

CASE REPORT

Endoscopic management of extensive inverted papilloma: technical challenges and outcomes

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ABSTRACT

BACKGROUND. Inverted papilloma is a clinically significant benign tumor of the sinonasal tract due to its locally aggressive behaviour, potential for malignant transformation, and frequent involvement of anatomically complex regions. Its presentation often mimics other inflammatory or neoplastic conditions, making early diagnosis and tailored surgical management essential for preventing functional and structural complications.

CASE REPORT. This case presents a rare and extensive bilateral sinonasal inverted papilloma with externalization through the nasal vestibule, occurring in a patient with a history of prior sinonasal surgery and significant anatomical distortion. The tumor’s aggressive local expansion, associated bone remodelling, and metaplastic ossification posed considerable diagnostic and surgical challenges, successfully managed through advanced endoscopic techniques.

KEYWORDS: inverted papilloma, sinonasal tumor, recurrence.

INTRODUCTION

Inverted papilloma (IP) is a benign but locally aggressive neoplasm arising from the Schneiderian mucosa lining the nasal cavity and paranasal sinuses. Although uncommon, accounting for approximately 0.5–4% of sinonasal tumors, IP poses significant clinical challenges due to its propensity for local invasion, high recurrence rates, and association with malignancy, predominantly squamous cell carcinoma^{1,2}. The tumor most frequently originates from the lateral nasal wall and maxillary sinus, rarely presenting bilaterally. The lesion demonstrates a marked male predominance and most frequently presents in the fifth to sixth decades of life³.

Histopathologically, Schneiderian papillomas are classified into three distinct subtypes: inverted, exophytic (fungiform), and oncocytic (cylindrical cell) papillomas⁴. The inverted subtype is characterized by an

endophytic growth pattern with epithelial proliferation invaginating into the underlying stroma, often accompanied by squamous metaplasia and variable degrees of dysplasia or malignant transformation, reported in up to 10% of cases^{5,6}. Conversely, the exophytic type demonstrates outward papillary projections and rarely undergoes malignant change, while the oncocytic subtype features columnar oncocytic cells and is infrequently associated with carcinoma^{4,7}.

Preoperative imaging is critical for accurate assessment of tumor extent and anatomical relationships, thereby guiding surgical management. Computed tomography (CT) excels at evaluating bony remodelling and tumor attachment sites, which are crucial for achieving complete excision and minimizing recurrence^{8,9}. Magnetic resonance imaging (MRI) provides superior soft tissue contrast, delineating tumor margins and detecting possible involvement of adjacent vital structures such as the orbit or skull base. The character-

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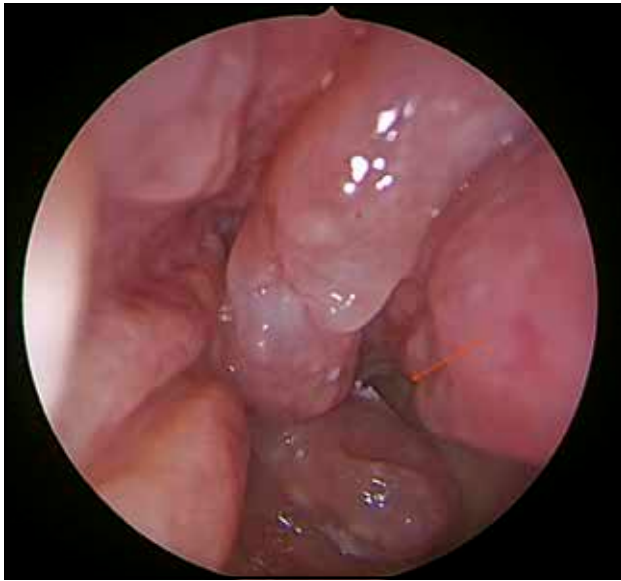


Figure 1. Endoscopic appearance of the tumor mass extending into the left nasal cavity.



Figure 2. Tumoral mass protruding through the right nasal vestibule.

istic “convoluted cerebriform pattern” on T2- and contrast-enhanced T1-weighted sequences is highly suggestive of IP and aids differentiation from inflammatory or malignant sinonasal lesions^{10,11}. The combined use of cranio-facial CT and MRI represents the current standard for preoperative evaluation⁸.

Surgical excision remains the cornerstone of inverted papilloma management, with the primary goal of complete tumor removal, including the mucosal attachment site, to reduce the risk of recurrence. Traditionally, open surgical approaches such as lateral rhinotomy or medial maxillectomy were standard; however, over the past two decades, endoscopic sinus surgery (ESS) has become the preferred approach due to its minimally invasive nature, superior visualization, reduced morbidity, and comparable or improved oncological outcomes^{12,13}. ESS allows precise tumor debulking and targeted resection of the tumor origin, preserving uninvolved structures and improving postoperative recovery.

Recurrence rates following surgery vary widely, ranging from 5% to 25%, often related to incomplete excision of the tumor base or multifocal disease¹⁴. Revision surgery is frequently necessary in recurrent cases, with endoscopic techniques still favoured when feasible. In cases of extensive disease with intracranial or orbital involvement, combined endoscopic and external approaches may be required to achieve clear margins³. The role of adjuvant therapies remains limited but may be considered in select cases with malignant transformation or aggressive behaviour³. Long-term follow-up, including regular endoscopic examinations and imaging, is essential to detect recurrences early and to monitor for malignant transformation, which occurs in up to 10% of patients^{6,14}.

CASE REPORT

A 70-year-old female with a history of right-sided sinonasal squamous cell carcinoma operated on via lateral rhinotomy 30 years prior, and facial reconstructive surgery 20 years ago, presented with bilateral nasal obstruction, postnasal discharge, and externalization of a mass through the right nasal vestibule. No prior medical documentation was available.

On examination, the patient exhibited bilateral exophthalmos, ectropion of the right lower eyelid, frontal bossing, and widening of the nasal pyramid. Nasal endoscopy revealed a firm, yellowish mass completely obstructing the right nasal cavity and nearly occluding the left (Figure 1), with extension into the nasopharynx and external protrusion through the right nostril (Figure 2).

The contrast-enhanced CT scan of the paranasal sinuses revealed a large, heterogeneously enhancing, obstructive soft tissue mass predominantly occupying the right nasal cavity, with extension into the nasal vestibule, posterior choana, and posteriorly to the nasopharynx (Figure 3). There was erosion or surgical absence of the right nasal turbinates, and the mass caused pressure-induced remodelling of the surrounding bony structures, including atrophy and bowing of the nasal septum and medial wall of the right maxillary sinus. These features, especially bony remodelling without frank bone destruction, are highly suggestive of an inverted papilloma, which is known for locally aggressive behaviour with compressive effects.

Similar but less extensive soft tissue masses were seen in the left nasal cavity, left middle meatus, and anterior ethmoid cells, and the frontal sinuses were completely obstructed bilaterally (Figure 3). A 12 mm bone defect in the posterior wall of the left frontal sinus was also

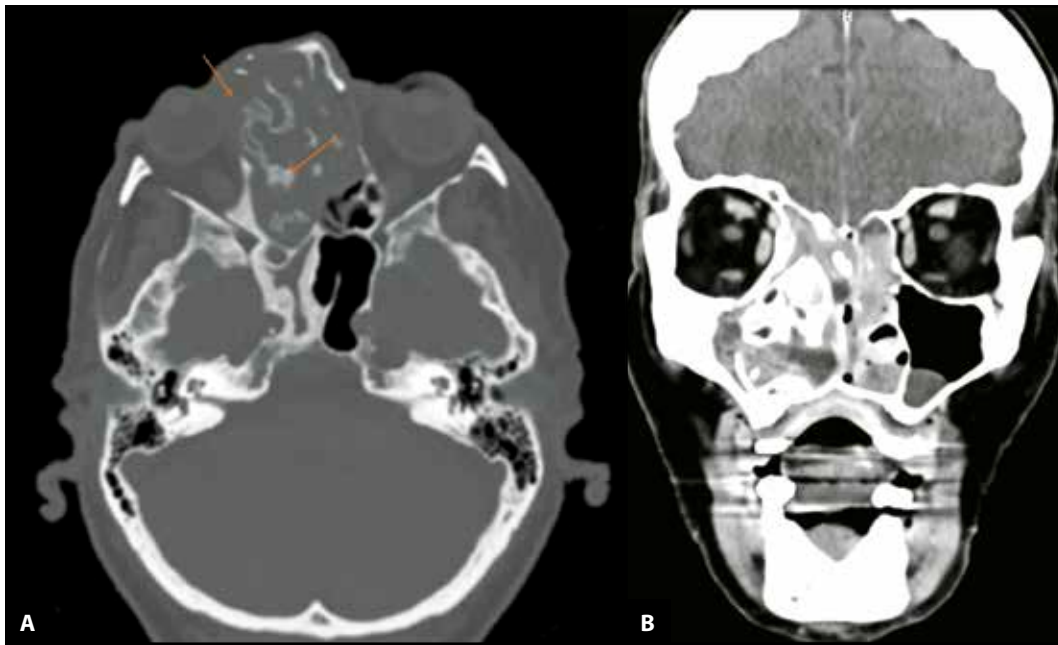


Figure 3. Cranio-facial CT scan (axial (A) and coronal (B) sections) showing areas of metaplastic/heterotopic ossification, lamina papyracea thinning and orbital roof remodelling (orange arrows).

noted, likely due to long-standing pressure or previous surgical intervention.

Importantly, the tumor contained areas of metaplastic/heterotopic ossification, a feature sometimes observed in inverted papillomas undergoing chronic inflammation or polypoid transformation. The mass demonstrated moderate, heterogeneous contrast enhancement, consistent with the vascularity seen in inverted papillomas. There was no evidence of direct invasion into adjacent orbital or intracranial structures, but thinning of the lamina papyracea and remodelling of

the orbital roof were present bilaterally (Figure 3), again indicating local aggressiveness rather than true invasion. In addition, signs of chronic sinusitis and retained secretions were seen in the right maxillary and right sphenoid sinuses, likely secondary to obstruction of natural drainage pathways by the mass.

Given the asymmetrical nasal mass, its local aggressiveness, bony remodelling without destruction, heterogeneous enhancement, and metaplastic ossifications, the findings were highly suspicious for an inverted papilloma, particularly in the context of a long-standing lesion

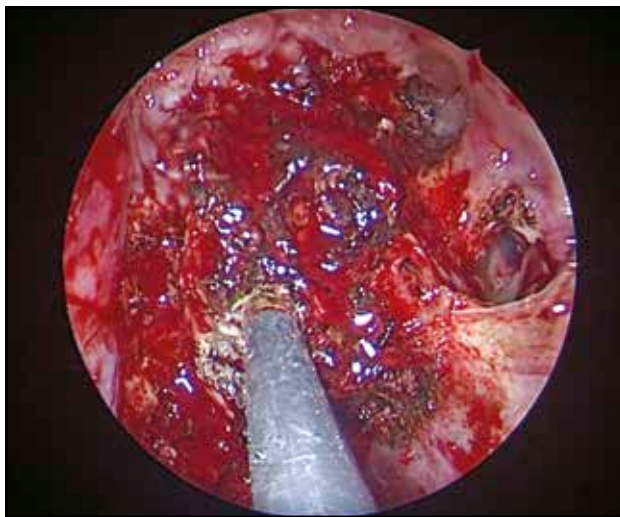


Figure 4. Endoscopic intraoperative image demonstrating the common frontal neo-ostium created via the Draf III approach.

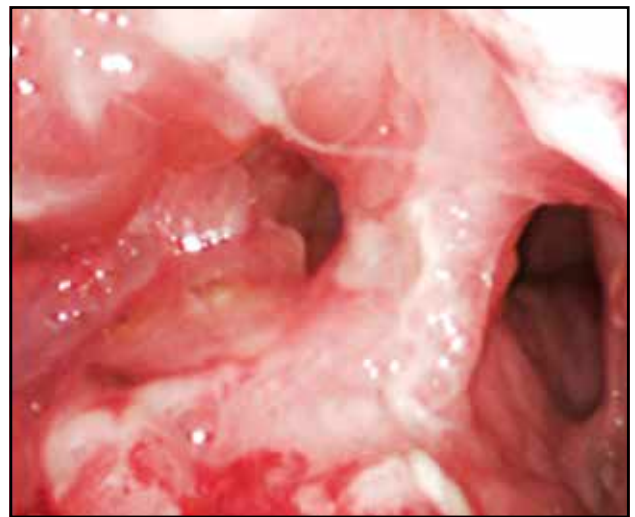


Figure 5. Endoscopic postoperative appearance at the three-month follow-up - no evidence of residual or recurrent disease.

and a history of surgery dating back 30 years.

The patient underwent endoscopic sinus surgery, which is now the gold standard for inverted papilloma due to its lower morbidity, improved visualisation, and comparable recurrence rates to open approaches^{13,14}. A piecemeal resection was performed, as the tumor was extensive and involved both nasal cavities, frontal recesses, and ethmoidal labyrinths (Figure 4). Intraoperatively, a bony mass (approx. 1.5 cm) was identified within the right nasal cavity, displacing the septum and obstructing the choanal arch, which required careful drilling and resection. Complete removal of the tumor was achieved by identifying and excising the mucosal attachment site, a critical step to reduce recurrence risk. Dense fibrosis and ossified tissue posed significant challenges, likely due to previous surgeries and chronic inflammation. The frontal sinus extension was addressed through a modified Draf type III frontal sinusotomy.

The histopathological examination was conclusive for inverted sinonasal papilloma, with extensive areas of osseous metaplasia; no dysplastic or malignant lesions were observed.

At the 3-month postoperative follow-up, the patient showed no clinical or endoscopic evidence of residual or recurrent disease. The nasal cavities were well aerated, with restoration of nasal patency (Figure 5). No signs of orbital or frontal sinus complications were noted. This favourable outcome highlights the efficacy of complete endoscopic resection, even in anatomically complex, previously operated patients.

DISCUSSIONS

This case illustrates a rare and particularly challenging presentation of extensive bilateral sinonasal inverted papilloma (IP) in a patient with a remote history of squamous cell carcinoma and reconstructive facial surgery. The externalization of the tumor through the right nasal vestibule, combined with bilateral exophthalmos, ectropion, and frontal bossing, reflects an unusually aggressive local expansion, rarely documented in the literature. Additionally, the presence of metaplastic ossification within the tumor mass is a noteworthy histopathological feature, occasionally seen in longstanding or chronically inflamed IPs, further complicating the surgical approach.

The surgical management of this case was notably complex due to multiple converging factors. First, the extensive anatomical distortion caused by previous oncological and reconstructive procedures significantly hindered the identification of normal surgical landmarks, complicating both orientation and dissection. Additionally, the presence of metaplastic ossification and dense fibrosis, likely resulting from chronic inflammation and prior interventions, required laborious drilling and tissue removal, particularly in the right nasal cavity and around

the frontal recesses. The use of an endoscopic modified Draf III approach was justified given the bilateral frontal sinus extension and altered postsurgical anatomy. This technique is increasingly supported in the literature as the preferred method for extensive or recurrent frontal IP due to its ability to create a wide common drainage pathway and enhance surgical access^{14,15}. Sciarretta et al.¹⁶ and Lombardi et al.¹⁷ demonstrated favourable outcomes with the Draf III procedure, reporting reduced recurrence rates in complex cases.

A major limitation in this case was the absence of prior medical records, which hindered assessment of the initial tumor extent and previous surgical techniques. However, the observed imaging features—such as bony remodeling without frank destruction and the presence of calcified soft tissue components—are consistent with the classic “convoluted cerebriform pattern” seen on the craniofacial MRI, described as a hallmark of IP by Ojiri et al.¹⁰ and Yousem et al.¹¹.

Postoperative follow-up of inverted papilloma (IP) is essential due to the tumor’s high tendency for recurrence and potential for malignant transformation. While there is no universally accepted protocol, most authors recommend a minimum follow-up duration of 3 to 5 years. However, increasing evidence supports the need for extended, and in some cases lifelong, surveillance. This recommendation is based on findings that recurrences can occur late, sometimes even up to 15 years after the initial surgery^{18,19}. For instance, studies have reported significantly higher recurrence rates in patients followed for more than 3 or 5 years compared to those with shorter monitoring periods, with figures ranging from 26% to 44% in long-term follow-up cohorts²⁰⁻²².

Most guidelines propose follow-up visits every 3 to 4 months in the first year, every 4 to 6 months during the second year, and then annually or biannually thereafter²³. Clinical examination combined with flexible nasal endoscopy remains the cornerstone of postoperative monitoring. The craniofacial MRI is used selectively, particularly when recurrence is suspected or endoscopic visualisation is suboptimal. In high-risk patients, such as those with prior squamous cell carcinoma, some authors suggest an MRI every 4 months in the first year followed by every 6 months for the subsequent years^{22,24}.

Importantly, recurrence may be asymptomatic in the majority of cases—only about 30% of recurrences present with symptoms—thus highlighting the importance of systematic radiological and endoscopic follow-up^{13,19}. Recurrence is most frequently attributed to incomplete resection, especially when tumor remnants are left within bony recesses such as the lamina papyracea²⁵. This underscores the necessity for thorough removal, including reaming or resection of affected bone structures when appropriate^{16,17}.

Frontal sinus involvement is consistently recognized as a significant risk factor for recurrence, likely due to ana-

tomical complexity and limited surgical accessibility²⁶. In contrast, tumors originating in the nasal cavity are associated with lower recurrence rates²⁷.

The potential for malignant transformation further justifies prolonged follow-up. Metachronous carcinoma may arise years after initial treatment, with incidence rates reported between 2.3% and 11%²⁸. These malignancies are associated with poorer prognosis, with 3-year survival dropping to 63% in some series²⁶. As such, long-term vigilance through clinical and radiological monitoring is not only prudent but critical in optimizing outcomes in patients treated for inverted papilloma.

Despite the extensive tumor burden and surgical challenges, complete macroscopic resection was achieved in our case, including removal of the mucosal attachment site—a crucial step for minimizing recurrence risk. The use of endoscopic sinus surgery (ESS) allowed for enhanced visualization and access with lower morbidity compared to open approaches, aligning with current gold-standard practices. Early postoperative outcomes were favourable, with successful restoration of frontal sinus ventilation and no immediate evidence of residual disease. However, long-term surveillance remains essential due to the high risk of recurrence, particularly in patients with prior sinonasal malignancy and complex anatomical history.

CONCLUSIONS

This case underscores the diagnostic and surgical complexity of recurrent or long-standing inverted papilloma in patients with prior sinonasal malignancy. Advanced endoscopic techniques can enable complete tumor removal even in distorted anatomical fields, but long-term follow-up remains critical due to the risk of recurrence.

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