the data from the most complete set of those found were reviewed.

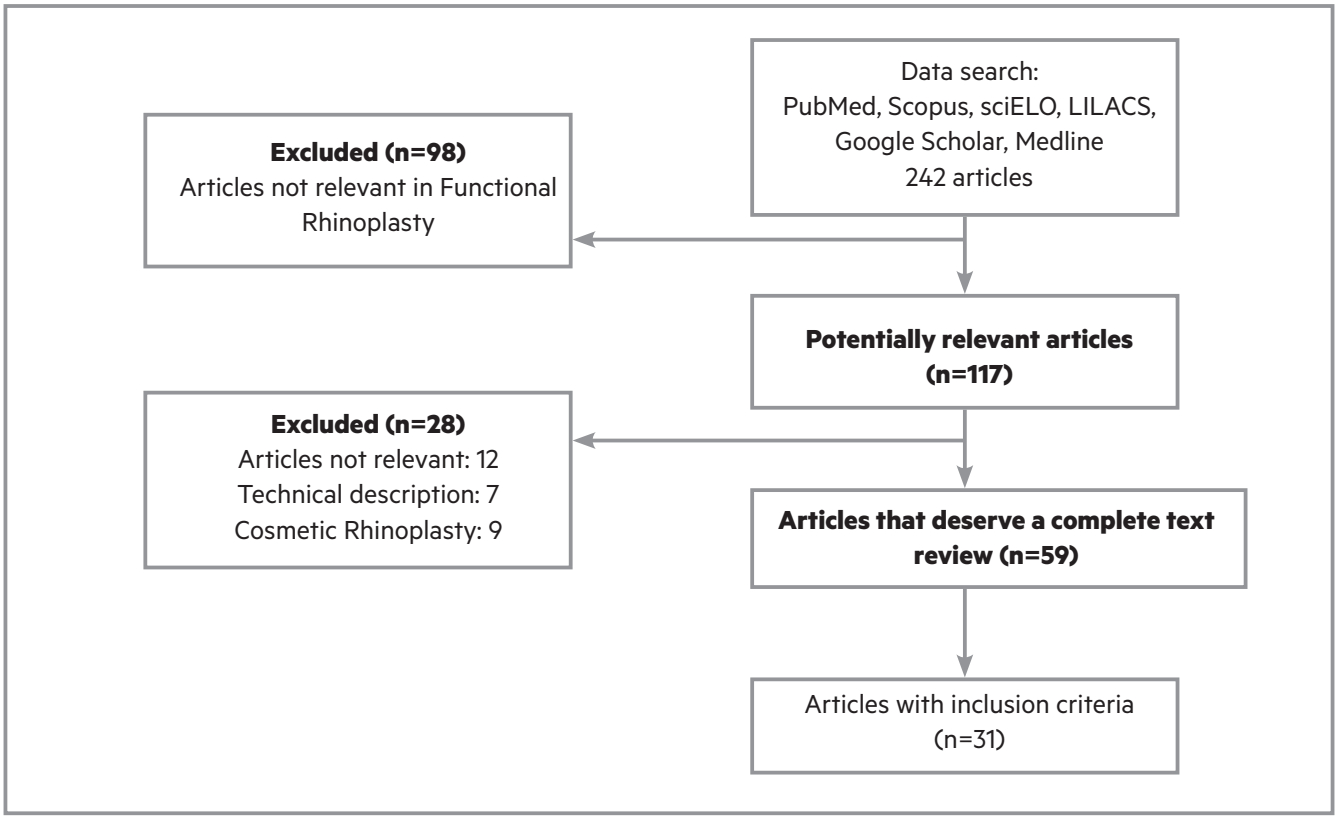

Figure 3: Study Flowchart

Data extraction

All the data were extracted from independent or associated authors; therefore, we used a data registration form or article selection flowchart created for this purpose, including the author, level of evidence, technique used, follow-up, results and findings. The 31 articles that met the inclusion criteria were independently reviewed for data extraction and quality assessment. Data extracted from each article included: study design, condition treated, inclusion/exclusion criteria, interventions performed, follow-up duration, percentage of subjects who completed the study, results measured, statistically analyzed variables, adverse reactions, and complications. Finally, the quality of the studies included was assessed according to the criteria defined by the Oxford Center for Evidence-Based Medicine (OCEBM) 2, while assigning each article with a designated level of evidence (Table 1).

Table 1: Grades of recommendation and levels of evidence (adapted from the Oxford Centre for Evidence-Cased Medicine).

Recommendation	Level of evidence	Type of study
A	1a	Systematic review of RCTs
	1b	Individual RCT
B	2a	Systematic review of cohort studies
	2b	Individual cohort study
	3a	Systematic review of case control studies
	3b	Individual case control study
C	4	Case series/case report
D	5	Expert opinion, bench research

RCT, randomized controlled trial.

RESULTS

A total of 242 abstracts were prepared and 177 potentially relevant articles were identified. Of those, 59 articles were in line for a full text review. A total of 31 studies met the inclusion criteria (Table 2).

The specific interventions varied both within and among the studies, and include spreader grafts and butterfly grafts above all. The quality of 30 articles was rated as level 4 and one of them was rated as 2b. Follow-up duration ranged from 1 to 13 years. Result measures also included subjective patient reports, non-validated questionnaires, and validated patient-reported measures, as well as objective measurements such as rhinomanometry, acoustic rhinometry, and nasal airflow studies.

Additionally, we found a wide variability in the use of statistics, number of patients, follow-up time, reporting of adverse reactions or unsatisfactory results. Out of the 31 studies included, 15 (48.3%) were prospective and 16 (51.7%) retrospective ones.

As for reporting results, 8 studies (25.8%) were subjective patient results, 7 (22.5%) used the visual analogue scale (VAS), 13 (41.9%) included a patient-validated questionnaire, and 9 (29%) used objective measurements. These categories were not exclusive, and some studies used a combination of measurements. The patient-validated questionnaire included: The Nasal Obstruction Symptom Evaluation (NOSE scale), the Likert Satisfaction Scale, the Epworth Sleepiness Scale, the Glasgow Benefit Inventory (GBI), and the Nasal Symptom Questionnaire (NSQ).

The most common objective measurement was rhinomanometry. Other objective measurements included nasal plethysmography and internal measurement of the nasal valve angle.

Statistical analysis (beyond simple descriptive statistics) of the results was performed in 5 studies (16%).

Despite the considerable variety of study design, quality, intervention, and result measures used, all the articles overall supported the effectiveness of spreader graft and butterfly graft techniques in functional rhinoplasty for the correction of internal nasal valve incompetence. Reported efficiency ranged from 100% to 44%. None of the studies found the spreader and butterfly grafts in functional rhinoplasty to be inefficient for the correction of internal nasal valve incompetence.

Adjunctive procedures were performed in 20 studies.

The most common adjunctive procedures were septoplasty (60%), turbinate reduction (45%), functional endoscopic sinus surgery (FESS) (15%), uvulopalatoplasty (5%), and orthognathic surgery (5%).

Only 11 studies (35.4%) addressed solely the nasal valve collapse repair with the spreader graft and butterfly graft techniques, without any other adjunctive procedure.

The most common adverse reaction was lack of improvement in airway patency. Revision surgery rates ranged from 4% to 9%. Postoperative complications were reported in 9 studies (29%) and the most frequent were: synechiae (13%), infection (6.4%), graft resorption (9.6%), and residual septal deviation (6.4%). Other reported complications included external deformity (3.2%), hematoma (3.2%), graft dislocation/migration (9.6%)

Table 2: Primary articles reviewed addressing targeted research question of nasal valve repair.

LEAD AUTHOR YEAR	LOE	N	TECH-NIQUES USED	FOL-LOW-UP: MONTHS (MEAN)	OUTCOMES MEASURED	FINDINGS
Akcam 2004[14]	4	40	SG, butterfly onlay graft	20	1. Symptom questionnaire for nasal breathing, snoring, and tiredness	95% improved patency; 43% reduced snoring; 58% reduced tiredness upon awakening; 23% with no improvement of day-time sleepiness/drowsiness
Andre 2004[15]	4	111	FESS,S-G,SP,TR	3-43 (22)	1. Questionnaire for nasal patency	44% optimal nasal patency; 11% no change; 1% persistent septal deviation with worsened nasal obstruction;
Andre 2006[16]	4	27	BG (sub-alar), SG, SP, TR	3-53 (14)	1. Subjective nasal airway satisfaction	65% improved patency
Andre 2006[17]	2b	154	FESS, SG, SP (replacement vs septal batten graft), TR	3-129 (17)	1. Questionnaire for nasal patency 2. Observer rated evaluation of septum	1. Septal batten: 86% improved nasal patency; midline septum in 54% 2. Septal replacement: 94% improved nasal patency; midline septum in 75% No difference in nasal patency between groups* 17% no change 3% breathing worse 2% residual deviated septum
Arslan 2007[18]	4	25	Dorsal onlay graft, SG, CS	6-48 (20)	1. Subjective nasal airway satisfaction	92% nasal airway satisfaction; Complications: 1 intranasal synechiae
Bertrand 2002[19]	4	29	SG (modified)	12	1. Rhinomanometry 3. Patient VAS score for nasal patency 4. Patient questionnaire for snoring	No difference in rhinomanometry* Overall VAS improvement* No correlation of preoperative VAS score and rhinomanometry* VAS correlated with rhinomanometry for right side at 1 year* 88% decreased snoring
Boccieri 2007[11]	4	53	CS, BG, SG, Peck onlay graft, orthognathic surgery	18-26	1. Patient VAS score for nasal patency 2. Rhinomanometry	100% improved nasal patency; 100% reduced nasal resistance; Complications: 1 graft resorption
Cervelli 2006[20]	4	33	SG (cartilage onlay)	2 weeks-8 years	1. Subjective nasal airway satisfaction	94% excellent functional results; 6% with persistent nasal obstruction; Complications: 9% revision rate; 1 graft dislocation; 1 graft resorption

Table 2: (continuation) Primary articles reviewed addressing targeted research question of nasal valve repair.

LEAD AUTHOR YEAR	LOE	N	TECHNIQUES USED	FOLLOW-UP: MONTHS (MEAN)	OUTCOMES MEASURED	FINDINGS
Chaiet 2014[21]	4	157	Butterfly onlay graft	3	1. Symptom questionnaire for nasal breathing, snoring, and tiredness	97% nasal airway satisfaction
Cillo 2006[22]	4	30	SG, SP, LAUP	8-37 (21)	1. Epworth Sleepiness Scale 2. Questionnaire for nasal breathing improvement, and snoring	50% decrease in average ESS*; 83% improved upper airway breathing*; 76% eliminated/ decreased snoring*
Clark 200[23]	4	72	SG , butterfly dorsal onlay	24	1. Subjective nasal airway satisfaction	100% improved patency; Complications: 4% revision rate; 4 minor infections; 1 hematoma at auricular cartilage donor site;
Constantian 1993[23]	4	23	BG vs alar cartilage relocation, CS, SG, SP, TR	2 6	1. Rhinomanometry	Increased mean postoperative airflow*
Constantian 1996[24]	4	160	BG, SG (dorsal onlay), SP	1-43 (8)	1. Rhinomanometry	95% overall improved patency; Improved patency with septoplasty nasal valve repair*; 99% patient satisfaction; 8% partial or total residual obstruction
Constantinides 1996[25]	4	27	SG, TR	16-77 (41)	1. Nasal plethysmography 2. Patient VAS score for nasal airflow 3. Observer exam of nasal valve	44% improved nasal resistance*; 26% worsened nasal resistance; 81% improved VAS score; No correlation between nasal valve exam and nasal resistance*; No correlation between VAS and nasal resistance*
Faris 2006[26]	4	23	BG, SG	6-27 (153)	1. Patient VAS score for nasal patency; 2. Patient VAS score for QOL;	Overall improvement in nasal patency*; Overall improvement in QOL VAS*; Complications: 1 graft resorption 1 graft migration

Table 2: (continuation) Primary articles reviewed addressing targeted research question of nasal valve repair.

LEAD AUTHOR YEAR	LOE	N	TECHNIQUES USED	FOLLOW-UP: MONTHS (MEAN)	OUTCOMES MEASURED	FINDINGS
Foda 2005[27]	4	11	CS, SG, SP, other multiple	1-96 (32)	1. Subjective nasal airway satisfaction 2. Postoperative photographs	79% improved nasal breathing
Friedman 2009[28]	4	100	Butterfly onlay graft	9	1. Symptom questionnaire for nasal breathing, snoring, and tiredness	56% reduced snoring; 71% improved patency; 88% satisfaction with nasal cosmetic
Gassner 2006[29]	4	6	Butterfly onlay graft modified	6	1. Subjective nasal airway satisfaction 2. Cottle test positive No significant septal or turbinate pathologies	60% optimal nasal patency
Jin 2006[30]	4	64	CS, SG, TR, other multiple	6 (13)	1. Subjective 5-point scale rating nasal obstruction 2. Postoperative photographs	Improvement in mean subjective postoperative nasal obstruction; 5% residual deviation; Complications: 1 depression of the middorsum after spreader graft 1 malpositioned dorsal cartilage graft
Khosh 2004[10]	4	53	CS, BG, SG, TR, dorsal onlay	12	1. Subjective nasal airway satisfaction	92% improved patency; Complications: 2 intranasal synechiae
Marcus 2006[13]	4	44	CS, BG, FESS, SG, SP	6	1. Questionnaire for nasal obstruction	93% reported improvement in nasal obstruction; 92% overall satisfied; Complications: 1 vestibulitis 4 intranasal synechiae
Most 2006[31]	4	41	SG, SP, TR, suture suspension of external valve	5-11 (227 days)	1. NOSE scale 2. Patient VAS for nasal breathing	NOSE scale improvement for entire group/subgroups*; Overall VAS score improvement*

Table 2: (continuation) Primary articles reviewed addressing targeted research question of nasal valve repair.

LEAD AUTHOR YEAR	LOE	N	TECHNIQUES USED	FOLLOW-UP: MONTHS (MEAN)	OUTCOMES MEASURED	FINDINGS
Ozturan 2000[32]	4	76	SP, SG vs splay graft vs no graft	3-27 (14)	1. Physical exam of nasal vault 2. Subjective nasal airway satisfaction	Spreader graft and splay graft groups with less nasal obstruction and less internal nasal valve constriction than no graft*; Complications: 13 intranasal synechiae
Palacin 2007[33]	4	41	Extended Spreader Graft	12	1. Subjective nasal airway satisfaction 2. Photograph follow up	100% optimal nasal patency
Rhee 2005[34]	4	20	BG, SG (flaring sutures), SP, TR	6	1. NOSE scale 2. Observer VAS for nasal obstruction 3. Likert satisfaction scale	Overall improved mean NOSE scores*; Physician severity score did not correlate to NOSE score*; Physician VAS score did correlate to NOSE score*; 75% patient satisfaction
Saedi 2014[35]	4	32	Spreader Graft/ Spreader Flap/Onlay Graft	12	Visual analog scale (VAS)	Differences pre/postoperative: VAS Nasal Obstruction p=0.68 VAS Cosmetic Satisfaction p=0.38
Scuito 1999[36]	4	12	CS, BG, SG, multiple other	7-40 (15)	1. Patient VAS for nasal patency 2. Rhinomanometry	100% improved VAS score 100% improvement in nasal airflow
Stacey 2009[37]	4	82	SG, butterfly onlay graft	3	1. Symptom questionnaire for nasal breathing, snoring, and tiredness	45% reduced snoring; 65% improved fatigue
Toriumi1997[38]	4	46	BG	1-15 years	1. Patient subjective 5-point score for nasal airway obstruction 2. Physical examination	98% improved nasal airway obstruction Complications: 1 with scarring of the internal vestibular skin 2 with persistent fullness of supra-alar region
Vuyk 2000[39]	4	110	SG, multiple other	60	1. Questionnaire for nasal patency	92% nasal airway satisfaction
Zijlker 1994[12]	4	27	CS, SG, multiple other	5-36 (18)	1. Patient VAS for nasal patency	88% improved patency; Complications: 1 septal hematoma

DISCUSSION

Internal nasal valve collapse is a major cause of airway obstruction and should be especially considered in post-rhinoplasty patients.[10]

The deformity can be static or dynamic. It can also coexist with other nasal pathologies including septal deviation, inferior turbinate hypertrophy, and external nasal valve collapse.

Osteotomies performed in cosmetic rhinoplasties and their effect on the internal nasal valve were studied by Grymer with the use of acoustic rhinometry. He reported a 25% reduction in the cross-sectional area of the valve, and a 13% area reduction in the pyriform aperture.

Sheen, described the placement of spreader grafts or spacers made of cartilage between the upper lateral cartilages and the septum to increase the angle of the internal nasal valve.[4] Spreader grafts displace the upper lateral cartilages laterally. The septal cartilage is most often used to make the grafts. The graft is 2-3mm wide and made to be the length of the upper lateral cartilage. It is placed submucosally and secured with sutures.

Some authors have defended the preventive use of spreader grafts in patients with an indication for primary rhinoplasty, who have short nasal bones and long and weak upper lateral.[11] In either primary or secondary rhinoplasty, spreader grafts have been reported to improve nasal valve patency by more than 80%.[12]

In 2002, Clark & Cook reported that using the butterfly graft in primary and revision rhinoplasty strengthens the lateral nasal wall and opens the angle of the internal nasal valve.

They studied 72 patients who were monitored for a minimum of 2 years and found that almost all patients experienced relief from nasal airway obstruction and improvement in the appearance of their noses.

Marcus et al., used butterfly grafts and spreader grafts in patients with functional airway obstruction who also underwent endoscopic sinus surgery, and found that 93% of those patients experienced some improvement in nasal breathing.[13] The results were not disaggregated comparing patients with butterfly graft to those with spreader graft.

In this paper, we performed a systematic review of what has been published in the literature in the last 32 years, while addressing a specific question regarding the value and effectiveness of spreader and butterfly grafts in functional rhinoplasty for the correction of internal nasal valve incompetence.

Most of the studies were rated as level of evidence 4, except for one study level 2b that more specifically compared one surgical technique with another. Due to the heterogeneity of study designs, result measures and the lack of level 1 evidence studies (randomized controlled trials), data pooling was considered inappropriate; therefore, a meta-analysis of the studies could not be performed.

With the use of traditional OCEBM guidelines, we assigned an aggregate grade C to current evidence on the use of spreader graft and butterfly graft techniques in functional rhinoplasty for the correction of internal nasal valve incompetence. Overall, there would appear to be a consistency of effect, with all studies reviewed reporting general improvement for cohort studies in the treatment of nasal valve in-

competence. The effect size was difficult to quantify, due to the heterogeneity of the result measures. In addition, many of the studies had other adjunctive procedures performed concomitantly. The impact of those other simultaneous procedures in the correction of nasal airway obstruction cannot be ignored: Septoplasty, turbinectomy, and sinus surgery. However, there were 11 studies that assessed the nasal valve in its pure form (without any concomitant procedures), and observed consistency of effect (i.e., improved nasal airway).

Many authors did not report surgical complications or the need for revision procedures.

Criticism could be raised about the use of the OCEBM guidelines for surgical disease processes that do not necessarily have an equivalent non-surgical comparison cohort. The OCEBM guidelines are insufficient to help differentiate studies in quality level 4, and this is an aggregate level C according to OCEBM criteria.

The other difficulty in measuring the results of this process is the lack of a gold standard objective test for nasal obstruction. The review showed that only 12.9% of the studies attempted to use an objective assessment tool, with rhinomanometry being the most common one; they are not universally available.

CONCLUSION

There is substantial level 4 evidence to support that butterfly grafts are as valuable and efficient as spreader grafts in functional rhinoplasty techniques for the treatment of internal nasal valve incompetence.

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RETROSPECTIVE ANALYSIS OF NASAL FRACTURE TREATMENT AT IPO HOSPITAL

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ABSTRACT

Among the emergencies otorhinolaryngologists most commonly see in the emergency room are nasal fractures, often regarded of minor importance, though with the chance of significant cosmetic and functional damage. This study aimed to outline a profile of the patients seen and treated in a reference service in the city of Curitiba, state of Paraná. A retrospective study related to the pathology was performed with the investigation of variables such as sex, age, semiology, etiology, diagnostic tools, intervention time, postoperative complaints, and rate of secondary surgeries. 205 records were included. There was a predominance of males (56.6%). The most affected age group was between 21 and 30 years old (27.8%). Most fractures were caused by physical assault (28%). The most prevalent symptom, directly linked to surgical indication, was rhinoscoliosis. Patients were treated in an average period of 8 to 14 days. Among surgical patients, 17% were dissatisfied and only 7.2% underwent reoperation. The data found were consistent with the medical literature and reached satisfactory results. However, it would be beneficial to promote a new study, this time a prospective one, to support the creation of a protocol to address this emergency with the aim of standardizing conduct and optimizing results.

KEYWORDS

Nasal fracture/epidemiology. Facial trauma. Nasal fracture/secondary nasal deformity.

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INTRODUCTION

There is a progressive increase in the number of patients seen in urgent and emergency care.[1-5] This fact echoes in national institutions, both public and private ones, according to data from the Brazilian Association of Otorhinolaryngology and Cervico-Facial Surgery.

The *Instituto Paranaense de Otorrinolaringologia* (IPO) is a high-complexity hospital that offers 24-hour urgent and emergency care for conditions related to the nose, ear and throat. It serves the city of Curitiba and its metropolitan area. The daily count of new emergency consultations is approximately 500 patients.[6] This is highly positive for an overview of epidemiological profiles, and to establish service protocols for the most prevalent or relevant pathologies.

In this context, facial trauma becomes quite relevant, due to the high incidence of cases. Besides, if not properly treated, the patient will develop aesthetic and functional sequelae, with emotional, social and economic side effects.[7] Its relevance grows in direct proportion to the increase in factors related to modern urban life, such as traffic accidents and interpersonal violence.[8] At the same time, nasal fractures are one of the most frequent conditions treated by otorhinolaryngologists.[9] It is the most prevalent among traumatic injuries of the face, being the third most common of the entire human skeleton.[10,11] In an epidemiological study on the prevalence of traumatic facial injuries performed at the *Hospital do Trabalhador* in Curitiba - Paraná, for instance, the nasal region was the most affected, with 44.75% of cases.[12]

This higher prevalence is primarily justified by the smaller force needed to fracture the nasal bone, when compared to the one needed to fracture other bones in the face, also because it is a structure in a prominent position.[10] Due to its anterior body projection, the nasal pyramid is too vulnerable to mechanical and traumatic aggression.[8,9]

The etiology of the nasal trauma is heterogeneous and is directly related to the profile of the studied population. Factors related to sex, age and mechanism of trauma may vary according to geographic distribution. In European countries, for instance, the use of bicycles for leisure, sports or as a means of transportation is widespread, which increases the risk of accidents of this nature.[8,13,14]

Often regarded as less complex injuries and with a "simple" treatment at first sight, nasal fractures have significant and unexpected implications, both from a structural point of view and with upper airway obstruction.[7] This fact can be appreciated by the high incidence of residual nasal deformities that require a secondary surgical procedure. Some studies mention this rate close to 50%.[10,11,15,16] The Journal of Craniofacial Surgery features a systematic review published recently in which 29% of closed reduction of nasal bone fractures result in dissatisfaction.[17]

Therefore, the choice of this topic was guided by the lack of studies related to the review of isolated nasal traumas in Brazil.[10] After a thorough review of national and international literature, a wide range of epidemiological profiles of nose fractures becomes evident, as well as expressive rates of deformities or residual sequelae after nasal surgical treatment. All that data sparked a need for self-assessment within IPO Hospital. Therefore, the aim of this investigation is to understand the profile of patients treated with a diagnosis of nasal fracture and the standard treatment to this

emergency in a reference service in the city of Curitiba, state of Paraná. With that in mind, our study was performed by carefully reviewing variables such as sex, age group, signs and symptoms, mechanism of trauma, diagnostic tools, time between trauma and treatment, aesthetic and functional postoperative complaints, rate of revisional or secondary surgeries, all with the aim of inspiring conceptions that are able to optimize the treatment and mitigate future negative results within the aforementioned institution.

MATERIALS AND METHODS

2.1 Theoretical database creation

We performed a comprehensive and detailed literature review to obtain data on facial trauma and specifically on nasal fracture. First, we reviewed data on anatomy, anamnesis, physical examination, diagnosis, treatment and prognosis. The textbooks on which this research was based were: *Tratado Brasileiro de Otorrinolaringologia* [Treaty of Otorhinolaringology][18] edited by the Brazilian Association of Otorhinolaryngology and Cervico-Facial Surgery, Cummings Otolaryngology - Head and Neck Surgery,[19] *Urgências e Emergências em Otorrinolaringologia* [Urgencies and Emergencies in Otorhinolaringology],[20] and Peterson's Principles of Oral and Maxillofacial Surgery – 3rd Edition.[21]

At the same time, we performed an in-depth review of articles from medical journals, i.e., magazines, newspapers and articles from expert publications on nasal fractures, with primary focus on epidemiology, etiology, diagnostic tools, treatment protocols, and incidence of complications. To identify those articles, the term "nasal bone fracture" was used in the search engines PubMed and SCOPUS, and the term "nasal fracture" and "epidemiology" in the search channels of VHL (Virtual Health Library) and SciELO (Scientific Electronic Library Online).

2.2 Methodological Design of the Study

This study retrospectively reviewed data related to the electronic medical records of 341 patients admitted to IPO Hospital, from January 1st to December 31, 2016, whose diagnosis established at the time of the first consultation, according to the International Classification of Diseases (ICD-10), was S02.2 (nasal bone fracture).

2.3 Sample of patients

During selection, there were no restrictions regarding sex, age or race, since those parameters were also to be studied. We excluded from data collection medical records whose patients had suffered any associated facial or head trauma; records that did not have enough data, at least partially, for the review to be done; patients who did not complete a diagnosis of nasal fracture during clinical and complementary investigation or who did not return to follow up on the diagnostic or treatment approach; and those patients who looked for treatment more than 30 days after the nasal trauma. Under those conditions, 136 patients were excluded and 205 patients were selected for data collection.

2.4 Data collection

Data were obtained from the review of medical records, while focusing on the demographic variables relevant to the care, surgical procedure and postoperative follow-up of patients. With that in mind, a questionnaire was developed for the collection of the information seen below.

2.4.1 Protocol/Questionnaire - Initial care

- Q1 - Name / Medical Record:
  -
- Q2 - Sex:
  - Male
  - Female
- Q3 - Age (years)
  - 0-10
  - 11-20
  - 21-30
  - 31-40
  - 41-50
  - 51-60
  - 61 or more
- Q4 - Mechanism of trauma
  - Car accident
  - Motorcycle accident
  - Cycling accident
  - Sports accident
  - Work accident
  - Pedestrian accident
  - Assault/Violence
  - Fall from a height
  - Fall from one's own height
  - Impact not related to fall
- Q5 - Signs and symptoms (more than one option)
  - Rhinoscoliosis
  - Oedema/Chemosis
  - Local pain
  - Nasal obstruction
  - Epistaxis
  - Nasal laceration with contusion
  - Saddle nasal dorsum
  - Crackling
  - Traumatic deviated septum
  - Hematoma
  - Bone unevenness or steps
- Q6 - Complementary exam
  - X-ray
  - Face tomography
- Q7 - Treatment approach
  - Surgery
  - Conservative
- Q8 - Time between trauma and surgery
  - 0-7 days
  - 8-14 days
  - 15-21 days
  - > 21 days

2.4.2 Protocol/Question - Evaluation after 30 days of surgical treatment

- Q1 - Aesthetic and/or functional complaints mentioned by the patient after 30 days (more than 1 option):
  - Cosmetic or structural deformity
  - Nasal obstruction
  - Olfactory disorder
  - Epiphora or nasolacrimal obstruction
- Q3 - Secondary surgery or reoperation:
  - Yes
  - No
  - Which one?

2.5 Surgical procedure

It is important to point out that for all the patients involved in the study, the surgical restorative treatment of their nasal fractures was performed by means of closed reduction.

2.6 Statistical analysis

The statistical treatment of the research was the one considered appropriate according to the nature of the data reviewed. In the inferential statistics, the following variables were compared: sex, age, mechanism of trauma, time elapsed between trauma and treatment, signs and symptoms present in patient care, postoperative complaints and secondary surgery rates of patients who underwent surgical treatment in the year of 2016.

The data obtained were sorted and categorized in Microsoft Excel version 2013, crossed and assessed. The results were described by frequencies and percentages. To assess the association between two categorical variables, Fisher's exact test or the chi-square test was used. Values of $p<0.05$ indicated statistical significance. Data were analyzed using the IBM SPSS Statistics v.20.0. Armonk, NY: IBM Corp. computer program.

2.7 Ethical aspects

The study was approved by the Ethics and Research Committee of IPO Hospital. The ethical principles and research regulations on human beings found in Resolution CNS/MS 466/2012 were observed according to the Brazilian Health Council, while adhering to the ethical principles of beneficence, non-maleficence, justice and autonomy.

There was no need to create and apply a free and informed consent form, as this study was not applied on human beings.

RESULTS

In 2016, 341 patients with ICD-10 S02.2 (nasal bone fracture) were registered at IPO Hospital. In the review of those records, 205 of them qualified by meeting the feasibility conditions to administer the questionnaire for data collection. On the other hand, we excluded 136 patients who promptly met the exclusion criteria previously defined for the study. Out of those patients dismissed, 52 dropped out or did not return to follow up on the diagnostic or treatment approach; 47 of them, despite being assessed as having nasal fractures in the admission consultation, were identified as having trauma without fractures after completing the clinical and complementary investigation; 20 looked for treatment more than 30 days after nasal trauma; 11 records did not include enough data, at least partially; 4 were unequivocally assessed with ICD-10 S02.2; and 2 of them had associated fractures of other facial or cranial bones. Therefore, the review presented below was performed based on data from 205 patients who had nasal fractures and met the inclusion criteria in the study.

There was a predominance of male patients, representing 56.6% (n=116) of the total, whereas 43.4% (n=89) were female. As for age distribution, the peak incidence was in the range between 21 and 30 years old with 27.8%, followed closely by the range between 11 and 20 years old, which represented 22.4% of individuals, and by the range between 31 and 40 years old, with 20.5% (Fig 1).

As for the mechanism of trauma, most of the fractures were due to physical assault or interpersonal violence (28%), followed by sports accidents (24.8%), fall from one's own height (20.0%) and impact not related to fall (16.8%) (Fig 2). Regarding the clinical profile, there was

a higher prevalence of rhinoscoliosis (60.3%), presence of ecchymosis/hematoma (54.5%), followed by epistaxis (32.7%), obstruction (27.6%), and bone unevenness (25.6%), with other signs and symptoms also studied being less prevalent (Fig 3). In a deep-dive review, we found that 70% of the records (85 patients) catalogued as rhinoscoliosis at medical admission were referred for restorative treatment ($p<0.001$; Fisher's test).

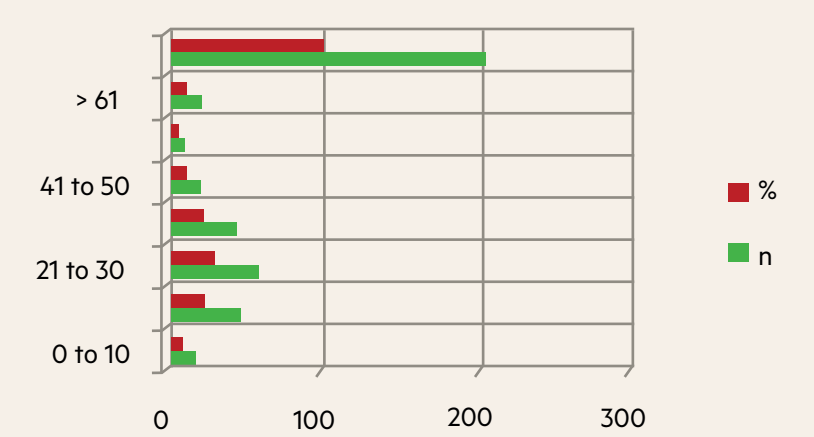

Figure 1: Age range.

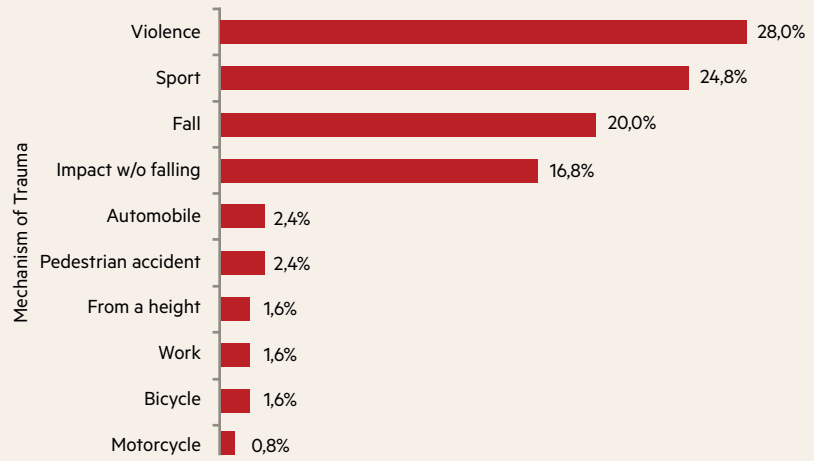

Figure 2: Mechanism of trauma.

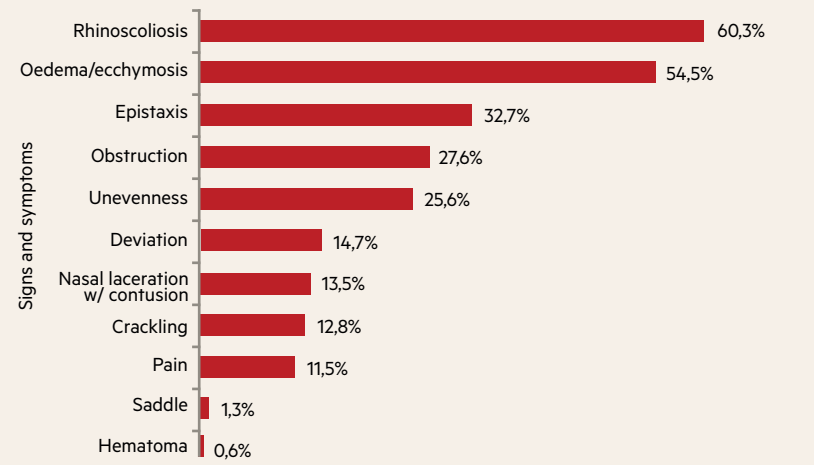

Figure 3: Signs and Symptoms

While correlating the etiology of nasal fractures with age group (Table 1), we found that teenage patients (11-20 years old) and young adults (21-30 years old) were predominantly related to mechanisms of violence and trauma in sports, which together account for nearly 80% of the causes of nasal fracture in those age groups, respectively. In the child segment (0-10 years) falls from one's own height and impact not related to falls were predominantly observed, accounting for more than 60% of mechanisms of nasal trauma in this age group. In the elderly (over 61 years old) and older adults (51-60 years old), nasal fractures are mostly related to falls from one's own height, totaling 86.7% and 80.0% in those age groups, respectively. As for the correlation between sex and etiology of the trauma (Table 2), we noticed that interpersonal violence and sports trauma were the most frequent etiologies for males, accounting for 38.2% and 36.8%, respectively. On the other hand, fall from one's own height was the most frequent etiology (36.8%) for females, followed by impact not related to falls (24.6%). Tables 1 and 2 show the frequencies and percentages of cases according to correlations between mechanism of trauma and age group, and mechanism of trauma and sex, respectively. Due to the small number of cases in several combinations of those variables, it was not possible to apply a statistical test.

Table 1: Mechanism of trauma x Age group.

Mechanism of trauma	Age (years)						
	0-10	11-20	21-30	31-40	41-50	51-60	>61
Violence	2	10	13	10			
	22,2%	35,7%	40,6%	33,3%			
Sport		11	12	6	2		
		39,3%	37,5%	20,0%	33,3%		
Fall	3	2	1	2		4	13
	33,3%	7,1%	3,1%	6,7%		80,0%	86,7%
Impact w/o fall	3	2	6	6	2	1	1
	33,3%	7,1%	18,8%	20,0%	33,3%	20,0%	6,7%
Pedestrian accident		1		2			
		3,6%		6,7%			
Automobile		1		1	1		
		3,6%		3,3%	16,7%		
Bicycle				2			
				6,7%			
Work	1			1			
	11,1%			3,3%			
From a height		1					1
		3,6%					6,7%
Motorcycle					1		
					16,7%		
Total	9	28	32	30	6	5	15

Table 2: Mechanism of trauma x Sex.

Mechanism of trauma	Sex	
	Male	Female
Violence	26	9
	38,2%	15,8%
Sport	25	6
	36,8%	10,5%
Fall	4	21
	5,9%	36,8%
Impact w/o fall	7	14
	10,3%	24,6%
Pedestrian accident	1	2
	1,5%	3,5%
Automobile		3
		5,3%
Bicycle	2	
	2,9%	
Work	2	
	2,9%	
From a height		2
		3,5%
Motorcycle	1	
	1,5%	
Total	68	57

Table 3: Type of treatment.

Treatment	n	%
Surgery	164	80.0
Non-surgical	41	20.0
Total	205	100.0

In the reviewed sample, computed tomography was used as a complementary exam in 70.3% of the patients treated within the institution, whereas facial X-rays were used in 29.7% of the medical approaches (Fig 4). It is important to point out that it was not possible to determine which test was used as a diagnostic tool in 10 cases, either because of no medical request or lack of information in the medical records.

Among the medical records studied, 41 patients (20%) were considered for the expectant or conservative approach, and 7 patients in that group were referred for restorative treatment, though they refused the surgical procedure, whereas 164 (80%) were referred for surgical reduction of fractures of nasal bones (Table 3). Of those, 28 patients (17.1%) reported functional complaints and/or cosmetic dissatisfaction during postoperative follow-up, with 11 cases of residual deformity, 10 occurrences of persistent nasal obstruction, and 7 reporting the two previous complaints coexisting. Local infection, anosmia, and epiphora were not recorded (Table 4). In 8 patients, rhinoseptoplasty was performed to

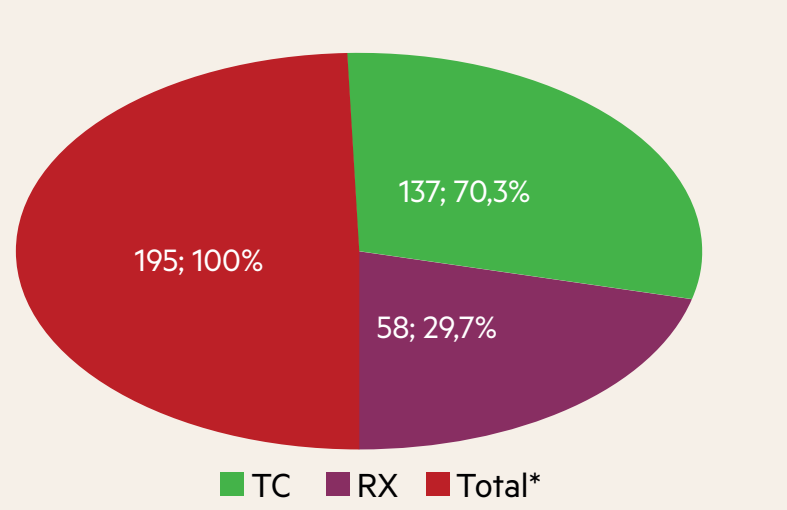

Figure 4: Complementary Exam.

correct persistent deformity, and in 4 of them septoplasty was performed only secondarily (Table 5), which totaled 12 cases of reoperation or approximately 7.2% (Table 5). The most prevalent interval between trauma and surgical reduction in patients who were referred for restorative procedures was 8 to 14 days (Fig 5).

There was also a review of postoperative complaints according to the sex affected. Figure 6 shows frequencies and percentages of cases according to sex and the presence or absence of any complaints after treatment (p-value: 0.673; Fisher's exact test, $p<0.05$). We found that 16.2% of male patients were dissatisfied with the surgical result, whereas 18.6% of female patients were dissatisfied. As to the complaint of residual cosmetic deformity in particular, both female and male were equivalent, with 5 and 6 cases each, respectively.

Finally, we concluded our data collection by verifying the frequency of postoperative complaints according to the time of intervention, in order to consider whether early or late approaches compromise the surgical results. This way, it was clear that 31% of the patients who underwent restorative treatment within 7 days of the nasal trauma showed some dissatisfaction with the postoperative result; of those treated between 8 to 14 days, 14.7% mentioned complaints; from 15 to 21 days 6.3%; and for more than 21 days 20% (Table 6).

Table 4: Complaint after treatment.

Complaint after treatment	n	%
No	136	83
Deformity	11	6.7
Nasal obstruction	10	6.1
Deformity; nasal obstruction	7	4.2
Total	164	100.0

Table 5: Secondary surgeries.

Secondary surgeries	n	%
No	152	92.8
Rhinoseptoplasty	8	4,8
Septoplasty	4	2.4
Total	164	100.0

Table 6: Postoperative dissatisfaction x Time interval between trauma and treatment

Complaints after treatment	Time elapsed between first consultation and surgery (days)			
	0 to 7	8 to 14	15 to 21	> 21
No	20	93	15	8
	69.0%	85.3%	93.8%	80.0%
Yes	9	16	1	2
	31.0%	14.7%	6.3%	20.0%
Total	29	109	16	10

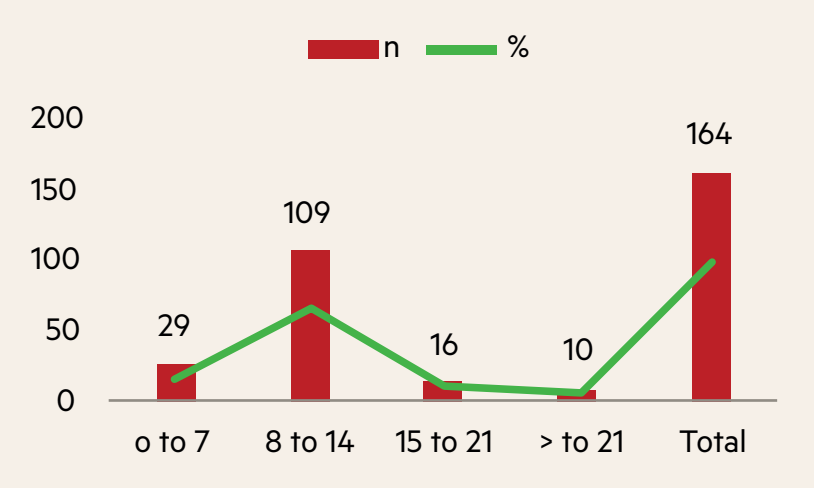

Figure 5: Time elapsed between trauma and surgery

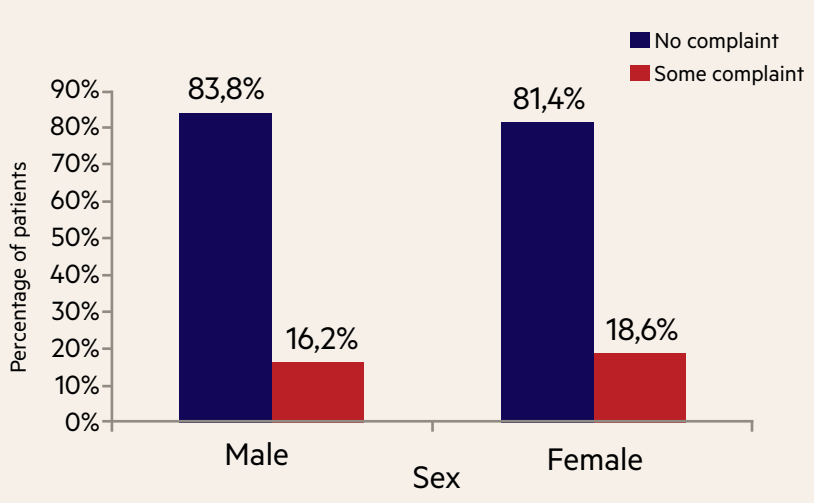

Figure 6: Postoperative dissatisfaction x Sex.

DISCUSSION

There are few studies that address nasal trauma on its own. This topic is usually addressed together with facial trauma in general. In this context, we found four publications in Brazil with the same purpose, the most expressive of which were performed at the *Hospital de Clínicas* from the State University of Campinas (UNICAMP) and at the University Hospital from the State University of Londrina (UEL), with 144 and 167 patients respectively. Despite assessing 341 medical records, our study included 205 patients over a period of one year, which, comparatively, shows great relevance. In international publications, except for literature reviews, a prospective review with 400 patients performed at the University Hospital Waterford (Ireland) was the only one to outdo this IPO Hospital review in Curitiba, Paraná as far as the number of patients studied.

As seen in other studies, males were most affected, and the most prevalent age group in our case study was from 21 to 30 years old. Similar data were found by Borghese et al.[10] who reached a ratio between male and female sexes of 3.1:1 and an average age of 26.3 years. Fornazieri et al.[9], in turn, reached an even higher ratio in their study, of 4:1 (men: women), with the most prevalent age being from 20 to 30 years. Hwang et al.[14] found a male prevalence of 77%, predominantly in the 20-29 age group. Therefore, the data presented in this study corroborate the fact that nasal trauma overall is a condition closely linked to young male individuals in an economically active age group. Consequently, our sample ends up converging with the other investigations and reviews in this regard.

In our study, the most frequent mechanism of fracture was physical assault, followed by sports accidents and falls from one's own height. In our sample, the etiology of nasal fractures followed a pattern similar to that of other publications relevant to the topic. In Borghese et al.[10], for example, interpersonal violence and sports also accounted for more than 72% of mechanisms of trauma, while falls from one's own height ranked only 5th place, overtaken by car accidents with 13.6%. Hwang et al.[14], in turn, also confirms this same trend within the nasal traumas studied separately, though different from the order of prevalence in our study, with fall from one's own height as the most common cause, at

35%, followed by violence (26.5%), sports (17%) and traffic accidents (15%). Although we established a pattern similar to the national and international literature when comparing the most prevalent etiologies, traffic accidents (car collisions and pedestrian accidents) did not emerge as the most prevalent causes in our review, probably due to the profile of IPO Hospital, which does not routinely deal with higher-energy trauma.

As shown in this study, nasal fractures seem to be less frequent in children and adults over 60 years of age, but when they occur, they are directly linked to low-energy trauma, associated with a fall from one's own height or impact not related to a fall. Coelho Junior R. G. et al.[8] points out that the low incidence of trauma in those age groups is due to family care, staying at home, child care and the characteristics of old age, such as little activity. In those age groups, traumas are simple, low-impact fractures and related to domestic accidents such as slipping, falling down stairs, hitting a glass door and childhood play. In people over 40 years of age, for example, falling from one's own height is the main mechanism of nasal trauma and can be explained by the association of those patients with comorbidities, such as osteoporosis, vertigo, stroke, among others. From 11 to 39 years old, the statistical results of this study were unquestionable when correlating nasal fractures to sports trauma and physical assault. Coelho Junior R. G. et al.[8] validate that data by highlighting the close relationship between early and/or excessive alcohol consumption and interpersonal violence, factors increasingly present in those age groups. In addition, the highest percentage of contact sports players, such as football, basketball and martial arts are concentrated in that age group.

As for the clinical presentation, we noticed the pattern of alterations was similar to that previously reported by other authors, with rhinoscoliosis being the most frequent sign. This is mainly a consequence of the studied populations, which predominantly consist of patients undergoing some form of surgical treatment, whose most obvious indication is the treatment of deformities caused by fracture. In our review, for instance, more than 80% of the medical records that reported nasal pyramid deviation were referred for surgical treatment.

In the studied sample, the use of computed tomography of the face as a complementary exam for suspected nasal fractures was chosen by the IPO Hospital clinical staff during treatment more than twice as often when compared to facial X-ray. According to Lu et al.[22], Nishioka et al.[23], and Han et al.[24] clinical examinations are the only way to have an accurate diagnosis of nasal fractures, and plain X-rays do not play a critical role in the management of nasal fractures—they even show high rates of false-positives—whereas face tomography allows the assessment of simultaneous injuries, it infers the type of fracture or mechanism of trauma applied to the nasal bones, measures the alignment of displaced fragments, evaluates the bone septum, and helps in surgical planning, and therefore can be a useful exam to efficiently predict the prognosis of postoperative results.

According to Basheeth et al.[11], after review of extensive literature on nasal fracture treatment, rates of cosmetic dissatisfaction after management of nasal bone fractures are between 68% and 87%, whereas respiratory functional complaints are prevalent between 64% and 86%. The same study also per-

formed a prospective review with more than 400 patients, and identified 22.5% of patients with cosmetic or functional complaints and about 11% of patients who had secondary rhinoseptoplasty surgeries. In Brazil, Borghese, et al.[10] presented a dissatisfaction rate of 32.1%, and a rate of secondary rhinoseptoplasty of more than 4%. Comparatively, in our study performed at IPO, we saw a dissatisfaction rate of 17.1% including cosmetic and functional complaints, with 10% residual deformities alone, against 7% complaints of exclusively obstructive nature, in addition to a 7.3% rate of reoperation between rhinoseptoplasties and secondary septoplasties, with only 4.8% when considering rhinoplasty alone. The numbers are in line with the aforementioned study at *Hospital de Clínicas* from the State University of Campinas, including a lower rate of dissatisfaction. Our numbers positively surprise by outdoing the rates of dissatisfaction and reoperations presented in the international literature, such as in the prospective study by Basheeth et al.[11] previously mentioned, as well as the data reported in *Ghali G. E. et al. Peterson's Principles of Oral and Maxillofacial, Third Edition, USA. People's Medical Publishing House*; 2012,[25] which mentions an incidence of unfavorable results close to 62% after reducing nasal fractures. Our study also improves upon the information recently published in a systematic review in The Journal of Craniofacial Surgery[17], which reports 29% dissatisfaction. Therefore, we see that our study gathered satisfactory data regarding patient satisfaction with the surgical treatment of nasal fractures within IPO Hospital. It is interesting to point out, however, a significant difficulty in maintaining the appropriate follow-up of those patients, which was also seen in other studies. Thus, one can speculate about the existence of possible bias when it comes to postoperative follow-up.

One of the essential aspects that must be considered when planning the treatment is the interval between trauma and reduction. Our investigation at IPO showed that a large proportion of patients had an average interval of 8 to 14 days from trauma to surgical treatment, and that the time interval of 0 to 7 days (between trauma and surgery) was the average period of intervention in which the patients were most postoperatively dissatisfied, as shown in table 6. Hoffmann et al.[26] confirms the need to wait until a more suitable evaluation of the nasal deformity is possible. While based on other studies, Koh et al.[27] validates that the reduction should ideally be performed within the first two weeks after the trauma, which generally occurs from 5 to 10 days after the event, allowing appropriate mobilization of the fractured segments, with undeniable exception of septal hematoma drainage, which should be immediate.[28] These reports are in line with our findings and show that most patients are being treated within the ideal "time" at our institution. At this point it makes sense to highlight a common bias in the clinical practice for some patients at IPO hospital, as it is a private institution. In this case, bureaucratic procedures, such as clearance for bills and exams by health plans may directly interfere with the analysis of this parameter (time between trauma and surgery), while increasing the waiting time for restorative treatment, thus compromising favorable results.

CONCLUSION

Nasal fractures are injuries associated with young and male individuals, primarily involved in situations of physical assault and trauma related to sports. At the same time, there is a trend to associate the fall from one's own height with age above 40 years and females. Past clinical history and physical examination are essential for diagnosis, for the determination of the appropriate treatment and for prognosis of the late results. Therefore, factors such as the correct indication of the moment to perform the restorative treatment must be respected.

Even if considered relatively simple in the medical field, the treatment for nasal fractures can often be performed poorly, while leading to secondary cosmetic and/or functional complaints. Therefore, it becomes key for the service to have a reliable and relentless approach.

The management of nasal fractures remains controversial and challenging. No standardized system has been implemented or successfully reported in the literature so far, to assess postoperative satisfaction and success. In this context, as a high-impact institution and a national benchmark of diagnoses and practice within otorhinolaryngology—not only because of the number of patients seen daily, but also because of the prominent scientific position held in recent years—we should establish a protocol with the aim to standardize care, complementary diagnostic assessment, treatment approach, and postoperative follow-up. In this case, the aim would be to optimize the treatment of those patients and further mitigate the levels of cosmetic-functional dissatisfaction. In order to successfully reach this goal, we should propose a new similar but prospective study with the same objectives, adding the questionnaire that is already created (items 2.4.1 and 2.4.2) to the emergency care routine, while establishing a scheduled and reliable flow of postoperative consultations, and implementing subjective rating scales to grade cosmetic and functional satisfaction. Finally, we should think over and structure strategies to reduce the number of patients who do not return or abandon treatment after the first consultation, after all, the study has shown that nearly 15% of patients with suspected nasal fractures in 2016 were excluded from the study due to lack of adherence.

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EVIDENCE-BASED OTOPLASTY WITH AUGMENTED REALITY: FIXATION OF THE REMNANT CONCHA IN THE MASTOID REGION

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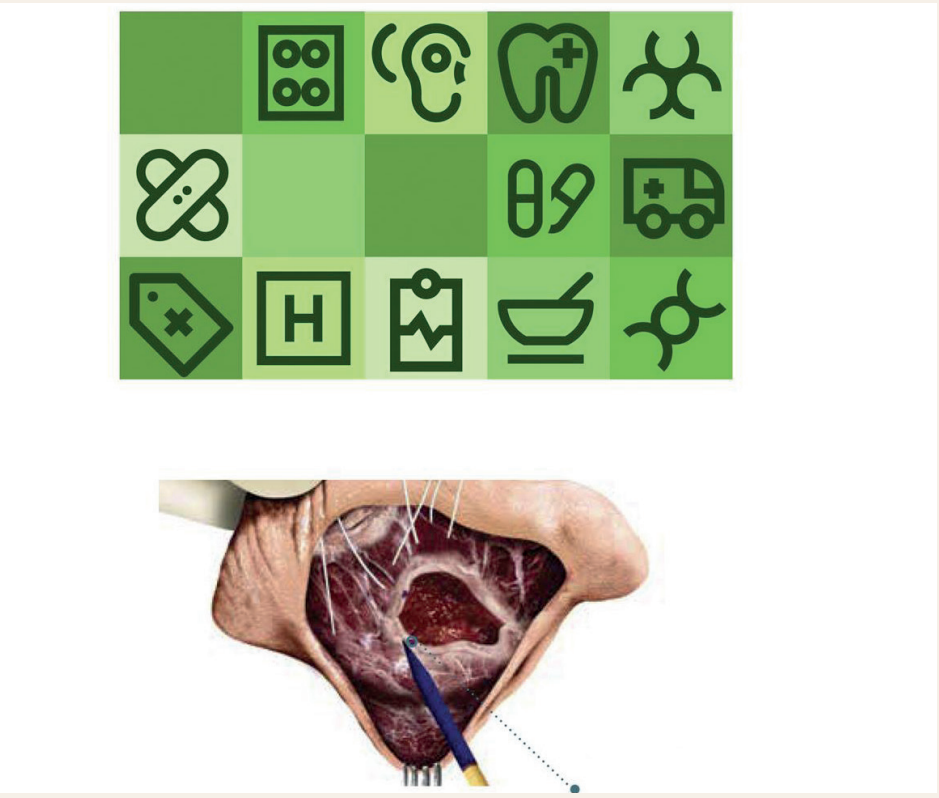
Pedro Aguiar **SOARES**[2]

This article demonstrates the evolution of knowledge transmission through augmented reality (AR) for a safer procedure for otoplasty surgery.
The fixation of the remaining concha in the mastoid region is a fundamental step, as it allows solving the bad positioning of the auricular pavilion, providing its retropositioning, simultaneously, with the superior rotation.



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