Review Article

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Nut Carcinoma in Brain: A Rare Presentation of a Malignant Tumor

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Abstract

NUT carcinoma (nuclear protein in testis) is a rare and aggressive malignancy, primarily arising from midline structures, such as the thorax and head and neck. Brain involvement in NUT carcinoma is exceedingly rare, particularly as the initial presentation. This report presents the case of a 40-year-old male who presented with symptoms of trigeminal neuralgia and was later diagnosed with NUT carcinoma involving the brain. This case highlights the diagnostic challenges posed by this malignancy and stresses the importance of considering malignancy in patients with unexplained neurological symptoms.

Keywords: NUT carcinoma; brain involvement; Trigeminal neuralgia; Craniotomy; Midline carcinoma; Rare malignancy.

INTRODUCTION

NUT carcinoma is an aggressive tumor characterized by chromosomal translocations, usually involving the NUT gene on chromosome 15q14 with BRD4 or BRD3 partners. It typically arises in midline structures, including the head, neck, and thorax, and has a dismal prognosis with a median survival of less than a year.[1,2] Brain involvement is typically a late-stage metastatic event rather than a primary presentation.[3,4] This case is a rare example of NUT carcinoma presenting with neurological symptoms, mimicking trigeminal neuralgia, leading to the diagnosis of a brain tumor.

CASE PRESENTATION

In January 2024, a 40-year-old male presented with right-sided facial pain localized to the V1 and V2 dermatomes, suggestive of trigeminal neuralgia. Despite treatment with carbamazepine, his symptoms worsened, extending to the V3 dermatome, and diplopia developed. MRI revealed an abnormal lesion in the right cavernous sinus, pointing towards a neoplastic process rather than typical neurovascular conflict. A right pterional craniotomy was performed, and histopathology confirmed the diagnosis of NUT carcinoma.

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Imaging Findings



Fig. 1: MRI (February 2024): A vascular loop compressing the cisternal part of the right seventh cranial nerve, suggestive of neurovascular conflict

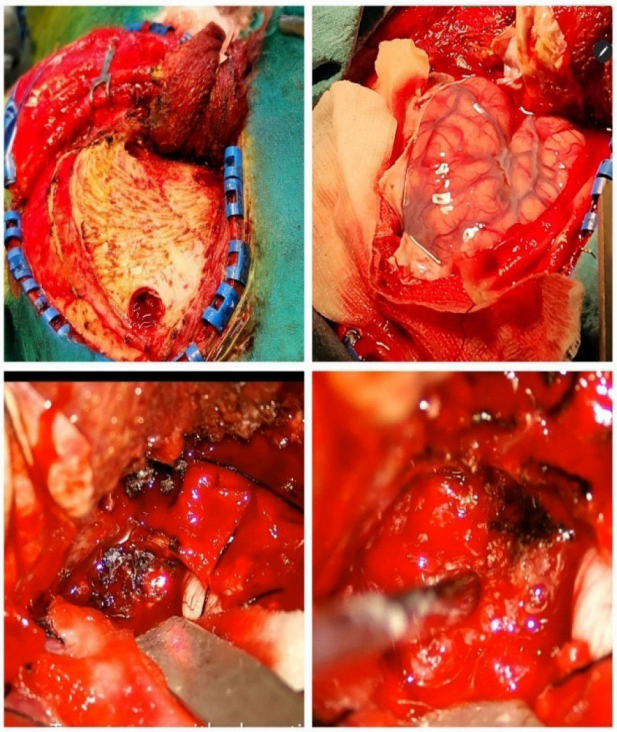
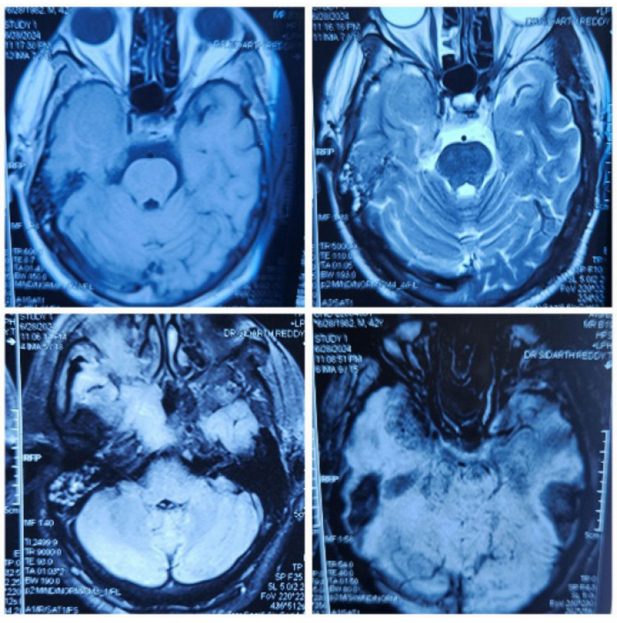


Fig. 4: Operative images

Histopathology confirmed NUT carcinoma, with positive staining for NUT and BRD4 markers.



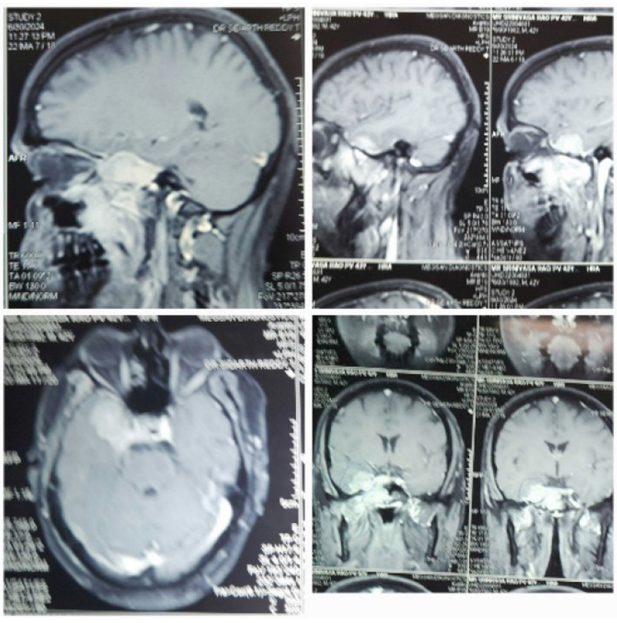


Fig. 2 and 3: MRI (July 2024): An intensely enhancing extra-axial mass lesion involving the right cavernous sinus, extending to the orbital apex, paranasal sinuses, and parapharyngeal space

Pathological Findings

Histopathological evaluation of tissue samples revealed small, round to oval tumor cells with a high nucleus-to-cytoplasm ratio. The tumor was arranged in nests and sheets, with hyperchromatic nuclei and scant cytoplasm. Immunohistochemistry showed positive results for pancytokeratin and cytokeratin[5,6], with strong nuclear positivity for p16, while markers like synaptophysin, CD56, and CD99 were negative.

DISCUSSION

NUT carcinoma is a rare and highly aggressive malignancy with a poor prognosis.[5] It typically presents in the thorax or head and neck regions, while brain involvement, particularly as a primary presentation, is exceedingly rare. This case is notable for the initial presentation mimicking trigeminal neuralgia, an uncommon occurrence in the literature.

Gupta (2020) reported a case of NUT midline lung carcinoma metastasizing to the brain three months after diagnosis, though without initial neurological symptoms.[7] In contrast, this case presented primarily with neurological symptoms, emphasizing the variability of clinical manifestations in NUT carcinoma.

Kakkar *et al.*[8] reviewed five cases of NUT carcinoma, one of which showed nasal cavity extension into the anterior cranial fossa, although no brain involvement was noted initially. Bauer *et al.*[9] also described the aggressive behavior of NUT carcinoma, noting rapid progression and metastasis to multiple organs. French *et al.*[10] further highlighted that brain metastasis is typically a late event in NUT carcinoma, unlike the primary brain involvement seen here.

Lee et al.[11] conducted an extensive analysis of 362 cases of NUT carcinoma in the head and neck and did not report any cases with primary brain involvement, underscoring the rarity of our case. Doyle and Fletcher[12] emphasized the importance of early diagnosis and intervention due to the poor prognosis associated with NUT carcinoma. Early diagnosis is crucial in cases with atypical presentations, as prompt treatment is necessary to improve patient outcomes.

Additional studies by Stanton *et al.*[13] and Stanton & French[14] have focused on potential therapeutic approaches, though most cases are refractory to standard treatments. Early detection and customized treatment strategies are vital in cases with unusual clinical presentations, such as primary brain involvement.

CONCLUSION

This case illustrates a rare presentation of NUT carcinoma with primary brain involvement, initially manifesting as trigeminal neuralgia. Clinicians should maintain a high index of suspicion for malignancy in patients with unexplained or progressive neurological symptoms. Early imaging and biopsy are essential for prompt diagnosis and management. Although NUT carcinoma remains a highly aggressive tumor with poor outcomes, early detection and aggressive treatment may offer the best chance for survival. Continued research into effective treatment strategies for rare NUT carcinoma presentations is needed.

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