American Journal of Otolaryngology–Head and Neck Medicine and Surgery 43 (2022) 103368

Contents lists available at ScienceDirect

American Journal of Otolaryngology–Head and Neck Medicine and Surgery

journal homepage: www.elsevier.com/locate/amjoto

Long-term stability of outcomes of endoscopic surgery for rhinogenic contact point headache (Sluder'’s neuralgia)

Antonino Maniaci [a,*], Jerome Rene Lechien [b,c,d,e], Christian Calvo-Henriquez [f], Giannicola Iannella [g], Sowerby Leigh [h], Angelo Ingrassia [a], Federico Merlino [a], Vittoria Bannò [a], Salvatore Cocuzza [a], Ignazio La Mantia [a]

[a] Department of Medical and Surgical Sciences and Advanced Technologies "GF Ingrassia," ENT Section, University of Catania, Catania, Italy
[b] Research Committee of the Young Otolaryngologists, International Federations of ORL Societies, Paris, France
[c] Department of Human Anatomy and Experimental Oncology, School of Medicine, UMONS Research Institute for Health Sciences and Technology, University of Mons, Mons, Belgium
[d] Department of Otorhinolaryngology-Head and Neck Surgery, CHU Saint-Pierre, School of Medicine, Université Libre de Bruxelles, Brussels, Belgium
[e] Department of Otolaryngology-Head and Neck Surgery, Foch Hospital (University of Paris-Saclay), Paris, France
[f] Task Force COVID-19 of the Young-Otolaryngologists of the International Federations of Oto-rhino-laryngological Societies (YO-IFOS), Department of Otolaryngology, Hospital Complex of Santiago de Compostela, Santiago de Compostela, Spain
[g] Department of Head-Neck Surgery, Otolaryngology, Head-Neck, and Oral Surgery Unit, Morgagni Pierantoni Hospital, Forlì, Italy
[h] Department of Otolaryngology-Head and Neck Surgery, Western University, London, Ont. Leigh, Canada

ARTICLE INFO

Keywords:
Rhinogenic contact point headache
Septal spur
Septal deviation
Concha bullosa
Endoscopic surgery
Sluder's neuralgia

1. Introduction

According to the International Headache Society classification, headache disorders can be divided into primary or idiopathic, secondary, and orofacial pain disorders such as neuralgia and sinonasal related disorders [1–3]. Rhinogenic contact point headache (RCPH) is included among the secondary forms of the Headache Classification Subcommittee of the International Headache Society [1]. RCPH is defined as a syndrome secondary to mucosal contact points in the nasal sinus cavities, in the absence of inflammatory signs, hyperplastic mucosa, purulent discharge, sinonasal polyps, or tumors [4–6]. However, the pathology remains debated in the literature, especially because of its diagnostic setting and therapeutic options [7]. Moreover, RCPH is a controversial clinical entity in the literature [8,9].

Endoscopic sinus surgery has been demonstrated to be a possible strategy for the treatment of related symptoms, assessed by the visual analog scale (VAS) and assessment through the migraine disability questionnaire (MIDAS) [4,5,8,10,11].

A recent systematic review analyzed the different data in the literature on the efficacy of surgical approaches for RCPH, comparing outcomes with medical treatment and short- and long-term follow-up [12]. There is considerable evidence in this regard, and the opinions on long-term efficacy have been long debated [13–15].

Cantone et al., at the 6 month follow-up, reported an improvement in VAS headache of 53 patients treated with endoscopic surgery [16]. The long-term efficacy of the surgical approach was also reported by Guyuron et al., confirming excellent results of septoplasty for the frequency, duration, and intensity of migraine headaches in 89/100 patients at the five-year follow-up ($p < 0.0001$) [6]. However, other authors in the literature affirm that the benefit of the patient-reported symptoms is due to the placebo effect and the phenomenon of cognitive dissonance [17–21].

In particular, the authors debate the stability of long-term outcomes, hypothesizing that the temporary reduction of symptoms within two

* Corresponding author.
E-mail addresses: antonino.maniaci@phd.unict.it (A. Maniaci), Sowerby@sjhc.london.on.ca (S. Leigh).

https://doi.org/10.1016/j.amjoto.2021.103368
Received 2 October 2021;
Available online 12 January 2022

years is due to the decrease in subjective perception consequent to cognitive dissonance [18,22–25]. West et al. affirmed that surgery could improve symptoms only in a limited number of patients, inducing more neuroplastic phenomena such as cognitive dissonance [18].

In contrast, Welge-Luessen et al. reported a 10-year longitudinal study that clearly contradicted previously reported data, with an overall improvement at 112 months up to 65% [21].

To clarify the stability of surgical outcomes in patients treated for RCPH, we analyzed the long-term variables implicated in therapeutic success in a retrospective cohort study. The hypothesis is that endoscopic surgery improves the quality of life in patients suffering from RCPH.

2. Methods

Three authors conducted a retrospective analysis of data that were

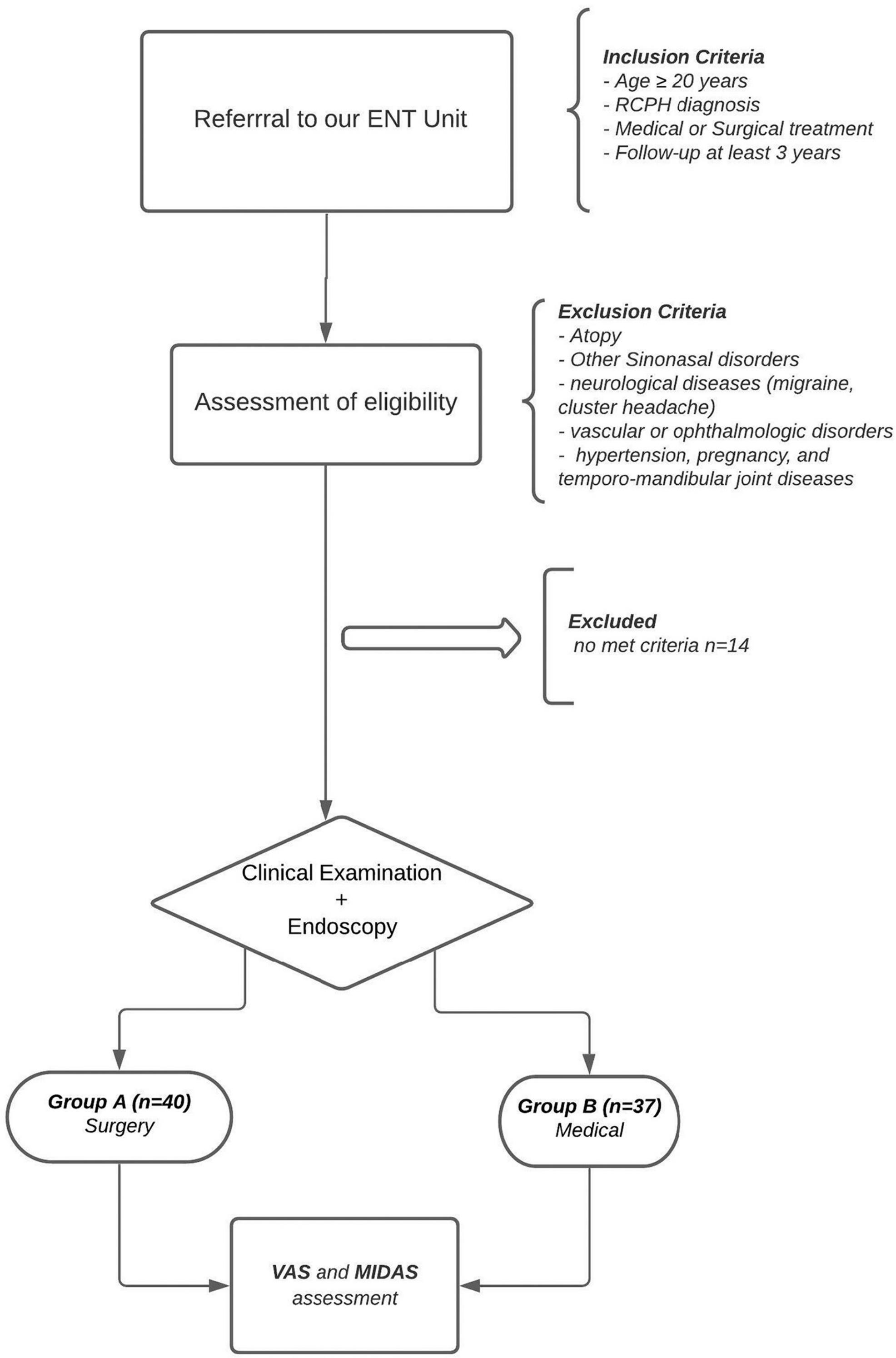

Fig. 1. Flow-diagram of patients' selection. Abbreviations: RCPH, rhinogenic contact point headache; VAS, visual analogue scale; MIDAS, Migraine Disability Assessment Test.

retrospectively collected from April 2017 to April 2021 from 94 patients with chronic headaches. The recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [26] were followed. The study design is summarized in Fig. 1.

The Ethics Committee of the University of Catania approved the study. Furthermore, participants were informed and gave written informed consent concerning the study's purpose and procedures, which were conducted according to the Declaration of Helsinki.

All patients who met the following inclusion criteria were asked to participate in the study. 1- chronic headache or facial pain not relieved by any analgesic. 2- diagnostically confirmed septal deviation, septal spur, or concha bullosa. 3- $>$ 20 years of age. 4-positive lidocaine test, intended as positive relief of the headache symptom after administering lidocaine in the nasal cavity. 5-undergoing medical or surgical treatment for RCPH.

Exclusion criteria were 1-total consecutive clinical and diagnostic follow-up less than 3 years. 2- patients presenting concomitant comorbidities such as allergy, sinonasal disorders, migraine, cluster headache, ophthalmologic or vascular disorders, hypertension, pregnancy, and temporomandibular joint disorders. 3-Patients reporting history of previous sinonasal surgeries.

2.1. Diagnostic assessment

Two different examiners (A.M and I.L.M.) performed the first diagnostic step that was a clinical examination and fiberoptic nasal rigid endoscopy procedure to detect mucosal contact points (*2.7 or 4 mm, Storz, Tuttingen, Germany*). Patients enrolled in the study presented the three most commonly observed anatomical variants: septal deviation, septal spur, and concha bullosa. The anatomical anomalies were subsequently confirmed through computed tomography (CT) with multiplanar reconstruction.

Confirmatory lidocaine testing during acute headache was performed in all patients. A cotton ball soaked in 5% lidocaine solution was applied and kept in place for 15 min. The response was considered positive when there was a reduction in pain intensity reported by the patients greater than 50%.

The pain assessment was carried out using a ten-point visual analog scale (VAS), at the end of which the two parameters, absent pain (on the left) and maximum pain (on the right), were reported.

2.2. Treatment modalities

The investigational group (Group A) underwent endoscopic surgery performed by the same two surgeons. Surgery consisted of the removal of the mucosal contact points. In addition, it included either lateral resection of the concha bullosa and/or conventional or endoscopic septoplasty for septal deviation (according to Cottle) and nasal spur.

The medical group (Group B) was treated with fluticasone propionate aqueous nasal spray, 125 mg per puff, two puffs in each nostril every morning for 15 consecutive days per month without surgical intervention for the contact point.

2.3. Statistical analysis

Data analysis was performed using IBM SPSS Statistics for Windows (IBM Corp. Released 2017, Version 25.0. Armonk, NY: IBM Corp.). Descriptive statistics were reported as average $\pm$ standard deviation or proportion. The *t*-test for paired samples was used to determine the difference between observations for normally distributed numeric variables. In addition, the non-parametric variation (Mann–Whitney *U* test) was performed to analyze group differences for continuous skewed numeric variables.

The ANOVA test assessed the differences in VAS outcomes after the 3 years follow-up between the groups enrolled, evaluating the different independent variables such as age, sex, preoperative RCPH scores, and anatomical anomalies that could affect long-term outcomes.

3. Results

From the 94 initially selected patients, 77 met the inclusion criteria (40 in the Group A and 37 in the Group B). Seventeen participants were excluded because they did not complete the follow-up for the minimum of 3 years.

The characteristics of the study participants are summarized in Table I. The patients' mean age was 34.14 $\pm$ 6.28 years; 42(54.6%) subjects were male while 35(45.4%) were female. The participants in both groups were comparable in terms of sex, age, and anatomic alterations in the nasal cavity.

Among the three anatomical nasal cavities, 29 (37.6%) patients presented nasal septal deviation, 23 (29.9%) septal spurs, while 25 (32.5%) had concha bullosa of the middle turbinate. In addition, 43 (55.84) experienced contact points on the right side while 34 (44.15%) on the left.

Based on the VAS scale, the intensity of pain in the surgical group revealed a reduction from 5.7 $\pm$ 1.48 (baseline) to 2.42 $\pm$ 1.12 (3 years after treatment), presenting a better improvement compared with the medical group (from 5.43 $\pm$ 1.38 to 3.91 $\pm$ 1.70; $p < 0.001$).

Patients with septal deviation reported a 3-year VAS score not significantly higher (2.79 $\pm$ 1.62) than that seen in the 3-year population as a whole (3.25 $\pm$ 1.64) ($p = 0.43$). On the contrary, patients with Concha bullosa had a worse VAS outcome at 3 years than other subgroups analyzed without reaching statistical significance (3.4 $\pm$ 1.5 vs. 2.92 $\pm$ 1.67; $p = 0.38$).

Among surgically treated patients, no statistical difference was reported in postoperative outcomes according to the different anatomical anomalies, concha bullosa ($p = 0.178$), septal deviation ($p = 0.098$), septal spur ($p = 0.812$) compared to the other. Similarly, in the Group B, none of the identified anomalies showed a significant improvement after medical therapy compared to the others: concha bullosa ($p = 0.731$), septal deviation ($p = 0.836$), septal spur ($p = 0.497$). However, the 3-years mean headache (days/month) decreased from 8.77 $\pm$ 3.37 (baseline) to 2.47 $\pm$ 1.13 (3 years after treatment), showing a greater improvement when compared with the medical group (from 8.32 $\pm$ 2.81 to 4.89 $\pm$ 1.12) ($p < 0.0001$).

Table I
Demographics features of patients enrolled. Abbreviations: RCPH, rhinogenic contact point headache; VAS, visual analogue scale; MIDAS, Migraine Disability Assessment Test.

		Surgery (n = 40)	Medical (n = 37)	p
Age		33.82 ± 6.24	34.63 ± 9.58	
Sex		19 M/21F (47.5% vs.52.5%)	16 M/24 F (40 vs 60%)	0.287
Anatomic variations	Chonca bullosa	10(25%)	18 (45%)	0.003
	Septal deviation	24(60%)	25 (62.5%)	0.703
	Septal spur	12(30%)	13 (32.5%)	0.723
Follow-up (mean)		38.63 ± 1.82	38.35 ± 1.56	
VAS score at 3 years	Intensity of headache	2.42 ± 1.12	3.91 ± 1.70	<0,0001
	Frequency of headache monthly/d	2.47 ± 1.13	4.89 ± 1.12	<0,0001
MIDAS degree	Grade 1	20/40 (50%)	6/37 (16.21%)	<0,0001
	Grade 2	17/40 (42.5%)	20/37 (54.05%)	0.119
	Grade 3	2/40 (5%)	8/37 (21.62%)	0.0007
	Grade 4	1/40 (2.5%)	3/37 (8.1%)	0.120

Furthermore, patients undergoing endoscopic surgery demonstrated stability in controlling related symptoms, maintaining the results obtained in the long term ($p = 0.32$) (Fig. 2a). On the contrary, patients who underwent medical therapy did not have significantly reduced symptoms throughout the follow-up, with an almost unchanged 3-year prognosis ($p = 0.47$) (Fig. 2b).

The ANOVA analysis, among independent variables of the surgical group, demonstrated that preoperative VAS score ≤4 (F = 4.688; $p = 0.037$) and preoperative MIDAS ≤2 (F = 10.534; $p = 0.002$) were significantly correlated with 3-year outcomes (Table II). In contrast, only preoperative VAS scores ≤4 maintained significance in the control group (F = 34.536; $p < 0.001$).

4. Discussion

Contact point headache has recently become a controversial concept, both because of its pathogenesis and subsequent treatment. In addition, the dualism between medical and surgical treatment is still active, with debated results both for corticosteroid-based nasal sprays and decongestant usage and nasal surgery techniques for the septal, turbinate, and ethmoidal anomalies [27–31].

In a prospective study, Madani et al. investigated the role of functional endoscopic sinus surgery in patients with mucosal contact points and chronic daily drug-unresponsive headaches [32].

The authors reported pain severity based on the VAS pain scale that decreased from 5.2 ± 1.8 (preoperative) to 1.47 ± 1.3 (postoperative) ($p = 0.013$), with a high percentage of subjects with septal deviation (70%). However, Cantone et al. focused their investigation on RCPH patients with concha bullosa being treated with surgical or medical management [16]. Headache severity and discomfort levels assessed by VAS and MIDAS scores demonstrated greater improvements in the surgical cohort than the medical cohort (7.9 ± 2.5 to 1.5 ± 0.8 vs. 7.5 ± 1.2 to 5.5 ± 1.2; $p < 0.001$ respectively).

Table II
Univariate analysis among independent variables and VAS outcomes at 3 years-follow-up of medical vs. surgical group.

Independent variable		VAS score 3-y follow-up			
		Surgical		Medical	
		F	Sig.	F	Sig.
Age at surgery	≤35	0.216	0.645	0.062	0.805
	>35				
Sex	Male	0.0004	0.984	1.239	0.273
	Female				
Contact type	Septal dev	2.878	0.098	0.044	0.836
	Chonca bullosa	1.879	0.178	0.119	0.732
	Septal spur	0.19	0.665	0.366	0.549
PreopVAS	≤4	4.688	0.037	34.536	<0.001
	>4				
PreopMIDAS	≤2	10.534	0.002	0.035	0.852
	>2				

Our results align with previously published series, reporting significantly better symptom control in surgical patients at follow-up [33–36]. VAS intensity in the surgical group showed an effective reduction from 5.7 ± 1.48 at baseline to 2.42 ± 1.12 ($p < 0.001$) at follow-up, while the medical group did not benefit from equally satisfactory results (5.43 ± 1.38 vs. 3.91 ± 1.70; $p < 0.001$). The septal deviation was also the most frequent 29/77(37.6%) of the three anatomical anomalies observed in our study. However, at the subgroup analysis, septal deviation did not show a VAS score significantly different (2.79 ± 1.62) than that of the other anomalies (3.25 ± 1.64) ($p = 0.43$).

Furthermore, at the subsequent univariate analysis among independent variables for both groups, the different anatomical anomalies were not significantly correlated with outcomes at follow-up (see Table II). Surgical patients reporting preoperative VAS scores ≤4 (F = 4.688; $p = 0.037$) and preoperative MIDAS scores ≤2 (F = 10.534; $p =$

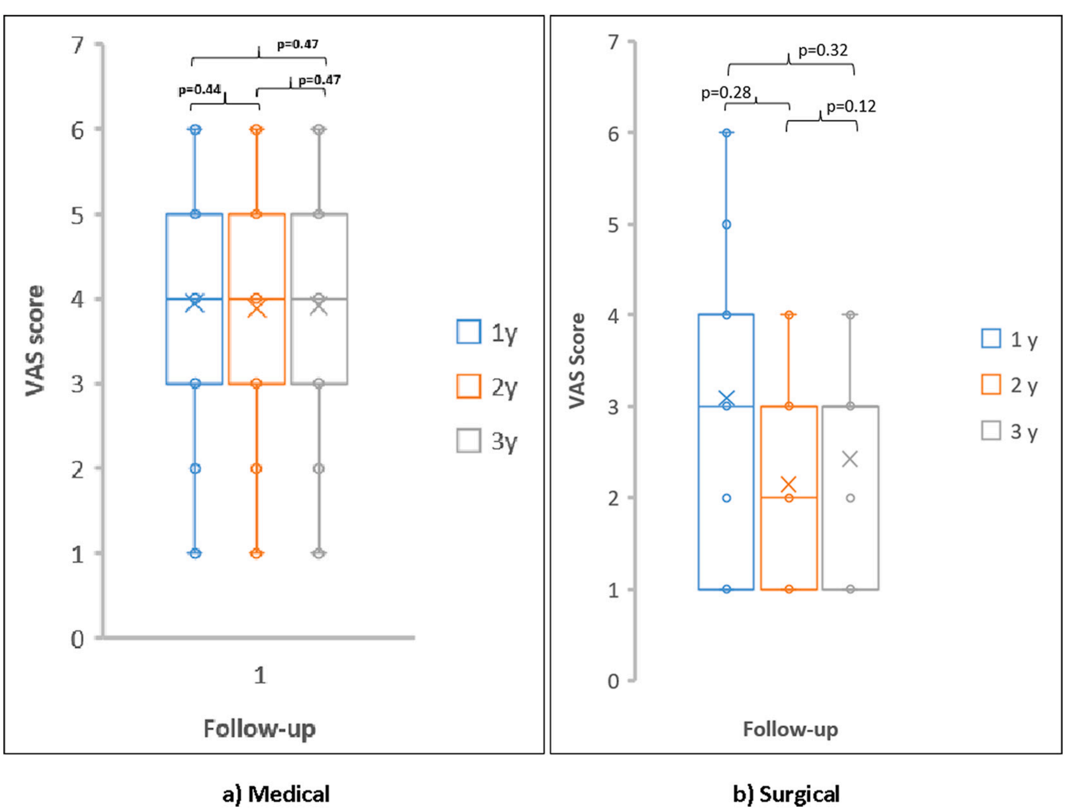

Fig. 2. a) Box plot according to VAS score at subsequent follow-up in medical group not found a statistical difference among different years (p = 0.44; p = 0.47; p = 0.47). b) Box plot according to VAS score at subsequent follow-up in surgical group found a significant stability of VAS outcomes (p = 0.28; p = 0.12; p = 0.32).

0.002) achieved better 3-year outcomes, while in the medical group, significance was maintained only for preoperative VAS scores (F = 34.536; $p < 0.001$).

A concept often debated in the literature is the stability of long-term outcomes at follow-up [18,22–25,32–34]. Some authors suggest that results are not long-lasting [35]. West et al. hypothesized that neuroplasticity phenomena such as cognitive dissonance could be triggered by surgery [18].

In contrast, other authors have reported long-lasting results. Welge-Luessen et al., who, to date, have the longest follow-up period, described excellent results in surgical patients with an average follow-up of 112 months, reporting an overall improvement of up to 65% [21].

A recent meta-analysis that compared 459 participants undergoing surgical treatment and 201 undergoing medical treatment demonstrated the superiority of endoscopic surgery for the management of RCPH patients reporting a surgical success rate of approximately 80% at long-term follow-up. Moreover, at pooled analysis, surgical therapy led to optimal short- and long-term control results, with no statistical differences between the subgroups analyzed ($p = 0.28$; Z < 0.00001; I2 = 13.3%) [15].

Our study demonstrated a greater reduction in pain reported by patients after surgical treatment of RCPH, and these results were long-lasting (Fig. 2). The analysis of the trend measured by the VAS scale for three consecutive years revealed no significant changes in the outcomes and confirmed the maintenance of the benefits at the end of the follow-up ($p = 0.47$). On the contrary the medical group did not obtain significant improvements during the whole follow-up, with the persistence of symptoms at 3 years (VAS = 3.91 ± 1.70; $p = 0.32$).

However, despite the promising results reported, available evidence in the literature should be considered carefully given the remarkable risk of bias and study limitations, especially due to lack of symmetry between enrolled and control patients, non-standardized protocols, or unclear selection criteria [37–39].

In the present study, we tried to control these potential risks of bias. Both cohorts were comparable in terms of age, sex, and underlying conditions. In addition, the inclusion criteria were clear and based on a standardized diagnostic protocol, including CT scan findings and instrumental tools such as the lidocaine test. Unfortunately, our subgroup analysis could not detect which anatomical structure anomalies presented a greater improvement to the administered treatment in both the medical and surgical groups. It could be attributed to having a small sample size to detect differences. Larger multicenter studies are thus encouraged in order to detect these potential prognostic factors.

5. Conclusions

Treatment of RCPH has as its main objective long-term pain control. While the results of medical treatment do not demonstrate long-term efficacy, on the contrary, the endoscopic surgical approach seems to allow excellent results with long-term control. Independent variables should be considered at preoperative assessment, probably constituting an indicator of therapeutic success.

CRediT authorship contribution statement

Conceptualization, A.M. and A.I.; methodology, G.I.; software, J.R. L., L.S., C.C.; validation, I.L.M., A.M. and A.I.; formal analysis, J.R. L, S. C.; investigation, I.L.M.A..; resources, A.M.; data curation, G.I.; writing—original draft preparation, A.M., V.B; writing—review and editing, I.L.M.; visualization, C.C.; supervision, F.M.; project administration, S.C.; All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Informed consent statement

Informed consent was obtained from all subjects involved in the study.

Declaration of competing interest

The authors declare no conflict of interest.

References

[1] The international classification of headache disorders: 2nd edition. Cephalalgia 2004;24(Suppl. 1):9–160. https://doi.org/10.1111/j.1468-2982.2003.00824.x.
[2] Nicholas M, Vlaeyen JWS, Rief W, et al. The IASP classification of chronic pain for ICD-11: chronic primary pain. Pain 2019;160:28–37. https://doi.org/10.1097/j.pain.0000000000001390.
[3] Benoliel R, Svensson P, Evers S, et al. The IASP classification of chronic pain for ICD-11: chronic secondary headache or orofacial pain. Pain 2019;160:60–8. https://doi.org/10.1097/j.pain.0000000000001435.
[4] Abu-Samra M, Gawad OA, Agha M. The outcomes for nasal contact point surgeries in patients with unsatisfactory response to chronic daily headache medications. Eur Arch Otorhinolaryngol 2011;268(9):1299–304. https://doi.org/10.1007/s00405-011-1590-2.
[5] Bektas D, Alioglu Z, Akyol N, Ural A, Bahadir O, Caylan R. Surgical outcomes for rhinogenic contact point headaches. Med Princ Pract 2011;20(1):29–33. https://doi.org/10.1159/000322076.
[6] Guyuron B, Kriegler JS, Davis J, Amini SB. Five-year outcome of surgical treatment of migraine headaches. Plast Reconstr Surg 2011;127(2):603–8. https://doi.org/10.1097/PRS.0b013e3181fed456.
[7] Herzallah IR, Hamed MA, Salem SM, Suurna MV. Mucosal contact points and paranasal sinus pneumatization: does radiology predict headache causality? Laryngoscope 2015;125(9):2021–6. https://doi.org/10.1002/lary.25194.
[8] Abu-Bakra M, Jones NS. Prevalence of nasal mucosal contact points in patients with facial pain compared with patients without facial pain. J Laryngol Otol 2001;115(8):629–32. https://doi.org/10.1258/0022215011908685.
[9] Wee JH, Lee JE, Hong SL, Shin JM, Kim DY. Prospective study on the characteristics and postoperative improvement of rhinogenic headache. J Rhinol 2015;22:6–10. https://doi.org/10.18787/jr.2015.22.1.6.
[10] Tosun F, Gerek M, Ozkaptan Y. Nasal surgery for contact point headaches. Headache 2000;40(3):237–40. https://doi.org/10.1046/j.1526-4610.2000.00034.x.
[11] Behin F, Behin B, Bigal ME, Lipton RB. Surgical treatment of patients with refractory migraine headaches and intranasal contact points. Cephalalgia 2005;25(6):439–43. https://doi.org/10.1111/j.1468-2982.2004.00877.x.
[12] Maniaci A, Merlino F, Cocuzza S, et al. Endoscopic surgical treatment for rhinogenic contact point headache: systematic review and meta-analysis. Eur Arch Otorhinolaryngol 2021;278(6):1743–53. https://doi.org/10.1007/s00405-021-06724-6.
[13] Roozbahany NA, Nasri S. Nasal and paranasal sinus anatomical variations in patients with rhinogenic contact point headache. Auris Nasus Larynx 2013;40(2):177–83. https://doi.org/10.1016/j.anl.2012.07.007.
[14] Peric A, Rasic D, Grgurevic U. Surgical Treatment of Rhinogenic Contact Point Headache: An Experience from a Tertiary Care Hospital. Int Arch Otorhinolaryngol 2016 Apr;20(2):166–71. https://doi.org/10.1055/s-0036-1578808. Epub 2016 Feb 17. PMID: 27096023; PMCID: PMC4835330.
[15] Yarmohammadi ME, Ghasemi H, Pourfarzam S, Nadoushan MR, Majd SA. Effect of turbinoplasty in concha bullosa induced rhinogenic headache, a randomized clinical trial. J Res Med Sci 2012;17(3):229–34.
[16] Cantone E, Castagna G, Ferranti I, et al. Concha bullosa related headache disability. Eur Rev Med Pharmacol Sci 2015;19(13):2327–30.
[17] Bieger-Farhan AK, Nichani J, Willatt DJ. Nasal septal mucosal contact points: associated symptoms and sinus CT scan scoring. Clin Otolaryngol Allied Sci 2004;29(2):165–8. https://doi.org/10.1111/j.0307-7772.2004.00774.x.
[18] West B, Jones NS. Endoscopy-negative, computed tomography-negative facial pain in a nasal clinic. Laryngoscope 2001;111(4 Pt 1):581–6. https://doi.org/10.1097/00005537-200104000-00006.
[19] Mariotti LJ, Setliff 3rd RC, Ghaderi M, Voth S. Patient history and CT findings in predicting surgical outcomes for patients with rhinogenic headache. Ear Nose Throat J 2009;88(5):926–9.
[20] Mohebbi A, Memari F, Mohebbi S. Endonasal endoscopic management of contact point headache and diagnostic criteria. Headache 2010;50(2):242–8. https://doi.org/10.1111/j.1526-4610.2009.01520.x.
[21] Welge-Luessen A, Hauser R, Schmid N, Kappos L, Probst R. Endonasal surgery for contact point headaches: a 10-year longitudinal study. Laryngoscope 2003;113(12):2151–6. https://doi.org/10.1097/00005537-200312000-00019.
[22] Antonaci F, Chimento P, Diener HC, Sances G, Bono G. Lessons from placebo effects in migraine treatment. J Headache Pain 2007;8(1):63–6. https://doi.org/10.1007/s10194-007-0360-4.
[23] Bendtsen L, Mattsson P, Zwart JA, Lipton RB. Placebo response in clinical randomized trials of analgesics in migraine. Cephalalgia 2003;23(7):487–90. https://doi.org/10.1046/j.1468-2982.2003.00528.x.

[24] Loder E, Goldstein R, Biondi D. Placebo effects in oral triptan trials: the scientific and ethical rationale for continued use of placebo controls. Cephalalgia 2005;25 (2):124–31. https://doi.org/10.1111/j.1468-2982.2004.00817.x.

[25] Anselmo-Lima WT, de Oliveira JA, Speciali JG, et al. Middle turbinate headache syndrome. Headache 1997;37(2):102–6. https://doi.org/10.1046/j.1526-4610.1997.3702102.x.

[26] von Elm E, Altman DG, Egger M, et al. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. Int J Surg 2014;12(12):1495–9. https://doi.org/10.1016/j.ijsu.2014.07.013.

[27] Altin F, Haci C, Alimoglu Y, Yilmaz S. Is septoplasty effective rhinogenic headache in patients with isolated contact point between inferior turbinate and septal spur? Am J Otolaryngol 2019;40(3):364–7. https://doi.org/10.1016/j.amjoto.2019.02.002.

[28] La Mantia I, Grillo C, Andaloro C. Rhinogenic contact point headache: surgical treatment versus medical treatment. J Craniofac Surg 2018;29(3):e228–30. https://doi.org/10.1097/SCS.0000000000004211.

[29] Barinsky GL, Hanba C, Svider PF. Rhinogenic headache in children and adolescents. Curr Pain Headache Rep 2020;24(3):7. https://doi.org/10.1007/s11916-020-0839-0. Published 2020 Jan 30.

[30] Sollini G, Mazzola F, Iandelli A, et al. Sino-nasal anatomical variations in rhinogenic headache pathogenesis. J Craniofac Surg 2019;30(5):1503–5. https://doi.org/10.1097/SCS.0000000000005239.

[31] Yi HS, Kwak CY, Kim HI, Kim HY, Han DS. Rhinogenic headache: standardization of terminologies used for headaches arising from problems in the nose and nasal cavity. J Craniofac Surg 2018;29(8):2206–10. https://doi.org/10.1097/SCS.0000000000004942.

[32] Madani SA, Hashemi SA, Morshedzadeh SA. Results of functional endoscopic sinus surgery in patients with mucosal contact points suffering from chronic daily headache non-responding to medications. Acta Fac Med Naiss 2013;30:159–64.

[33] Stewart WF, Lipton RB, Dowson AJ, Sawyer J. Development and testing of the migraine disability assessment (MIDAS) questionnaire to assess headache-related disability. Neurology 2001;56(6 Suppl. 1):S20–8. https://doi.org/10.1212/wnl.56.suppl_1.s20.

[34] Cocuzza S, Maniaci A, Di Luca M, et al. Long-term results of nasal surgery: comparison of mini-invasive turbinoplasty. J Biol Regul Homeost Agents 2020;34 (3):1203–8. https://doi.org/10.23812/19-522-L-4.

[35] Bilal N, Selcuk A, Karakus MF, Ikinciogullari A, Ensari S, Dere H. Impact of corrective rhinologic surgery on rhinogenic headache. J Craniofac Surg 2013;24 (5):1688–91. https://doi.org/10.1097/SCS.0b013e31827c7d8f.

[36] Marzetti A, Mazzone S, Tedaldi M, Topazio D, Passali FM. The role of balloon sinuplasty in the treatment of vacuum rhinogenic headache. Indian J Otolaryngol Head Neck Surg 2017;69(2):216–20. https://doi.org/10.1007/s12070-017-1086-5.

[37] Levine H, Setzen M. Headache in otolaryngology: rhinogenic and beyond. Otolaryngol Clin North Am 2014;47(2):xi–xii. https://doi.org/10.1016/j.otc.2013.11.004.

[38] Lou Z. The rhinogenic headache resulting from the contact point between inferior turbinate and septal spur. Am J Otolaryngol 2019;40(6):102281. https://doi.org/10.1016/j.amjoto.2019.102281.

[39] Folic MM, Barac AM, Ugrinovic AB. Effectiveness of the treatment of rhinogenic headache caused by intranasal contact [published online ahead of print, 2021 Jun 2]. Ear Nose Throat J 2021:1455613211019706. https://doi.org/10.1177/01455613211019706.