CASE STUDY

Unraveling Adenoid Cystic Carcinoma: Diagnostic and Therapeutic Strategies in Salivary Gland Tumours with Challenging Prognosis.

Gabriel Maluf[1]

Keywords: Adenoid Cystic Carcinoma, Submandibular Gland, Salivary Neoplasm, Perineural Invasion, Sialoadenectomy

ABSTRACT

Background: Case study of woman 55-year-old, single, retired female patient who presented with a painless, slowly growing swelling in the right submandibular region for approximately 8 months, accompanied by mild dysphagia for the last two months. The absence of systemic symptoms, such as pain, fever, or weight loss, initially made the presentation clinically nonspecific. Still, the persistent swelling and its characteristics on physical examination and imaging raised strong suspicion of salivary gland neoplasia.

Objectives: To analyze diagnostic strategies and therapeutic modalities for adenoid cystic carcinoma in salivary glands, investigating the reasons behind its challenging prognosis and identifying clinical approaches that may improve disease control and patient survival.

Methods: The diagnostic process consisted of clinical evaluation and sequential examinations, notably a cervical ultrasound that identified a vascularized nodule in the submandibular gland. The mass was confirmed by neck CT scan with no signs of invasion, while fine-needle aspiration biopsy suggested salivary gland neoplasia, although the initial result was inconclusive. The article followed the CARE protocol for Case Studies and reports.

Results: The diagnosis of adenoid cystic carcinoma of the submandibular gland was confirmed by histopathological examination as low/intermediate grade. Despite clear margins, the presence of perineural invasion—a critical prognostic factor—justified the indication for adjuvant radiotherapy (IMRT), whose acute side effects were monitored and controlled during treatment.

Conclusion: This case report highlights that successful treatment of adenoid cystic carcinoma of the submandibular gland depends on early diagnosis and a multimodal approach (surgery and radiotherapy). Due to the aggressiveness of the tumor and the risk of late metastases, the study emphasizes the vital need for rigorous and prolonged follow-up to ensure patient survival and quality of life.

Main Contribution to Evidence-Based Practice: This article contributes to evidence-based practice by integrating clinical experience with molecular advances (such as MYB-NFIB fusion) to guide the management of adenoid cystic carcinoma. It reinforces the need for multidisciplinary and personalized approaches, providing support for risk stratification and standardization of therapeutic protocols in rare salivary gland tumors.

International Healthcare Review (online)

eISSN: 2795-5567

How to Cite
Maluf, G. (2026). Unraveling Adenoid Cystic Carcinoma: Diagnostic and Therapeutic Strategies in Salivary Gland Tumors with Challenging Prognosis. International Healthcare Review (online). https://doi.org/10.56226/140

Published online: 26/February/2026

Corresponding Author:

Gabriel Maluf
Universidad Nacional Ecologica _ Bolivia
gabriel53977@uecologica.edu.boo

Authors' Affiliations:
[1] Universidad Nacional Ecologica -UNE - Bolivia

What do we already know about this topic?
Adenoid cystic carcinoma (ACC) is a rare and aggressive neoplasm that, despite its slow growth, has a high infiltrative capacity and a propensity for perineural invasion and late metastases. Treatment is based on surgery combined with adjuvant radiotherapy, but clinical management is challenging due to high rates of local recurrence. Therefore, the prognosis requires long-term multidisciplinary follow-up to monitor disease progression and optimize survival.

What is the main contribution to Evidence-Based Practice from this article?
The main contribution of this article to evidence-based practice is the integration of clinical experience with scientific literature to guide the management of adenoid cystic carcinoma (ACC). By analyzing adverse prognostic factors, histological subtypes, and genetic markers (such as the MYB-NFIB fusion), the study reinforces the need for a multidisciplinary and individualized approach. This work assists in refining therapeutic models and selecting risk-based adjuvant therapies, contributing to the future standardization of clinical protocols for rare conditions..

What are this research's implications towards health policy?
The article presents implications in three spheres: in theory, it deepens the understanding of the biological heterogeneity of cancer and the relevance of gene fusions (such as MYB-NFIB) for oncological models; in clinical practice, it reinforces the need for multidisciplinary approaches and risk-based strategies that consider long-term recurrences; and in health policy, it advocates for the standardization of protocols for rare tumors and the expansion of access to molecular tests and collaborative research to reduce care gaps..

Authors' Contributions Statement:
Maluf, G. is the main and sole author.

Introduction

Adenoid cystic carcinoma (ACC) is a malignant neoplasm that originates in the salivary glands, although it can also arise in other glands of the body, such as the mucous membranes of the trachea and bronchi. It is known for its relatively slow growth, but it has a high tendency to recur locally and develop distant metastases, even after long periods (Ellington et al., 2012).

Epidemiologically, ACC represents a significant portion of malignant salivary gland tumours, being the second most common type in minor salivary glands and the most frequent in the trachea. It generally affects middle-aged individuals, with a slight prevalence in females (Cantù, 2021).

Clinically, ACC can manifest in different ways, depending on its location. In larger salivary glands, such as the submandibular gland, the most common symptom is a painless, progressively growing swelling. However, an important and concerning feature of ACC is its strong propensity for perineural invasion, the ability of tumour cells to spread along nerves (Miyabe et al., 2019). This invasion can lead to symptoms such as persistent pain, numbness (paresthesia), or even paralysis of the involved nerves (Spiro & Huvos, 1992).

The definitive diagnosis of ACC is made through histopathological analysis of tumour tissue. Management often involves surgery to remove the tumour, and the presence of perineural invasion usually indicates the need for adjuvant radiation therapy (RT) to reduce the risk of local recurrence (Bakst, Glastonbury, Parvathaneni, Katabi, Hu, & Yom, 2019). Due to their capacity for late metastasis (the lung being the most common site), long-term follow-up is crucial for these patients, with continued surveillance for early detection of recurrences or metastases (Zhou et al., 2022). Figure 1 shows the location of the submandibular gland, and Figure 2 shows a histopathological image of submandibular ACC.

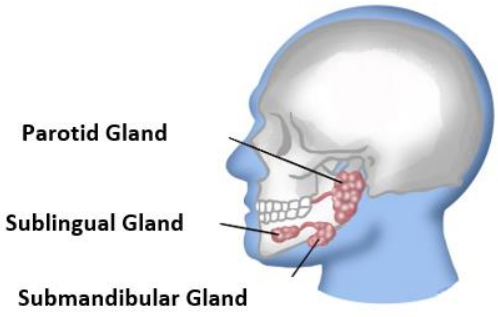

Figure 1. Location of the submandibular gland.

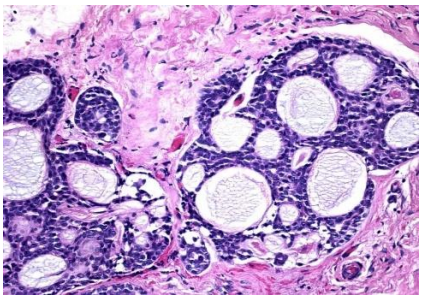

Figure 2. Histopathology of submandibular ACC.

Image 2 shows clusters of tumour epithelial cells with basophilic nuclei (blue-purple), forming rounded, infiltrative structures. Within these clusters, multiple cystic spaces of varying sizes are noted, filled with an eosinophilic material (light pink), which may be mucoid or hyaline. These cystic spaces give the tumour a "Swiss cheese" or "sieve" appearance, which is characteristic of the cribriform pattern of ACC. Surrounding these epithelial formations is a connective stroma (pink) that appears to be infiltrated by tumour cells. Blood vessels (red) can also be identified, and in some areas, the presence of inflammatory infiltration can be inferred. The proliferation of tumour cells around and within small cystic spaces is one of the histological hallmarks that aid in the diagnosis of ACC.

Methodology

A 55-year-old single, retired woman presented to the emergency room on September 27, 2020, at 7:47 PM, complaining of painless swelling in the right submandibular region for approximately 8 months. She reported that the swelling had been growing slowly and that, for the past 2 months, she had noticed mild difficulty swallowing more solid foods. She denied pain, fever, involuntary weight loss, or other systemic symptoms. She had a history of medication-controlled arterial hypertension (AT) and denied smoking or alcohol consumption.

Physical examination of the cervical region revealed an approximately 3x2 cm

swelling in the right submandibular region. It was firm, with well-defined borders, mobile, and painless to palpation. There were no inflammatory signs or palpable cervical adenopathy. Oroscopy revealed no significant changes in the oral mucosa or salivary duct openings. Laboratory tests were requested and performed on September 26, 2020. The results obtained were: Hemoglobin, 13.5 g/dL (normal), Total leukocytes: 7,200/mm³ (normal), Neutrophils: 60% (normal), Lymphocytes: 30% (normal), Platelets: 250,000/mm³ (normal), Fasting blood glucose: 95 mg/dL (normal), BUN: 30 mg/dL (normal), Creatinine: 0.8 mg/dL (normal), Sodium: 140 mEq/L (normal), Potassium: 4.2 mEq/L (normal), C-reactive protein (PCR) 3.5 mg/L (slightly elevated, but nonspecific, may indicate subclinical inflammation or be normal for age). Additional tests were requested and performed on September 29, 2020, and an ultrasound of the salivary glands revealed a hypoechoic, solid, and well-defined nodular mass in the right submandibular gland, measuring 2.8 x 2.1 cm, with internal vascularisation on Doppler. There was no evidence of stones or ductal dilation. Other ultrasound findings included the left submandibular gland with normal morphology, echotexture, and dimensions, and no focal lesions were observed. The parotid and sublingual glands showed no significant ultrasound alterations, and no lymph nodes with pathological characteristics were identified in the cervical lymph node chains examined. Contrast-enhanced computed tomography (CT) of the neck confirmed the presence of a well-defined mass in the right submandibular gland, with heterogeneous contrast enhancement. There were no signs of invasion of adjacent structures or lymph node enlargement. During US-guided fine-needle aspiration (FNA), the aspirated material was sent for cytopathological analysis. The FNA result was suggestive of salivary gland neoplasia, with features of a cystic lesion and epithelial cells. However, FNA alone is often not definitive in differentiating benign from malignant lesions in some types of salivary gland tumours.

Given the clinical presentation and imaging findings, the main diagnostic hypotheses for benign tumours included pleomorphic adenoma (mixed tumour), which is the most common benign tumour of the major salivary glands and may have cystic components and present slow growth, or cystadenoma, which is a predominantly cystic benign tumour.

As for malignant tumors, the patient could have mucoepidermoid carcinoma, which is the most common malignant tumor of the salivary glands, which may present cystic components and have varying degrees of aggressiveness; ACC,

which is a malignant tumor with a predilection for minor salivary glands but can occur in larger glands and is characterized by an infiltrative histological pattern and a tendency toward perineural spread; or a mucocele retention cyst, which, although less likely given its progressive growth and characteristics on imaging, should be considered. The patient underwent further imaging on October 10, 2020, where a mass in the right submandibular region was evaluated. The findings in this examination were: the right submandibular gland showed a solid, well-defined mass located in the parenchyma of the right submandibular gland, measuring approximately 3.0 x 2.0 x 2.5 cm (AP x LL x T). The lesion demonstrated heterogeneous enhancement after intravenous contrast. There were no evident signs of invasion of adjacent structures (muscles, floor of the mouth). The cleavage plane with the adjacent vascular and nervous structures was preserved. The left submandibular gland had a normal appearance and enhancement. The cervical lymph nodes, where no lymph node enlargement was observed in the cervical chains, with features of malignancy (size, shape, enhancement). The other structures evaluated in the neck (thyroid, pharynx, larynx, and cervical vessels) presented normal appearances for the patient's age. The conclusion was that the mass was well-defined in the right submandibular gland, with heterogeneous enhancement, consistent with salivary gland neoplasia. There was no evidence of pathological cervical lymph node enlargement or signs of locoregional invasion.

Laboratory tests performed on October 15, 2020, showed no changes compared to previous tests. However, the following were ordered: AST/SGOT: 25 U/L (normal), ALT/SGPT: 28 U/L (normal), and serum calcium: 9.0 mg/dL (normal).

The patient's case was discussed at a tumour board meeting (a weekly meeting held between physicians to discuss cases where there is some inconclusive suspicion of diagnosis and treatment). The patient's clinical presentation, with a painless, slow-growing lump, is consistent with several salivary gland neoplasms. The FNA, although suggestive of a neoplasm with cystic components, is inconclusive for a definitive diagnosis, especially for differentiating between benign and malignant tumours and for specific subtypes.

Given the patient's history, physical examination, and imaging findings, the suspicion of salivary gland neoplasm was high, and excisional biopsy (surgical removal of the affected gland) is the gold standard for definitive diagnosis and treatment of salivary gland tumours. Following the meeting, a treatment plan was developed, which included a right submandibular sialadenectomy, the

surgical removal of the right submandibular gland. During surgery, it is essential to pay attention to the preservation of the facial nerve, lingual nerve, and hypoglossal nerve, which are important anatomical structures near the submandibular gland.
The intraoperatively removed material underwent frozen section biopsy to obtain a preliminary indication of the nature of the lesion (benign or malignant) and to guide the extent of the resection. However, a definitive diagnosis would depend on the final histopathological analysis.
The material was sent to the pathological anatomical department, which performed the definitive histopathological examination and determined the specific tumour type, its degree of malignancy, surgical margins, and whether or not there was perineural or lymphatic invasion. The expectation of a diagnosis of ACC (cylindroma) would require detailed discussion of the follow-up plan and prognosis with the patient and the medical team, as this type of carcinoma is known for its tendency to perineural invasion and local recurrence, even after complete resection, and for the possibility of distant metastases (the lung is the most common site), even after long periods. The definitive histopathological examination of the surgical specimen confirmed the diagnosis of low/intermediate grade submandibular gland ACC, with free surgical margins, but with the presence of focal perineural invasion.

Results

ACC is a malignant neoplasm of the salivary glands, characterised by slow growth but with a high tendency for local recurrence and distant metastasis. Although it can occur in larger salivary glands, such as the submandibular gland, it is more common in smaller salivary glands. ACC represents approximately 1% of head and neck tumours and 5% to 10% of all salivary gland neoplasms. It is the second most common malignant tumour of the minor salivary glands and the most common in the trachea and bronchial submucosal glands (Spitz, Tilley, Batsakis, Gibeau, & Newell, 1984; Phillips et al., 2024). It usually affects middle-aged individuals, with a slight female predilection in some series. Symptoms may vary depending on the tumour location (Ishikawa et al., 2019). In this patient's case, the main symptom was a painless swelling in the right submandibular region, which grew slowly. As the tumour progressed, there was mild difficulty swallowing solid foods. Other common symptoms, especially in tumors that develop in other locations, may include persistent pain, especially if there is neural invasion, paresthesia or numbness in the affected area, facial paralysis (if the tumor involves the facial

nerve), nasal obstruction or epistaxis (if located in the nasal cavities/paranasal sinuses), and dysphonia or dyspnea (if in the larynx or trachea) (Liu et al., 2024).
Due to perineural invasion, the patient was referred for radiation oncology evaluation to consider adjuvant RT to reduce the risk of local recurrence. Perineural invasion is a high-risk factor for local recurrence in ACC and is a crucial histopathological feature in malignant tumours. It refers to the ability of tumour cells to spread and grow along or in the centre of nerves. The presence of perineural invasion, as identified in this patient, indicates a poorer prognosis and may be associated with an increased risk of local recurrence, even after complete surgical removal of the tumour, and a higher likelihood of distant metastases (Phillips et al., 2024).
Intensity-modulated radiation therapy (IMRT) was performed, which allows radiation to be directed with high precision to the target area, minimising the dose to adjacent healthy tissues, such as the spinal cord, contralateral parotid gland, and other structures of the oropharynx and larynx, reducing side effects. The irradiation field included the surgical bed of the right submandibular gland (where the tumour was removed) and a surrounding safety margin, as well as the perineural dissemination pathways considered at risk (Phillips et al., 2024). There was no elective irradiation of lymph node chains, as preoperative imaging studies showed no pathological lymph node enlargement. The patient received a total dose of 60 Gray (Gy) and was administered in 30 fractions, with 2 Gy per fraction, once daily, Monday through Friday. Treatment lasted 6 weeks, and RT planning involved a simulation CT scan, in which the patient was reproducibly positioned using a thermoplastic mask. Precise contours of the target volume (tumour bed) and organs at risk were created. Dose distribution was optimised to ensure homogeneous target coverage and maximum protection of normal tissues.
During RT, the patient was monitored weekly to assess acute side effects, such as mucositis, which was managed with analgesics and specific mouthwashes; xerostomia (with reduced saliva production due to irradiation of the minor salivary glands and the contralateral submandibular gland, if partially included in the field). The patient was advised to use salivary substitutes and maintain good oral hygiene; radiodermatitis (a skin reaction in the irradiated area), ranging from redness to scaling, which was treated with moisturising creams and ointments; and fatigue. The patient was advised about the possibility of late side effects, such as chronic xerostomia, tissue fibrosis in the irradiated region (which can affect neck mobility), and, in rare cases,

osteoradionecrosis of the jaw. On January 20, 2021, during postoperative follow-up, new tests were requested to monitor post-surgical recovery and general health, without requesting a routinely measured tumour marker for ACC. The results were: Haemoglobin: 12.8 g/dL (Normal, post-surgical recovery), Total leukocytes: 6,800/mm³ (Normal, no infection), CRP 2.0 mg/L (normal, indicating resolution of any post-surgical inflammation), blood pressure maintained under control with usual medication. Although not a laboratory test, it is an important clinical finding for follow-up. It is important to note that, for ACC, there are no specific blood tumour markers widely used in clinical practice for diagnosis or monitoring of recurrence. Follow-up is primarily done through clinical and imaging exams.

A CT scan of the neck and chest with contrast was performed (for post-surgical follow-up). The examination was performed on January 25, 2021. The findings were: in the right submandibular region, the absence of the right submandibular gland, due to the surgical procedure. A small area of fibrosis/post-surgical scarring was noted in the surgical bed, with no evidence of residual mass or apparent local recurrence. The adjacent muscle planes were preserved. The left submandibular gland showed no significant changes, with no evidence of lymph node enlargement, with pathological characteristics in the evaluated cervical chains. The lung fields were clear, with no nodules or masses suggestive of metastatic implants, and no evidence of mediastinal or hilar lymph node enlargement. The heart and great vessels presented with preserved dimensions and morphology, without effusions or thickening in the pleura and pericardium, and the chest walls and bone skeleton showed no significant changes. She underwent rigorous follow-up with periodic clinical examinations and imaging (CT scans of the neck and chest) every 6–12 months for the first few years, and annually thereafter, to monitor for local recurrence or distant metastases. The patient was counselled on the signs and symptoms of recurrence and the importance of adherence to follow-up. When perineural invasion is present, life expectancy varies considerably and is influenced by multiple factors, including tumour staging, histological grade, surgical margins, and the presence of metastases. Five-year survival rates can be relatively high (approximately 70–80%), but 10- and 15-year survival rates decrease significantly due to the slow-growing nature of the tumour and the propensity for late metastases. Perineural invasion is an independent risk factor for recurrence and decreased overall and disease-free survival. Patients with perineural invasion generally have a poorer long-term prognosis compared to

those without this characteristic. Close, long-term follow-up is crucial for these patients due to the possibility of late recurrences or distant metastases.

Conclusion

The case of this 55-year-old patient highlights the complexity of diagnosing and managing submandibular gland ACC. The initial presentation of a painless, slowly growing, albeit nonspecific, swelling raised the suspicion of salivary neoplasia. The combination of imaging studies (US and CT) and FNA, although inconclusive, indicated the need for excisional biopsy, which is the gold standard for definitive diagnosis. Histopathological confirmation of ACC, with the crucial presence of focal perineural invasion, established the aggressive nature of the disease and the need for multimodal treatment. A right submandibular sialadenectomy with free margins was the cornerstone of surgical treatment. The decision to proceed with adjuvant radiotherapy to the surgical site (60 Gy in 30 fractions, via IMRT) was crucial, aiming to reduce the high risk of local recurrence associated with perineural invasion. Managing the acute side effects of radiotherapy, such as mucositis and xerostomia, was essential to the patient's quality of life during treatment.

Long-term follow-up is mandatory for this patient. Due to the slow-growing nature of ACC and its propensity for late recurrence and distant metastases, a strict protocol must be maintained, which includes periodic clinical visits initially every 3–6 months and then annually. Serial imaging studies are required to monitor for any signs of local recurrence or development of distant metastases, especially in the first 5 years and annually thereafter. Management of late effects of RT should also be considered, with continued monitoring and treatment of chronic xerostomia and other potential tissue sequelae.

While 5-year survival rates for ACC can be high, 10- and 15-year survival rates tend to decrease, reinforcing the need for continued surveillance. This case highlights the importance of a multidisciplinary approach in planning and implementing treatment and monitoring patients with complex neoplasms, ensuring the best chances of a good long-term outcome.

Abbreviations

ACC - Adenoid Cystic Carcinoma, **Gy -** Grays, **AH -** Arterial Hypertension, **IMRT -** Intensity Modulated Radiation Therapy, **FNA -** Fine Needle Aspiration Biopsy, **RT -** Radiotherapy, **CT -** Computed Tomography, **US -** Ultrasound.

RECEIVED: 4 /September /2025 ● ACCEPTED: 20/October/2025 ● TYPE: Case Study ● FUNDING: There was no funding for the execution of this study project. ● DECLARATION OF CONFLICTING INTERESTS: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. ● Availability of data and materials data is available from the corresponding author on reasonable request ● Ethics approval and consent to participate: The case study was approved by the Ethics Committee of the authors' organization with a GEP Approval number: 7.185.885. Approval is availabe in the Journal's platform

References

Bakst, R. L., Glastonbury, C. M., Parvathaneni, U., Katabi, N., Hu, K. S., & Yom, S. S. (2019). Perineural Invasion and Perineural Tumor Spread in Head and Neck Cancer. *International journal of radiation oncology, biology, physics*, *103*(5), 1109–1124. https://doi.org/10.1016/j.ijrobp.2018.12.009

Cantù G. (2021). Adenoid cystic carcinoma. An indolent but aggressive tumour. Part A: from aetiopathogenesis to diagnosis. Acta otorhinolaryngologica Italica : organo ufficiale della Societa italiana di otorinolaringologia e chirurgia cervico-facciale, 41(3), 206–214. https://doi.org/10.14639/0392-100X-N1379

Ellington, C. L., Goodman, M., Kono, S. A., Grist, W., Wadsworth, T., Chen, A. Y., Owonikoko, T., Ramalingam, S., Shin, D. M., Khuri, F. R., Beitler, J. J., & Saba, N. F. (2012). Adenoid cystic carcinoma of the head and neck: Incidence and survival trends based on 1973-2007 Surveillance, Epidemiology, and End Results data. *Cancer*, *118*(18), 4444–4451. https://doi.org/10.1002/cncr.27408

Ishikawa, T., Tateda, M., Oshima, H., Sawada, A., Oka, N., Suzuki, H., & Hashimoto, S. (2019). Metastasis of adenoid cystic carcinoma from a submandibular gland to the larynx. *Auris, nasus, larynx*, *46*(6), 907–911. https://doi.org/10.1016/j.anl.2018.11.001

Liu, S., Yang, J., Lu, H., Wu, Y., Yang, W., Xu, W., & Zhang, C. (2024). Adenoid cystic carcinoma of submandibular gland: Emphasis on locoregional metastasis and prognosis. *Oral diseases*, *30*(3), 1152–1162. https://doi.org/10.1111/odi.14478

Miyabe, S., Ishibashi, K., Saida, K., Fujiyoshi, Y., Fukano, H., Ueda, K., Ueda, S., Watanabe, S., & Nagao, T. (2019). Adenoid Cystic Carcinoma With Sialolithiasis of the Left Submandibular Gland: A Case Report and Literature Review. *International journal of surgical pathology*, *27*(3), 305–310. https://doi.org/10.1177/1066896918814304

Phillips, A. L., Li, C., Liang, J., Sheyn, A., Rastatter, J. C., Chelius, D. C., Jr, Orbach, D., & Richard, C. (2024). Adenoid cystic carcinoma of the parotid and submandibular glands in children and young adults: A population-based study. *Pediatric blood & cancer*, *71*(5), e30928. https://doi.org/10.1002/pbc.30928

Spiro, R. H., & Huvos, A. G. (1992). Stage means more than grade in adenoid cystic carcinoma. *American journal of surgery*, *164*(6), 623–628. https://doi.org/10.1016/s0002-9610(05)80721-4

Spitz, M. R., Tilley, B. C., Batsakis, J. G., Gibeau, J. M., & Newell, G. R. (1984). Risk factors for major salivary gland carcinoma. A case-comparison study. *Cancer*, *54*(9), 1854–1859. https://doi.org/10.1002/1097-0142(19841101)54:9<1854::aid-cncr2820540915>3.0.co;2-1

Uyeda, M., Gonçalves, Y. Z. M., & Maluf, G. (2026). Factors in Genetic Alterations in DNA Repair Pathways and Their Effects on Endometrial Cancer. *International Healthcare Review (online)*. https://doi.org/10.56226/144

Uyeda, M., Gabriel, M., & Maria Graziela de fátima Alvarez, K. (2026). Impact of Adjuvant Radiotherapy on Survival of Patients with Stage I-II Endometrial Cancer: A Systematic Review. *International Healthcare Review (online)*. https://doi.org/10.56226/150

Zijiu, C., Li, W., & Qin, J. (2025). Philosophical Reflections on Chinese Naturopathy against Malignant Tumours. *International Healthcare Review (online)*. https://doi.org/10.56226/99

Zhou, M., Ma, T., Wang, X., Zhang, S., Yang, G., Song, R., & Chen, X. (2022). High-risk subtype: Clinical manifestations and molecular characteristics of submandibular gland adenoid cystic carcinoma. *Frontiers in oncology*, *12*, 1021169. https://doi.org/10.3389/fonc.2022.1021169