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Case Report

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Intracranial Metastasis of Oral Squamous Cell Carcinoma: A Case Report

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ABSTRACT

Brain metastasis from oral squamous cell carcinoma is exceptionally rare with only a few instances mentioned in the literature. Malignancies of the head and neck have a link to tobacco and alcohol usage. Head and neck cancer Oral squamous cell carcinoma (OSCC) is a malignancy of the head and neck region most strongly linked to tobacco and alcohol use, which account for up to 80% of cases. Standard treatments such as surgery, chemotherapy, and radiotherapy are often accompanied by adverse effects including oral mucositis, dysgeusia, xerostomia, and pain, which can precipitate dehydration, electrolyte imbalance, and malnutrition. While distant metastases from OSCC are uncommon, they most frequently involve the lungs, liver, and bones; brain metastases are extremely rare. Human papillomavirus (HPV)-associated OSCC represents a biologically distinct subtype with differing carcinogenesis, risk factors, and prognosis compared to HPV-negative disease. This report describes an exceptionally rare case of HPV-associated OSCC with brain metastasis, highlighting the complex multidisciplinary management required.

Keywords: Oral Squamous Cell Carcinoma, HPV, Oropharyngeal Cancer.

INTRODUCTION

Oral squamous cell carcinoma (OSCC) is a malignancy of the head and neck (HN) region affecting risk factors including tobacco use which is associated with approximately 70 to 80% of cases and consumption of alcohol [1]. Standard therapies to treat OSCC involve chemotherapy, radiation, and surgery, however, these can lead to a multitude of serious adverse effects including oral mucositis infections, changes to taste, dysfunction of the salivary gland, and pain. Complications like this may lead to other issues like dehydration, electrolyte imbalances, and malnutrition which all must be mitigated with proactive supportive care. Managing a patient with head and neck squamous cell carcinoma (HNSCC) requires multidisciplinary collaboration from a team of medical oncologists, radiation oncologists, otolaryngologists, surgeons, and potentially critical care teams [2]. Attention to risk factors can be helpful for disease prevention while collaborative care teams can help address complications in those who are battling OSCC.

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Distant metastasis of OSCC is uncommon and in the event that it does occur it favors the lungs, liver, or bones [2]. Brain metastasis due to OSCC is extremely rare, with a handful of case reports documented in the literature [2]. Occurrences like this signify how aggressive a disease course of OSCC metastasizing to the brain unfolds. The case presented here is remarkably unique in its coverage of a patient battling HPV-associated OSCC that metastasized to the brain. This report details the clinical course in the hospital and intensive care unit and considers the significant role of HPV in OSCC and related risk factors, prognostic factors, and management considerations. This highly unusual case presented unique challenges that physician and associated healthcare teams can learn from.

CASE PRESENTATION

The patient is a 62-year-old male with a significant medical history of malignant neoplasm of the oropharynx, currently undergoing chemotherapy and radiation therapy. The patient presented to the emergency department with severe weakness and altered mental status that persisted despite sedation being withdrawn.

The patient's family reported that he had self-administered intravenous fluids at home, raising concerns about potential complications. Upon evaluation, the patient was found to be severely dehydrated and exhibited significant electrolyte derangements, necessitating transfer to the intensive care unit (ICU) for close monitoring and management.

During his hospitalization, the patient developed left arm swelling, suggestive of venous thrombosis, and subsequent complications included methicillin-resistant Staphylococcus aureus (MRSA) bacteremia.

Upon physical examination, vital signs indicated he was intubated and unresponsive, with temperature recorded at 98.7°F, heart rate of 112 bpm, blood pressure of 90/60 mmHg, and oxygen saturation at 94% on mechanical ventilation.

Laboratory results revealed critical findings, including low hemoglobin (8.9 g/dL) and hematocrit (27%), elevated white blood cell count (21,000/mm^3) indicative of infection, and high creatinine levels (2.5 mg/dL), suggesting acute kidney dysfunction, likely attributable to dehydration and possible acute tubular injury.

During the patient's ICU stay, a regimen of medications was initiated, including intravenous fluids, electrolytes to correct imbalances, broad-spectrum antibiotics to address the MRSA bacteremia, sedatives for sedation purposes, pain medications for comfort, anti-nausea medications, and dietary supplements to support overall nutrition.

Given the complexity of the patient's condition, multiple consultations were sought, including nephrology for the management of acute kidney injury and infectious disease to guide the treatment of his bacteremia.

The patient is also known to have documented allergies to Bactrim, Biaxin, and Flagyl, necessitating careful selection of antimicrobials to avoid adverse reactions.

DISCUSSION

HPV+ head and neck cancers are due to human papillomavirus infection whereas HPV- head and neck cancers are commonly due to chemical carcinogens. This means that these differing types of cancers have vastly different mechanisms of carcinogenesis, risk factors, and response to treatment. For example, the main risk factor for HPV- HNSCC is tobacco and alcohol use. Tobacco smoke contains carinogenic nitrosamines and polycyclic aromatic hydrocarbons that generate reactive oxygen species and form DNA adducts, leading to mutations in key tumor supressor genes such as TP53. Alcohol consumption overtime will increase mucosal permeability and generate acetaldehyde, a toxic metabolite that favors DNA damage. Overtime, these changes will drive malignant transformation. Conversely, HPV+ HNSCC is most commonly due to the viral proteins, E6 and E7 which inhibit cell-cycle checkpoints allowing cancer cell proliferation [3]. Despite the differing mechanisms of carcinogenesis for head and neck squamous cell carcinoma, HPV+ and HPV- have both been treated with the same approach. HPV+ HNSCC has historically had a better prognosis than HPV- HNSCC prompting recent change in the staging guidelines for HPV+ HNSCC to account for the better response to the current treatment [3].

Demographics:

Oral squamous cell carcinoma is most commonly diagnosed in Southeast Asia. According to a cross-sectional study from 2024, the most common age of diagnosis of OSCC is 54.16 ± 1.1 [4]. However, there is an increasing population of younger patients developing OSCC, likely due to alcohol and tobacco consumption. Additionally, there was a gender bias toward males; 69.4% of cases of OSCC found in this study were in male patients [4]. The average survival time of these patients was less than three years.

Risk Factors:

- **Tobacco:** Smoking, chewing, and vaping of tobacco products is a top risk factor for OSCC [5,6]. Carcinogenic mutations can create a breeding ground for cell proliferation and abnormal replication in the oral epithelium. Epidemiological studies estimate that 70-80% of OSCCs can be attributed to tobacco or alcohol exposure [6].

- **Alcohol:** Alcohol, a known carcinogen that is consumed by many on a daily basis, has a strong correlation with oral squamous cell carcinoma. After alcohol becomes converted to its metabolite acetaldehyde, it is able to bind onto DNA products and induce point mutations, double strand breaks, and other changes in the genome. These changes confer a survival advantage for cells and allow for unregulated growth, creating a precancerous lesion. These lesions usually arise on the tongue (which is the most common site), palate, gingiva, and buccal mucosa [7].
- **Betel nut:** Betel nut, better known as areca nut, confers a high risk for oral squamous cell carcinoma. It is identified as a group 1 carcinogen and primarily used in countries like India and Taiwan. There are four alkaloids present in areca nut that confer carcinogenic properties, those being arecoline, arecaidine, guvacine, and guvacoline. These alkaloids cause DNA damage, p53 tumor suppressor down regulation, and chromosomal aberrations [8].
- **Poor Oral Hygiene:** While poor oral hygiene may entail chewing betel nut, alcohol drinking, and tobacco smoking, simple evasion of brushing your teeth and lack of dentist visits confer an increased risk of squamous cell carcinoma. Development of periodontitis specifically creates a chronic inflammatory disease of the teeth. This chronic inflammation creates compensatory hyperplasia of squamous cells lining the mucosa, increasing the chance for driver mutation development, which can lead to cancer formation [9].
- **Immunosuppression:** The implication of immunosuppression leading to oral squamous cell carcinoma is a universal aspect, applying to all cancers of the body. Immune cells of the body, including macrophages, lymphocytes, and natural killer cells, are able to destroy cells that develop mutations driving carcinogenesis. Immunosuppression with AIDS/HIV and chronic glucocorticoid therapy causes a downregulation of the human immune system, allowing for tumor cells to grow unchecked [10].

This patient's significant smoking history likely contributed to his development of OSCC as a compilation of his HPV infection. Our patient had no history of exposure to betel nuts and had a history of only moderate alcohol consumption.

This case highlights the intricate challenges in managing severe electrolyte imbalances and altered mental states in a patient with advanced malignancy undergoing chemotherapy. The patient demonstrated significant deterioration due to dehydration and electrolyte derangements, necessitating ICU transfer, aggressive resuscitation, and interdisciplinary consultation.

Altered mental status in patients with malignancies can result from multifactorial etiologies including metabolic disturbances, effects of chemotherapy, and infections. The patient's self-administration of IV fluids further complicated his management, emphasizing the need for comprehensive counseling regarding hydration status and the risks associated with unsupervised interventions in oncology patients.

Under the guidance of various specialists, the approach taken for the patient involved meticulous monitoring of electrolytes, implementing targeted interventions, and adjusting medications based on evolving clinical dynamics. Ultimately, such cases highlight the necessity for collaborative healthcare approaches to manage the complex needs of patients with cancer effectively.

CONCLUSION

HPV-associated oral squamous cell carcinoma upon metastasis to the brain leads to a multitude of challenges in management. High-risk HPV types are established as players in development of oropharyngeal cancers. The aggressive nature of this patient's neoplasm led to severe electrolyte imbalances and altered mental status. Management in this case involved chemotherapy which was associated with several complications like mucositis, nephrotoxicity, and anemia. The wide breadth of issues he faced through his illness could not have been predicted and emphasizes the need for adequate multidisciplinary support in oncological patients. Future research should aim to develop better understanding into specific treatments of oropharyngeal head and neck cancers as well as more standardized protocols for the management of similar cases with intracranial metastasis to enhance patient outcomes.

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CONFLICT OF INTEREST

The authors have no conflicts of interests with the article.

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