

Clinical outcomes of treatment of sinonasal inverted papillomas (IPs) depending on the surgical technique and learning curve

Authors' Contribution:

A—Study Design

B—Data Collection

C—Statistical Analysis

D—Data Interpretation

E—Manuscript Preparation

F—Literature Search

G—Funds Collection

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ABSTRACT:

Introduction: Sinonasal inverted papillomas (IPs) constitute a major challenge for ENT specialists. In the last decades, the number of endoscopic procedures has increased, while the percentage of external or double approach procedures has decreased. The aim of this study was to evaluate long-term IP treatment outcomes depending on applied surgical method.

Material and methods: a retrospective study included 69 patients (28 women and 41 men) treated during 2002–2012 at the Department of Otolaryngology and Laryngological Oncology of the Poznań University of Medical Sciences. Of these patients, 47 underwent endoscopic procedure, 16 received a double procedure and six were subject to an external procedure.

Results: The recurrence rate in patients treated endoscopically was 32%, while among patients treated by the external/double approach it reached 64% ($p = 0.03306$). The recurrence rate after endoscopic surgery was 75% during 2002–2006, but during 2007–2012 amounted to 28%. There was no correlation between recurrence rate and age ($p = 0.087686$), gender ($p = 0.42810$), type of symptoms ($p = 0.20955$), or Krouse staging ($p = 0.23658$). The position relative to Ohngren's plane ($p = 0.004768$) and tumor location in the anterior ethmoid ($p = 0.00416$) were the factors significantly influencing the risk of relapse.

Discussion: Endoscopic procedures are effective in IP treatment, although proper indications and surgeon experience should be taken into consideration.

KEYWORDS:

Inverted Papilloma, sinonasal tumors, endoscopic surgery, learning curve

INTRODUCTION

Although sinonasal inverted papillomas (IPs) are considered benign, they pose a significant therapeutic challenge. Surgery is the treatment of choice and endoscopy is a common approach [1,2]. Relapses remain a relevant problem, and each subsequent operation is associated with much poorer prognosis [3]. The aim of the study was to analyze long-term treatment outcomes depending on the surgical approach and to investigate the learning curve phenomenon.

MATERIAL AND METHODS

The retrospective study comprised 69 patients (28 women and 41 men) treated for IP during the period of 2002–2012 at the

Department of Otolaryngology and Oncological Laryngology of Poznań University of Medical Sciences. Patients were treated with three operating procedures including: endoscopic surgery, external and double approaches.

The study analyzed the following factors: age and sex of patients, tumor location, staging according to Krouse [4], the applied surgical method, and presence of complications.

The primary endpoint was the occurrence of relapses depending on the surgical approach applied analysis. The secondary goal was to evaluate the learning curve for endoscopic surgery by determining the recurrence rate after endoscopic surgery in each year. Recurrence rate in relation to age, sex, type of symptoms, tumor location, staging according to Krouse, position in relation to Ohngren's plane

were also analyzed. Statistical analysis was performed using the STATISTICA statistical package 10. Calculation of individual relationships was performed using the Chi-square test, comparison of differences with ANOVA, and test of proportion with 95 % CI.

RESULTS

During the period of the study 47/69 (68.12%) patients were treated with an endoscopic procedure, 16/69 patients with a combined approach (23.19%), and 6/69 patients (8.70%) with an external approach. Total number of endoscopic resections, external/combined approaches and recurrences in particular years are shown in Table 1. There was a statistically significant increase in the number of endoscopic operations ($p = 0.0347$) when comparing the time periods 2002–2006 [36.36% (4/11) of patients] with 2007–2012 [74.14% (43/58) of patients].

The age of the patients ranged from 23 to 78 years (mean: 55.58 years; median: 59 years). The age of the women ranged from 23 to 78 years (mean: 59.5 years, median: 59 years), and the age of the men ranged from 26 to 74 years (mean: 52.90 years; median: 58 years). Mean ages of patients treated with the endoscopic procedures, the combined approach and with the external approach were 56.02, 54.19 and 55.83 years, respectively. There were no statistically significant relationships between patient age and applied method of treatment ($p = 0.9310$).

Tumors were located in the nasal cavity in 60 (86.96%) patients; in the maxillary sinus in 42 (60.87%) patients; in the anterior ethmoid in 36 (52.17%) patients; in the posterior ethmoid in 28 (40, 58%) patients; in the sphenoid sinus in 11 (15.94%) patients; and in the frontal sinus in 6 (8.70%) patients. Six (8.70%) patients had a lesion spreading outside of the sino-nasal region: the orbit - four patients; the nasopharynx - two patients; buccal fat pad, infratemporal fossa, zygomatic area, hard palate. There was no statistically significant correlation between the location of the tumor and the applied method of treatment ($p = 0.05083$). In 19 (27.54%) patients, lesions were localized in a single anatomic region, while more than one anatomical structure was involved in the remaining patients. Two structures were occupied in 21 (30.43%) patients; three structures in 20 (28.99%) patients; and four structures in 9 (13.04%) patients. There was no statistically significant correlation between disseminated changes and the applied method of treatment ($p = 0.5870$).

Higher tumor staging correlated with a decrease in the percentage of endoscopic operations—in cases of changes as-

essed as T1 acc. to Krouse 13/14 (93%) patients were treated endoscopically, in T2 group - 16/17 (94%) patients underwent endoscopic surgery, in T3 - 16/31 (52%) patients, and in T4 - 2/7 (29%) patients. There was a statistically significant relationship between the type of treatment and tumor staging according to Krouse [$\chi^2(6) = 36.24942$; $p = 0.0000$]. Patients with lower staging were treated endoscopically more often than patients with stage T3 and T4 tumors (in such cases the external or combined approach was used more frequently).

Hospital stays after surgery ranged from 1 to 8 days (mean: 3.42 days; median: 3 days). The duration of hospitalization for endoscopic surgery ranged from 1 to 6 days (mean 2.83 days); hospital stay after external/combined surgery ranged from 2 to 8 days (mean 4.68 days). The difference in length of hospitalization between endoscopic and external/combined surgery was statistically significant ($p = 0.0000$). In the analyzed group, we noted two cases of complications in patients following the combined approach and one complication after endoscopic surgery.

There was a statistically significant relationship between the applied method of treatment and the occurrence of relapse ($p = 0.03306$). Among endoscopically treated patients, recurrence rates were significantly lower (31.91%) than in patients treated with combined or external approaches (63.64%). In 15 (68.18%) patients recurrences were treated endoscopically and in 12 (54.55%) patients with combined or external approach. Two (9.09%) patients underwent surgery for the recurrence of the IP at another department.

Out of four endoscopic procedures, three ended in relapse (75%) in 2002–2006, while 12 relapses were noted following 43 endoscopic procedures (27.91%) in 2007–2012. Although the percentage of recurrences after endoscopic operations decreased over time, there was no statistically significant difference between the analyzed periods [95% CI (-10.7810, 74.4327); $p = 0.0565$].

Recurrence rate depended on the position relative to Ohngren's plane ($p = 0.004768$) and tumor location in the anterior ethmoid ($p = 0.00416$); however, it was independent of age ($p = 0.087686$), gender ($p = 0.42810$), the type of symptoms ($p = 0.20955$), or staging according to Krouse ($p = 0.23658$).

Seven (10.14%) patients had suffered a second relapse, five of which (71.43%) underwent endoscopic surgery and two (28.57%) were treated with combined or external approach. Third and fourth relapse was noted in two patients (2.90%).

Four (5.8%) patients were diagnosed concomitantly with inverted papilloma and squamous cell carcinoma and underwent the following procedures: maxillary sinus surgery with the combined approach (sublabial and endoscopic), partial resection of the maxilla, wedge resection of the hard palate and the alveolar process of maxilla with midfacial degloving approach, and lateral rhinotomy with removal of the frontal sinus and orbital tumor.

Observation period ranged from 5 to 153 months (mean: 56.32 months, median: 46 months). Throughout this time-period recurrence was noted in 29 (42.03%) patients between 2 months and 140 months from the procedure (mean: 26.07 months; median: 14 months).

DISCUSSION

Methods of treatment of IP have changed at the turn of the last decade. In the 60s and 70s such tumors were usually removed through transnasal approach. However, high recurrence rates prompted surgeons to use more aggressive open surgical access, such as lateral rhinotomy with en bloc resection of the tumor resulting in decreased recurrence rates (40–80% vs. 0–50%) [5,6,9].

Further method was midfacial degloving and sublabial approach characterized by recurrence rates ranging 3–13% [5,8]. The introduction of endoscopic surgical techniques and precise methods of radiological imaging [8] was a milestone in treatment of IP, making endoscopy the most popular method of treatment of IP [2,7,8,10–12] with recurrence rates of 0–17% [5,6,8].

The effectiveness of endoscopic methods is closely associated with the experience of the surgeons at a particular department [5]. According to the literature, recurrence rates in inverted papilloma vary between 12% and 67% depending on the surgical method [2,6,7]. In our study group, recurrence occurred in 42% of patients, including 32% of patients treated endoscopically and 64% of patients treated with the combined / external approach.

By definition, endoscopic procedures are less invasive and are associated with better functional and cosmetic results, shorter hospital stays and fewer potential complications.

As with any new introduced surgical method we encounter the „learning curve” phenomenon, which relates to operator’s skills improving with the number of performed procedures. Gained experience reduces the risk of sub-radical surgery, potential complications, and shortens the duration of the procedure [21]. In our study covering years 2002–2006 the

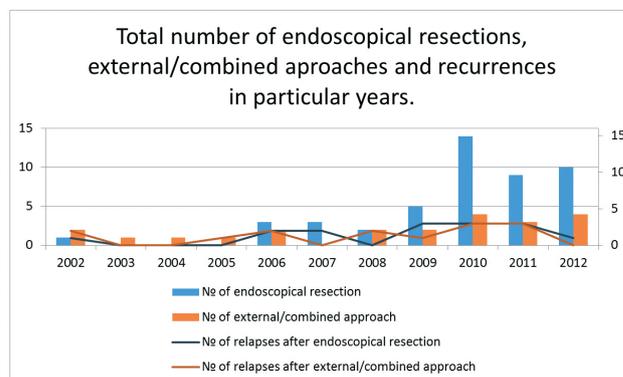


Fig. 1. Total number of endoscopic resections, external/combined approaches and recurrences in particular years.

recurrence rate after endoscopic surgery reached 75%, decreasing to 28% in years 2007–2012, which is still relatively high compared to departments with a longer tradition of endoscopic surgeries [5,6,8].

The most important rules of endoscopic procedures include broad visualization of the operative field, enabling tumor exposure, finding the key landmarks, and allowing free manipulation of tools. The success of the procedure relies on the ability to remove the entire affected mucosa and mucoperiosteum [13]. Use of an endoscope provides good visibility and enlarged tumor view, which is very important when lesions are located in deep parts of the sinonasal region [14].

Complications after endoscopic surgery described in the literature include: bleeding and hematoma occurrence, numbness of the face, excessive lacrimation, various types of fistulas, frontal stenosis, cerebrospinal fluid leak, facial cellulitis, acute sinusitis, diplopia, mucocele formation, and epiphora [7,15,16]. Three patients from the analyzed group suffered complications, i.e. fistula between maxillary sinus and vestibule of the mouth, bleeding that required surgical revision, and nasal leak of the cerebrospinal fluid.

Recurrence of IP remains a significant challenge for the surgeon. Previous surgery modifies the treated region and it is often impossible to identify anatomical landmarks [17]. Sometimes surgery must be a compromise between complete resection and conservation of adjacent vital organs located in the orbit or the anterior cranial fossa.

Hence, attempts are undertaken toward complementary alternative treatments, such as topical application of 5-fluorouracil [17,18] or 5-aminolevulinic acid [19], or radiotherapy [20].

CONCLUSIONS

Most cases IP can be successfully treated with endoscopic procedures. The choice of surgical technique should

always take into consideration the location and extent of the tumor as well as the experience of the surgeon and diagnostic and therapeutic possibilities available in the treatment center.

REFERENCES

1. Lisan Q., Laccourreye O., Bonfils P.: Sinonasal inverted papilloma: From diagnosis to treatment. *Eur. Ann. Otorhinolaryngol. Head Neck Dis.* 2016 Apr. 1.
2. Akkari M., Lassave J., Mura T., Gascou G., Pierre G., Cartier C. et al.: Atypical presentations of sinonasal inverted papilloma: Surgical management and influence on the recurrence rate. *Am. J. Rhinol. Allergy.* 2016 Mar.; 30 (2): 149–154.
3. Lee T.J., Huang S.F., Lee L.A., Huang C.C.: Endoscopic surgery for recurrent inverted papilloma. *The Laryngoscope.* 2004 Jan.; 114 (1): 106–112.
4. Krouse J.H.: Development of a staging system for inverted papilloma. *The Laryngoscope.* 2000 Jun.; 110 (6): 965–968.
5. Han J.K., Smith T.L., Loehrl T., Toohill R.J., Smith M.M.: An evolution in the management of sinonasal inverting papilloma. *The Laryngoscope.* 2001 Aug.; 111 (8): 1395–1400.
6. Krouse J.H.: Endoscopic treatment of inverted papilloma: safety and efficacy. *Am. J. Otolaryngol.* 2001 Apr.; 22 (2): 87–99.
7. Healy D.Y., Chhabra N., Metson R., Holbrook E.H., Gray S.T.: Surgical risk factors for recurrence of inverted papilloma: Surgical Risk Factors for Recurrence of IP. *The Laryngoscope.* 2015 Sep.; n/a–n/a.
8. Kim D.Y., Hong S.L., Lee C.H., Jin H.R., Kang J.M., Lee B.J. et al.: Inverted papilloma of the nasal cavity and paranasal sinuses: a Korean multicenter study. *The Laryngoscope.* 2012 Mar.; 122 (3): 487–494.
9. Weissler M.C., Montgomery W.W., Turner P.A., Montgomery S.K., Joseph M.P.: Inverted papilloma. *Ann. Otol. Rhinol. Laryngol.* 1986 Jun.; 95 (3 Pt 1): 215–221.
10. Kadapa N.B.P., Reddy L.S., Kumuda R.S., Reddy M.V.V., Rao L.M.S.C.S.: Nasal endoscope: an armamentarium in the management of sinonasal inverted papilloma. *Indian J. Otolaryngol. Head Neck Surg. Off Publ. Assoc. Otolaryngol. India.* 2014 Jun.; 66 (2): 200–204.
11. Gu F.M., Zhang L.S.: Clinical outcomes of endoscopic and open resection of recurrent sinonasal inverted papilloma. *J. Craniofac. Surg.* 2014 May; 25 (3): 1090–1093.
12. Ungari C., Riccardi E., Reale G., Agrillo A., Rinna C., Mitro V. et al.: Management and treatment of sinonasal inverted papilloma. *Ann Stomatol. (Roma).* 2015 Dec.; 6 (3–4): 87–90.
13. Lund V.J., Stammberger H., Nicolai P., Castelnuovo P., Beal T., Beham A. et al.: European position paper on endoscopic management of tumours of the nose, paranasal sinuses and skull base. *Rhinol. Suppl.* 2010; (22): 1–143.
14. Wormald P.J., Ooi E., van Hasselt C.A., Nair S.: Endoscopic removal of sinonasal inverted papilloma including endoscopic medial maxillectomy. *The Laryngoscope.* 2003 May; 113 (5): 867–873.
15. Dragonetti A., Gera R., Sciuto A., Scotti A., Bigoni A., Barbaro E. et al.: Sinonasal inverted papilloma: 84 patients treated by endoscopy and proposal for a new classification. *Rhinology.* 2011 Jun.; 49 (2): 207–213.
16. Zhang L., Li X., Shi L., Cai X., Ye P., Feng X. et al.: *Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi.* 2014 Sep.; 49 (9): 721–725.
17. Adriaensens G.F., Lim K.H., Georgalas C., Reinartz S.M., Fokkens W.J.: Challenges in the Management of Inverted Papilloma: A Review of 72 Revision Cases. *The Laryngoscope.* 2015 Sep. 7.
18. Adriaensens G.F., van der Hout M.W., Reinartz S.M., Georgalas C., Fokkens W.J.: Endoscopic treatment of inverted papilloma attached in the frontal sinus/recess. *Rhinology.* 2015 Dec.; 53 (4): 317–324.
19. Zhang Y., Yang Y., Zou X.: Efficacy of 5-Aminolevulinic Acid Photodynamic Therapy in treatment of nasal inverted papilloma. *Photodiagnosis Photodyn. Ther.* 2013 Dec.; 10 (4): 549–551.
20. Strojanc P., Jereb S., Borsos I., But-Hadzic J., Zidar N.: Radiotherapy for inverted papilloma: a case report and review of the literature. *Radiol. Oncol.* 2013 Mar.; 47 (1): 71–76.
21. Montague M.L., Kishore A., McGarry G.W.: Audit-derived guidelines for training in endoscopic sinonasal surgery (ESS) – protecting patients during the learning curve. *Clin. Otolaryngol. Allied. Sci.* 2003 Oct.; 28 (5): 411–416.

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