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

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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]. 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
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...
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 ± 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 1. The patients’ mean age was 34.14 ± 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 anatomical 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.

Table 1

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

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Anatomical variations</th>
<th>Follow-up (mean)</th>
<th>VAS score at 3 years</th>
<th>MIDAS degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery (n = 40)</td>
<td>Medical (n = 37)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>33.82 ± 6.24</td>
<td>34.63 ± 9.58</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>19 M/21 F (47.5% vs.52.5%)</td>
<td>16 M/24 F (40% vs 60%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anatomical variations</td>
<td>Choana bullosa (24/60%)</td>
<td>18 (45%)</td>
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<tr>
<td></td>
<td>Septal deviation</td>
<td>25 (62.5%)</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Septal spur</td>
<td>13 (32.5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow-up (mean)</td>
<td>38.63 ± 1.82</td>
<td>38.35 ± 1.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS score at 3 years</td>
<td>2.42 ± 1.12</td>
<td>3.91 ± 1.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensity of headache</td>
<td>2.47 ± 1.13</td>
<td>4.89 ± 1.12</td>
<td></td>
<td></td>
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<tr>
<td>Frequency of headache; monthly/d</td>
<td>0.287</td>
<td>0.923</td>
<td></td>
<td></td>
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<tr>
<td>MIDAS degree</td>
<td>0.003</td>
<td>0.723</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Grade 1</td>
<td>0.0001</td>
<td>0.0001</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Grade 2</td>
<td>0.119</td>
<td>0.0007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 3</td>
<td>0.012</td>
<td>0.120</td>
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</tbody>
</table>
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 $\leq 4$ ($F = 4.688; p = 0.037$) and preoperative MIDAS $\leq 2$ ($F = 10.534; p = 0.002$) were significantly correlated with 3-year outcomes (Table II). In contrast, only preoperative VAS scores $\leq 4$ 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 $5.2 \pm 1.8$ (preoperative) to $1.47 \pm 1.3$ (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 ($7.9 \pm 2.5$ to $1.5 \pm 0.8$ vs. $7.5 \pm 1.2$ to $5.5 \pm 1.2; p < 0.001$ respectively).

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 $5.7 \pm 1.48$ at baseline to $2.42 \pm 1.12$ ($p < 0.001$) at follow-up, while the medical group did not benefit from equally satisfactory results ($5.43 \pm 1.38$ vs. $3.91 \pm 1.70; p < 0.001$). 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 ($2.79 \pm 1.62$) than that of the other anomalies ($3.25 \pm 1.64$) ($p = 0.43$).

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 $\leq 4$ ($F = 4.688; p = 0.037$) and preoperative MIDAS scores $\leq 2$ ($F = 10.534; p =$

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>VAS score 3-y follow-up</th>
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<tr>
<td></td>
<td>Surgical</td>
</tr>
<tr>
<td></td>
<td>$F$</td>
</tr>
<tr>
<td>Age at surgery</td>
<td></td>
</tr>
<tr>
<td>$\leq 35$</td>
<td>0.216</td>
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<tr>
<td>$&gt; 35$</td>
<td></td>
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<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.0004</td>
</tr>
<tr>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Contact type</td>
<td></td>
</tr>
<tr>
<td>Septal dev</td>
<td>2.878</td>
</tr>
<tr>
<td>Chonca bullosa</td>
<td>1.879</td>
</tr>
<tr>
<td>Septal spur</td>
<td>0.19</td>
</tr>
<tr>
<td>PreopVAS $\leq 4$</td>
<td>4.688</td>
</tr>
<tr>
<td>PreopVAS $&gt; 4$</td>
<td></td>
</tr>
<tr>
<td>PreopMIDAS $\leq 2$</td>
<td>10.534</td>
</tr>
<tr>
<td>PreopMIDAS $&gt; 2$</td>
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</tbody>
</table>

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 ($p = 0.28; p = 0.12; p = 0.32$).
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

[15] Yarmohammadi ME, Ghasemi H, Pourfarzam S, Nazonshan MR, Majd SA. Effect of plasticity 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 = 0.0001; 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 be a valuable option for patients with refractory migraine headaches and intranasal contact points. Differences between the subgroups analyzed (p = 0.28; Z = 0.0001; I2 = 13.3%) [15] were not statistically significant.

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.

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