Thi-Qar Medical Journal (TQMJ):Vol.(27),No.(1),2024

Web Site: https://jmed.utq.edu Email: utjmed@utq.edu.iq

ISSN (Online): 3006-4791

Endoscopic Sinus Surgery for Sinonasal Inverted Papilloma: Our Experience with Medial Maxillectomy

Muaid Ismail Aziz*[1]

Haval Ahmed Hama[2]

Mariwan Latif Fatah[3]

Soran Omer Hama[4]

1 University of Sulaimani College of Medicine, Branch of Clinical Science

2 University of Sulaimani College of Medicine, Branch of Clinical Science and Smart Health Tower

3 University of Sulaimani College of Medicine, Branch of Clinical Science

4 Sulaimani General Directorate of Health, ENT – Head and Neck Center.

*Corresponding – Author: muaid.aziz@univsul.edu.iq

Abstract

Introduction: Sinonasal inverted papilloma is a non-cancerous growth of epithelial cells commonly found in the nasal cavity and paranasal sinuses. It predominantly affects adults in their 50s, with a higher occurrence in males. This condition has a notable recurrence rate and carries a risk of malignant transformation ranging from 5% to 15%.

Objective: This study aims to assess the effectiveness of endoscopic medial maxillectomy as a surgical intervention for sinonasal IP, focusing on patient outcomes and recurrence rates.

Methods: In a retrospective descriptive cohort study conducted between January 2021 and February 2023 at Sulaimany Teaching Hospital-Otolaryngology, Head and Neck Surgery Center and Middle East ENT Center at Zhian Private Hospital, 11 patients were enrolled. Of these participants, 72.7% (8 cases) were male and 27.3% (3 cases) were female, with a mean age of 45.45 years (range= 23-56). The patients underwent endoscopic resection for sinonasal inverted papilloma and were assessed using endoscopy, sinonasal outcomes test (SNOT)-22, radiological imaging, and histopathological examination.

Results: The study included 11 patients who underwent endoscopic resection for sinonasal inverted papilloma. The examination of these patients revealed a higher prevalence of T2 stage (6 cases) and T3 stage (4 cases) during the initial diagnosis. Furthermore, one occurrence of recurring disease and one instance of malignant transformation were documented.

Conclusion: The results underscore the efficacy of modern endoscopic surgical techniques in efficiently treating inverted papillomas, leading to improved patient outcomes, decreased recurrence rates, and enhanced overall quality of life following the operation. These advances have successfully eradicated most inverted papillomas endoscopically, resulting in good quality of life and low recurrence rates.

Keywords: Endoscopy, Sinonasal Inverted Papilloma, Maxillectomy

Introduction

In recent years, there have been significant advancements in endoscopic sinus surgery (ESS), particularly in its application to managing sinonasal diseases. Initially developed for treating inflammatory paranasal sinus disease, ESS has evolved to address several nasal and sinus pathologies, including non-inflammatory processes and neoplasms (Reh et al, 2009., Lane et al, 2006). One such neoplasm that has gained attention is sinonasal inverted papilloma (IP), a benign lesion with a propensity for aggressive local growth and a high recurrence rate (Stammberger et al, 2018). To effectively manage IP, a surgical approach known as endoscopic medial maxillectomy (EMM) has been proposed as an alternative to traditional open craniofacial procedures (Albert et al, 2002).

Anatomy

Anatomy of the lateral nasal wall: Understanding the anatomy of the lateral nasal wall is crucial for performing EMM. The lateral wall of the nasal cavity consists of both bony and membranous parts. The upper half of the lateral nasal wall corresponds to the medial orbital wall. It comprises the frontal process of the maxilla, the lacrimal bone, and the orbital plate of the ethmoid bone (lamina papyracea) (Lee, 2012). The ethmoid air cells within the thin lacrimal and ethmoid bones separate the nasal cavity from the orbit. The nasolacrimal groove and canal pass in front of the anterior end of the middle turbinate and open into the inferior nasal meatus (Albert et al, 2002). The middle turbinate attaches to the lateral nasal wall near the orbit and the maxillary sinus junction. A membranous part of the lateral nasal wall can be found anterior or posterior to the uncinate process. The main features of the lateral nasal wall include the superior, middle, and inferior turbinates, with the possibility of a fourth turbinate called the supreme turbinate. The middle and superior turbinates arise from extensions of the ethmoid bones, while the inferior turbinate is an embryologically independent osseous structure (Dustin et al, 2013).

Anatomy of the paranasal sinuses

Maxillary sinus: The maxillary sinus, located within the maxilla, is the most extensive paranasal sinus. It consists of a single pyramidal chamber with a volume of approximately 15 millilitres in adults. The medial wall of the maxillary sinus is composed of a thin bony plate formed by the maxilla, the inferior turbinate, the uncinate process, the perpendicular plate of the palatine bone, and the lacrimal bone. The uncinate process partially covers the maxillary sinus ostium, measuring 3 to 4 mm in diameter. The lateral apex of the sinus extends into the zygomatic process of the maxillary bone or the zygoma. The maxillary sinus roof is formed by the bony orbital floor, which may contain the infraorbital nerve. The maxilla's alveolar and palatine processes form the maxillary sinus floor. It is generally situated 1.0 to 1.2 cm below the level of the floor of the nasal

cavity. The maxillary sinus is usually separated from the molar dentition by a layer of compact bone, although this layer may be thin or absent in some cases (Tabaee, 2011).

Ethmoid sinus: The ethmoid sinus is a complex group of small cavities within the ethmoid bone. It is divided into an anterior group and a posterior group by the basal lamella of the middle turbinate. The anterior ethmoid cells consist of the bullar system, the uncinate system, and the meatal system. The posterior ethmoid air cells are located above and behind the basal lamella and are characterised by incomplete septations. The lamina papyracea forms the lateral wall of the posterior ethmoidal cells, while the superior turbinate constitutes a significant portion of the medial wall (Levine et al, 2005).

Frontal sinus: The frontal sinus, shaped like a pyramid, is within the frontal bone. Its anterior table is thicker than the posterior table and comprises thick cortical bone. The medial aspect of the frontal sinus is covered by the pericranium, followed by the frontalis muscle, subcutaneous fat, and skin. The posterior wall of the frontal sinus forms the anteroinferior border of the pterygomaxillary fossa. It contains important anatomical structures such as the internal maxillary artery, sphenopalatine ganglion, vidian nerve, greater palatine nerve, and the second branch of the trigeminal nerve (8). Besides, the advancements in technology and surgical experience have expanded the technique of endoscopic sinus surgery, allowing for the safe and effective management of various nasal and sinus pathologies (Kountakis et al, 2005).

Sphenoid sinus: The sphenoid sinus is a crucial surgical access point for expanded endoscopic procedures in sella, suprasellar, and parasellar areas, surrounded by key anatomical structures like the internal carotid artery (ICA), optic nerves, and cranial nerves. Its size, shape, and septation vary. Situated in the sphenoid bone, it is bordered by ethmoid air cells anteriorly, cavernous sinuses laterally, and structures like the pituitary fossa superiorly. Intersphenoid septations divide the sinus into compartments, impacting surgical risk. Understanding pneumatization patterns aids in complex surgeries like those involving the cavernous sinus. The sphenoid ostium connects to the nasal cavity through the sphenoethmoidal recess (Flood et al, 2021, Wang et al, 2010).

Pathologic Features of IP: Generally, IP appears as a firm, nontranslucent mass with a polylobulated appearance. Histologically, IPs are characterized by a thickened epithelium enclosed by the basement membrane, giving them an "inverted" appearance compared to other Schneiderian papillomas. Dysplasia levels in the nonkeratinizing epithelium can vary from none to severe, and attention is needed to detect possible concurrent malignancies like squamous cell carcinoma (SCC) (Eide et al, 2022).

Etiology: The exact cause of IP is not fully understood. While human papillomavirus (HPV) has been associated with up to 40% of cases, recent studies have shown contradictory results. Other potential factors linked to IP include occupational exposures like organic solvents and welding

fumes. However, the role of these factors in IP recurrence or persistence remains controversial (Minni et al, 2021., Attlmayr et al, 2017., Coutinho et al, 2020).

Clinical Presentation: IP typically presents unilaterally, with bilateral growth reported in only about 5% of cases. Symptoms are non-specific and may include nasal obstruction, epistaxis, rhinorrhea, headaches, and hyposmia. Interestingly, some patients may be asymptomatic even with IP or its recurrence. Carcinoma can also be associated with IP either synchronously or metachronously (Eggers et al, 2007., Adriaensen et al, 2016).

Diagnosis: IP diagnosis is crucial before surgery and is confirmed through histology. Medical interviews, physical exams, and imaging studies like CT scans and MRIs help suspect IP. Radiographic features on CT scans show a heterogeneous mass with calcification and bony remodelling around it. MRI reveals the tumor as iso- or hypo-intense on T1-weighted images and hyper-intense on T2-weighted images. Pre-operative imaging aids in determining the extent of the neoplasm and planning the surgical approach (Carta et al, 2011., de Azevedo et al, 2013).

Sinonasal Inverted Papilloma (IP) : Sinonasal inverted papilloma (IP) is a benign but locally aggressive tumour that arises from the Schneiderian membrane lining the nasal cavity and paranasal sinuses. It is characterised by an inverted growth pattern, with the tumour extending into the underlying stroma rather than projecting into the nasal cavity. IP commonly affects the lateral wall of the nasal cavity, including the maxillary sinus, and has a high recurrence rate even after surgical resection (Jiang et al, 2017). Sinonasal IP management poses a challenge due to its tendency for local recurrence and potential for malignancy transformation. Traditional open craniofacial procedures have been the standard approach for resecting sinonasal IP. However, these procedures are associated with significant morbidity, including facial incisions, bone removal, and prolonged hospital stays. In recent years, endoscopic medial maxillectomy (EMM) has emerged as a less invasive alternative for treating sinonasal IP (Jiang et al, 2017., Pagella et al, 2014., Sbrana et al, 2021).

This study investigates the efficacy of endoscopic medial maxillectomy (EMM) as a medical intervention for sinonasal inverted papilloma. By comparing EMM's outcomes with traditional open craniofacial procedures, we seek to determine EMM's effectiveness and safety in achieving complete resection, minimising morbidity, and reducing the risk of recurrence. Additionally, we aim to evaluate the functional outcomes and quality of life of patients who undergo EMM for sinonasal IP.

Methods

Study Design: This study investigates the efficacy of endoscopic medial maxillectomy (EMM) as a medical intervention for sinonasal inverted papilloma (IP). It adopts a prospective cohort design.

Patients diagnosed with IP who meet the inclusion criteria will be recruited from a tertiary care centre specialising in otolaryngology. The study will adhere to ethical guidelines and obtain approval from the institutional review board before commencing data collection.

Participant Selection: The study will include adult patients in their 50s diagnosed with sinonasal inverted papilloma. Before their inclusion, informed consent will be obtained from all participants. Patients with a history of previous treatments for IP, significant comorbidities that may affect surgical outcomes, or those unwilling to participate in follow-up assessments will be excluded.

Intervention: Endoscopic Medial Maxillectomy (EMM): Patients selected for the study will undergo endoscopic medial maxillectomy as the primary intervention for managing sinonasal inverted papilloma. EMM involves a minimally invasive endoscopic approach that aims to achieve complete resection of the tumour while preserving sinonasal function. The surgical procedure will be performed by experienced otolaryngologists specialised in endoscopic sinus surgery.

Data Collection: Preoperative data collection will include detailed patient demographics, medical history, imaging studies (CT scans, MRIs), and diagnostic findings confirming the presence of sinonasal inverted papilloma. Intraoperative data will document surgical details, including the extent of resection, intraoperative complications, and surgical outcomes. Postoperative assessments will evaluate recurrence rates, postoperative complications, and sinonasal function.

Outcome Measures: The primary outcome measures of this study will include:

- Complete resection rates: These were determined by postoperative imaging studies confirming the absence of residual tumour.

- Recurrence rates: These are assessed through regular follow-up visits and imaging studies to detect any recurrence of sinonasal inverted papilloma.

- Postoperative sinonasal function: Evaluated using standardised quality of life questionnaires and objective nasal airflow and olfaction measures.

Statistical Analysis: Statistical analysis will be conducted using appropriate methods to compare outcomes between endoscopic medial maxillectomy patients and traditional open craniofacial procedures for managing sinonasal inverted papilloma. Descriptive statistics will summarise patient characteristics, while inferential statistics, such as chi-square tests or t-tests, will analyse differences in outcomes between groups.

Ethical Considerations: This study will adhere to ethical principles outlined in the Declaration of Helsinki and obtain informed consent from all participants. Patient confidentiality will be maintained throughout the study, and data handling procedures will comply with institutional guidelines on research ethics. By following these rigorous methods, this study aims to provide valuable insights into the efficacy of endoscopic medial maxillectomy as a medical intervention

for sinonasal inverted papilloma. This contributes to optimizing treatment strategies for this challenging condition.

Results: As can be seen from table (1) the study encompassed 11 patients diagnosed with inverted papilloma (IP) through histological confirmation. Among these patients, the majority were male (72.7%) with an average age of 45.45 years. Common occupations included teaching, housewifery, and employment. A notable proportion (18.2%) of patients were smokers. Regarding sinus involvement, 72.7% had left-sided involvement, 18.2% had right-sided involvement, and 9.1% had bilateral involvement. Following postoperative follow-up, 81.8% of patients were disease-free, while 9.1% experienced recurrence after 6 months, and another 9.1% developed carcinoma after a year.

Table (1). Demographic And Clinical Data Of The Patients

Parameters		No. (%)	Mean SD	P Value
Sex	Male	8(72.7%)		
	Female	3 (27.3%)		0.40
Age	23-45y	4 (36.4%)	45.45	
	45-56y	7 (63.6 %)		0.17
Occupation	Teacher	2 (18.2 %)	44.00	
	House Wife	2 (18.2 %)	29.50	
	Employer	3 (27.3 %)	42.33	
	Beverage Shop	1 (9.1 %)	17.00	0.2
	Military	1 (9.1 %)	12.00	
	Medical Staff	1 (9.1 %)	56.00	
	No Work	1 (9.1 %)	.00	
Smoking	Yes	2 (18.2 %)	25.00	0.5
	No	9 (81.8%)	34.33	
Side Of The Tumor	Right	2 (18.2 %)		
	Left	8 (72.7%)		0.65
	Bilateral	1 (9.1 %)		
Postoperative Follow-Up 1, 3, 6 Months And 1 Year	Disease Free	9	81.8%	0.02
	Recurrent After 6 Months	1	9.1%	
	Carcinoma After 1 Year	1	9.1%	

In cases where a visible pedicle was present, 88.9% of patients were disease-free, 11.1% experienced recurrence, and none exhibited carcinomatous changes. Conversely, in cases without a visible pedicle, 50% were disease-free while the remaining 50% developed carcinomatous changes Table (2).

Table (2). Correlation Between Tumor Origin And Postoperative Findings

Pedicle Visible(Origin)	Postoperative Finding			Total	P-Value
	Disease Free	Recurrence	Carcinomatous Change		
Yes	8(88.9)	1(11.1)	0(0.0)	9(100.0)	0.35
No	1(50.0)	0(0.0)	1(50.0)	2(100.0)	
Total	9(81.8)	1(9.1)	1(9.1)	11(100.0)	

Staging distribution among patients revealed that 54.5% were classified as stage T2, 36.4% as stage T3, and 9.1% as stage T4. The primary endoscopic procedures performed were middle meatal inferior (MMI) and middle meatal II (MMII), with no statistically significant association observed between staging and endoscopic procedures (Table 3).

Table (3). The Significance Of Staging System And Endoscopic Procedure

Staging (Krouse)			ESS		Total	P-Value
	MMI	MMII	MMIII	MMIII DRAFIII		
T2	2(100.0)	1(25.0)	3(75.0)	0(0.0)	6(54.5)	0.13
T3	0(0.0)	3(75.0)	1(25.0)	0(0.0)	4(36.4)	
T4	0(0.0)	0(0.0)	0(0.0)	1(100.0)	1(9.1)	
Total	2(100.0)	4(100.0)	4(100.0)	1(100.0)	11(100.0)	

Staging distribution among patients revealed that 54.5% were classified as stage T2, 36.4% as stage T3, and 9.1% as stage T4. The primary endoscopic procedures performed were middle meatal inferior (MMI) and middle meatal II (MMII), with no statistically significant association observed between staging and endoscopic procedures (Table 4).

Table (4). The Significance Of Staging And Postoperative Findings

Staging(Krouse)	Postoperative Finding			Total	P-Value
	Disease Free	Recurrent	Carcinoma		
T2	6(100.0)	0(0.0)	0(0.0)	6(100.0)	0.07
T3	3(75.0)	1(25.0)	0(0.0)	4(100.0)	
T4	0(0.0)	0(0.0)	1(100.0)	1(100.0)	
Total	9(81.8)	1(9.1)	1(9.1)	11(100.0)	

As can be seen from the Table (5), patients who underwent MMI and MMII procedures had a 100% disease-free rate, whereas MMIII patients had a 75% disease-free rate, and MMIII DRAFT patients all developed carcinoma. The association between endoscopic procedures and postoperative findings did not reach statistical significance (p=0.2).

Table (5). The Significant Of Endoscopic Procedures And Postoperative Finding

Postoperative Finding			ESS		Total	P-Value
	MMI	MMII	MMIII	MMIII DRAFIII		
Disease Free	2(100.0)	4(100.0)	3(75.0)	0(0.0)	9(81.8)	0.2
Recurrent	0(0.0)	0(0.0)	1(25.0)	0(0.0)	1(9.1)	
Carcinomatous Change	0(0.0)	0(0.0)	0(0.0)	1(100.0)	1(9.1)	
Total	2(100.0)	4(100.0)	4(100.0)	1(100.0)	11(100.0)	

Patients with involvement of the posterior, lateral, and medial walls of the maxillary sinus remained disease-free; however, those with anterior wall involvement experienced a 50% recurrence rate, while those without a visible pedicle had a 100% incidence of carcinomatous changes. The relationship between anatomical location and postoperative findings was not statistically significant (p=0.18) (table 6).

Table (6). Correlation Between Anatomical Location At Surgery And Post-Operative Findings.

Anatomical Location At Surgery	Finding			Total	P-Value
	Disease Free	Recurrent	Carcinomato Us Change		
Posterior Wall Of Maxillary	1(100.0)	0(0.0)	0(0.0)	1(100.0)	0.18
Lateral Wall Of Maxillary	1(100.0)	0(0.0)	0(0.0)	1(100.0)	
Medial Wall Of Maxillary	6(100.0)	0(0.0)	0(0.0)	6(100.0)	
Anterior Wall Of Maxillary	1(50.0)	1(50.0)	0(0.0)	2(100.0)	
None	0(0.0)	0(0.0)	1(100.0)	1(100.0)	
Total	9(81.8)	1(9.1)	1(9.1)	11(100.0)	

Postoperatively, the mean SNOT-22 score was recorded at 10.09, indicating an enhancement in quality of life following endoscopic sinus surgery. No statistically significant differences in SNOT-22 scores were observed across various endoscopic procedures (p=0.67) (table 7).

Table (7). The Significance Of Surgery And QOL

ESS	Post-Operative SNOT				P-Value
	N	Mean ± S. D	95% Cl	Mini - Maxi	
MMI	2	5.50 ± 4.95	-38.97 - 49.97	2 - 9	0.67
MMII	4	9.75 ± 4.78	2.13 - 17.37	3 - 14	
MMIII	4	13.25 ± 9.84	-2.41 - 28.91	2 - 22	
MMIII DRAFIII	1	8.0 ± 0.0	0.00 - 0.00	8 - 8	
Total	11	10.09 ± 6.86	5.48 - 14.7	2 - 22	

The mean pre-operative SNOT-22 score was notably reduced from 38.72 to 10.09 postoperatively ($p<0.001$), signifying a substantial improvement in patient-reported outcomes related to quality of life following the surgical intervention (Table 8).

Table (8). The Significant Correlation Between Pre And Post-Operative Results Of SNOT22

Pre-Operation SNOT Score	Frequency	Post-Operation SNOT Score	Frequency
12	1	2	2
16	1	3	1
17	1	8	2
33	1	9	1
35	1	10	1
38	1	12	1
45	1	14	1
54	1	21	1
55	1	22	1
56	1		
65	1		
Total	11	Total	11
Mean ± S. D		Mean ± S. D	P-Value
38.72 ± 18.10		10.09 ± 6.86	<0.001

Discussion

According to existing literature, IP is categorized as a non-malignant growth found in the nasal cavity and paranasal sinuses. Typically, it is most frequently identified during individuals' fifth and sixth decades of life, displaying a higher incidence among males with a ratio of 3:1. (Jiang et al, 2017). The demographic characteristics of the participants in our study are comparable to those reported in the existing literature. Our sample consisted of 11 individuals, with 8 males and 3 females, resulting in a male-to-female ratio of approximately 3.6:1. The mean age of the participants was 45.45 years, which is similar to the findings of Claudia et al., who reported a mean age of 47 years in their study of 14 males and 7 females (male-to-female ratio of 3:1) (Ungari et al, 2015). The differences observed in our study were not statistically significant (P-value = 0.17), indicating that the demographic profile of our participants aligns closely with the existing data in the field (Table 1). The condition's exact cause remains unclear based on the current scientific literature. However, several potential contributing factors have been proposed, including HPV infection, occupational hazards, and smoking, although their roles have not been definitively confirmed. Minni et al. reported a significant association between smoking and exposure to various

known occupational risk factors for sinonasal malignancies (Minni et al, 2021). Despite these insights, the precise etiology of the condition has not been conclusively established in the existing body of research.

Contrary to the findings within our study group, we identified two individuals who were smokers and held distinct occupations. However, our analysis did not reveal any statistically significant associations between smoking habits and occupational backgrounds, as indicated in Table (1), with corresponding P-values of 0.5 and 0.2. These outcomes reflect the sample's composition, where it is noteworthy that half of the cases studied by Minni et al. had a history of smoking and exposure to recognized occupational hazards. The existing literature indicates that inverted papilloma (IP) is a unilateral nasal condition, observed in approximately 17% of patients presenting with unilateral sinus disease (Hildenbrand et al, 2019). Our findings showed ten instances of the disease affecting only one side. Specifically, eight cases exhibited left-sided sinonasal disease, as detailed in Table (1), with no statistically significant impact (P-value=0.65) on the disease progression or treatment strategy. This pattern aligns with the observations made by Pagella et al., who noted a higher prevalence of left-sided involvement than the right side (Pagella et al, 2014). Our findings showed that the disease manifested unilaterally in ten cases. Specifically, there were eight instances of sinonasal disease on the left side, as indicated in Table (1). The absence of a significant impact (P-value=0.65) on the disease or treatment plan aligns with the results reported by Pagella et al., who similarly found a greater prevalence of left-sided involvement compared to the right side (Pagella et al, 2014).

The existing literature has highlighted the significance of identifying and including the localised attachment sites of IP in the surgical specimen. Based on this understanding, the surgeon should thoroughly address the attachment site, eliminating the need for extensive, unnecessary surgical procedures. This attachment-oriented approach has been shown to provide adequate oncological outcomes comparable to standard endoscopic techniques while reducing operative time and the rate of postoperative complications (Pagella et al, 2014., Landsberg et al, 2008). The data in table 2 indicate no statistically significant impact (p= 0.35) of the attachment site on the postoperative success rate following endoscopic resection of IP. This finding aligns with the conclusions drawn by Schneyer et al., who reported that outcomes from endoscopic resections did not show significant differences compared to historical controls (p = 0.696) (Schneyer et al, 2011).

Our patients underwent classification based on the Krouse staging system to determine the appropriate type of endoscopic procedure for their condition. Nowadays, skilled rhinologists with a full range of tools consider endoscopic techniques the preferred standard of care across all disease stages. A systematic review has affirmed that surgeons opt for the endoscopic approach irrespective of the tumour stage. Notably, challenges arise in completely excising disease in the frontal sinus and periorbital regions with intraorbital extension, highlighting the limitations of the pure endoscopic method. When faced with frontal sinus inverted papillomas, surgeons may find a

pure endoscopic approach challenging, prompting consideration of Draf II or III techniques to ensure adequate lesion exposure (Goudakos et al, 2018). The need for more advanced endoscopic approaches aligns with the findings in Table (3), where disease progression and frontal sinus involvement necessitate increasingly sophisticated endoscopic strategies for tumour removal.

Even after examining the data in table (4), we observed that the Krouse staging system does not influence the recurrence rate of inverted papilloma (IP) (p-value=0.07), with stage 3 showing recurrence rates similar to those reported by Lisan et al. Their findings indicated that stage 3 carries a higher risk of recurrence, yet no significant disparity in recurrence risk was noted between the groups (Lisan et al, 2017). The literature cites a range of 0-24% for recurrence rates following endoscopic surgery. In our study, we observed a recurrence rate of 9.1%, which falls below the reported figures in existing literature and is notably lower than the recurrence rate reported by Ahn et al. at 29.2% (Landsberg et al, 2008, Ahn et al, 2018).

In our investigation, the occurrence of carcinomatous changes was noted at a rate of 9.1%, a figure lower than those reported in the literature by Safadi et al. at 11.5% and Mirza et al. at 11% for the overall malignancy rate (Sbrana et al, 2021., Safadi et al, 2017., Mirza et al, 2007). The choice of endoscopic technique for IP removal is determined by the staging system. Key aspects of IP resection involve accurately identifying the implantation site, meticulously excising the mucosal rim, and supplementing with bone drilling (Coutinho et al, 2020). Analysis from Table (5) and Table (6) reveals that the specific endoscopic procedures and anatomical sites during surgery do not impact the postoperative recurrence rate (p-value=0.2, 0.18) as long as complete removal of the surrounding mucosa and tumour, along with bone drilling, is achieved. Endoscopic surgery can lead to surgical complications affecting sinonasal functions, such as bleeding, orbital issues, cerebrospinal fluid leaks, and lacrimal pathway stenosis. The incidence of complications associated with ES varies between 0% and 20% (van Samkar et al, 2016).

In our evaluation utilizing the data presented in table (7) and table (8), we examined the comorbidities and quality of life of all patients using the SNOT-22 questionnaire. This questionnaire comprises 22 inquiries regarding sinonasal functions both before and after the extended procedures, yielding p-values of 0.67 and 0.001, respectively. The findings from our study were corroborated by Samkar et al (van Samkar et al, 2016) and Bertazzoni et al (2017), who reported no significant distinctions between patients who underwent wide local excisions and those who had extended medial maxillectomies. However, Samkar et al's results differed as they found no significant difference in SNOT-22 scores between groups (p= 0.456), possibly due to their reliance solely on postoperative data without preoperative comparisons.

Conclusion

The study on the efficacy of Endoscopic Medial Maxillectomy for Sinonasal Inverted Papilloma (IP) concluded that the procedure showed promising results. Out of 11 patients studied, the majority were males (72.7%) with a mean age of 45.45. Notably, 81.8% of patients were disease-free postoperatively, with only one case of recurrence and one case of carcinomatous change after a year. The study highlighted the importance of endoscopic follow-ups at 1, 3, 6, and 12 months to monitor patient outcomes. Complications like facial pain and numbness were noted postoperatively, emphasising the need for careful management. The correlation between tumour origin, staging, endoscopic procedures, and postoperative findings provided valuable insights into the effectiveness of the intervention. Overall, the research supports the use of Endoscopic Medial Maxillectomy as a viable medical intervention for Sinonasal Inverted Papilloma.

Limitation : A limitation in our research lies in the limited size of the patient cohort, comprising only 11 cases. Additionally, the duration of the follow-up period may not be extended sufficiently to definitively ascertain the probability of recurrence and the primary outcome of endoscopic surgery.

Recommendation : Based on our findings, we suggest improving the evaluation and treatment of unilateral nasal conditions and focusing more on the histopathological analysis of any unilateral nasal growths. Conducting postoperative follow-ups with endoscopy allows for the early identification of any potential recurrence.

References

Adriaensen GF, Lim KH, Georgalas C, Reinartz SM, Fokkens WJ. Challenges in the management of inverted papilloma: a review of 72 revision cases. The Laryngoscope. 2016 Feb;126(2):322-8.
Ahn SH, Lee EJ, Kim JW, Baek KH, Cho HJ, Yoon JH, Kim CH. Better surgical outcome by image-guided navigation system in endoscopic removal of sinonasal inverted papilloma. Journal of Cranio-Maxillofacial Surgery. 2018 Jun 1;46(6):937-41.
Albert L. Rhoton. The Sellar Region. Neurosurgery, 2002. Vol. 51. No. 41.Pg. S335-74.
Attlmayr B, Derbyshire SG, Kasbekar AV, Swift AC. Management of inverted papilloma. The Journal of Laryngology & Otology. 2017 Apr;131(4):284-9.
Bertazzoni G, Accorona R, Schreiber A, Pietrobon G, Karligkiotis A, Fazio E, Castelnuovo P, Nicolai P. Postoperative long-term morbidity of extended endoscopic maxillectomy for inverted papilloma. Rhinology. 2017 Dec 1;55(4):319-25.
Bugter O, Monserez DA, van Zijl FV, Baatenburg de Jong RJ, Hardillo JA. Surgical management of inverted papilloma; a single-center analysis of 247 patients with long followup. Journal of Otolaryngology-Head & Neck Surgery. 2017 Dec;46(1):1-7.

Carta F, Verillaud B, Herman P. Role of endoscopic approach in the management of inverted papilloma. Current Opinion in Otolaryngology & Head and Neck Surgery. 2011 Feb 1;19(1):214.

Coutinho G, Marques J, Leal M, Spratley J, Fernandes MS, Santos M. Surgical outcomes of sinonasal inverted papilloma: a 17 year review. Brazilian journal of otorhinolaryngology. 2020 Jul 13;86:315-20.

de Azevedo Caparroz F, Gregório LL, Kosugi EM. Evolution of endoscopic surgery in the treatment of inverted papilloma. Brazilian Journal of otorhinolaryngology. 2013 Jan 1;79(1):13-7.

Dustin M. Dalgorf, Richard J. Harvey. Sinonasal Anatomy and Function. American Journal of Rhinology & Allergy. 2013. Vol. 27. No. 3.Pg. 3- 6.

Eggers G, Mühling J, Hassfeld S. Inverted papilloma of paranasal sinuses. Journal of Cranio-Maxillofacial Surgery. 2007 Jan 1;35(1):21-9.

Eide JG, Welch KC, Adappa ND, Palmer JN, Tong CC. Sinonasal Inverted Papilloma and Squamous Cell Carcinoma: Contemporary Management and Patient Outcomes. Cancers. 2022 Jan;14(9):2195.

Flood LM. Atlas of Sellar, Suprasellar, and Parasellar Lesions, Editor; Narayanan Janakiram, Assoc Editors; Dharambir S. Sethi and Shilpee Bhatia Sharma, Thieme 2021, Pages 462 Illustrations 1097, ISBN: 9789388257534. The Journal of Laryngology & Otology.:1

Goudakos JK, Blioskas S, Nikolaou A, Vlachtsis K, Karkos P, Markou KD. Endoscopic resection of sinonasal inverted papilloma: systematic review and meta-analysis. American Journal of Rhinology & Allergy. 2018 May;32(3):167-74.

Hildenbrand T, Weber R, Mertens J, Stuck BA, Hoch S, Giotakis E. Surgery of inverted papilloma of the maxillary sinus via translacrimal approach—long-term outcome and literature review. Journal of clinical medicine. 2019 Nov 5;8(11):1873.

Jiang XD, Dong QZ, Li SL, Huang TQ, Zhang NK. Endoscopic surgery of a sinonasal inverted papilloma: surgical strategy, follow-up, and recurrence rate. American Journal of Rhinology & Allergy. 2017 Jan;31(1):51-5.

Kountakis SE, Senior BA, Draf W, editors. The frontal sinus. Berlin, Germany: Springer; 2005 Dec 1.

Landsberg R, Cavel O, Segev Y, Khafif A, Fliss DM. Attachment-oriented endoscopic surgical strategy for sinonasal inverted papilloma. American Journal of Rhinology. 2008 Nov;22(6):629-34.

Lane AP, Bolger WE. Endoscopic management of inverted papilloma. Current Opinion in Otolaryngology & Head and Neck Surgery. 2006 Feb 1;14(1):14-8.

Lee KJ. Essential otolaryngology: head and neck surgery. McGraw-Hill; 2012.

Levine HL, Clemente P, editors. Sinus surgery: Endoscopic and microscopic approaches. Stuttgart: Georg Thieme Verlag; 2005.

Lisan Q, Moya-Plana A, Bonfils P. Association of Krouse classification for sinonasal inverted papilloma with recurrence: a systematic review and meta-analysis. JAMA Otolaryngology–Head & Neck Surgery. 2017 Nov 1;143(11):1104-10.

Minni A, Gera R, Bulgheroni C, Ralli M, Cialente F, Candelori F, Mevio N, Dragonetti A. Endoscopic resection of sinonasal inverted papilloma: a multivariate retrospective analysis of factors affecting recurrence and persistence. Ear, Nose & Throat Journal. 2021 Sep;100(5_suppl):542S-8S.

Mirza S, Bradley PJ, Acharya A, Stacey M, Jones NS. Sinonasal inverted papillomas: recurrence, and synchronous and metachronous malignancy. The Journal of Laryngology & Otology. 2007 Sep;121(9):857-64.

Pagella F, Pusateri A, Giourgos G, Tinelli C, Matti E. Evolution in the treatment of sinonasal inverted papilloma: pedicle-oriented endoscopic surgery. American journal of rhinology & allergy. 2014 Jan;28(1):75-81.

Reh DD, Lane AP. The role of endoscopic sinus surgery in the management of sinonasal inverted papilloma. Current Opinion in Otolaryngology & Head and Neck Surgery. 2009 Feb 1;17(1):6-10.

Safadi A, Yafit D, Abu-Ghanem S, Ungar OJ, Wengier A, Abergel A, Fliss DM, Koren I. The clinical behavior of sinonasal inverted papilloma with cellular dysplasia: case series and review of the literature. European Archives of Oto-Rhino-Laryngology. 2017 Sep;274(9):3375-82.

Sbrana MF, Borges RF, Pinna FD, Brandão Neto D, Voegels RL. Sinonasal inverted papilloma: rate of recurrence and malignant transformation in 44 operated patients. Brazilian journal of otorhinolaryngology. 2021 Mar 15;87:80-4.

Schneyer MS, Milam BM, Payne SC. Sites of attachment of Schneiderian papilloma: a retrospective analysis. InInternational forum of allergy & rhinology 2011 Jul (Vol. 1, No. 4, pp. 324-328). Hoboken: Wiley Subscription Services, Inc., A Wiley Company.

Stammberger, H, and Valerie Lund. Anatomy of the nose and paranasal sinuses, Scott Brown Otorhinolaryngology Head and Neck Surgery .8thEd. 2018. Vol. 1.Pg. 968-972.

Tabaee A. The Maxillary Sinus: Medical and Surgical Management. The Annals of Otology, Rhinology & Laryngology. 2011 Aug 1;120(8):560.

Ungari C, Riccardi E, Reale G, Agrillo A, Rinna C, Mitro V, Filiaci F. Management and treatment of sinonasal inverted papilloma. Annali di stomatologia. 2015 Jul;6(3-4):87.

van Samkar A, Georgalas C. Long-term quality of life after endoscopic removal of sinonasal inverted papillomas: a 6-year cohort analysis in a tertiary academic hospital. European Archives of Oto-Rhino-Laryngology. 2016 Jun;273(6):1433-7.

Wang J, Bidari S, Inoue K, Yang H, Rhoton A Jr. Extensions of the sphenoid sinus: a new classification. Neurosurgery 2010;66(4):797–816.