Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Ophthalmology

Multimodal Imaging in Choroidal Metastases of Pancreatic Adenocarcinoma: A Case Report

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DOI: https://doi.org/10.36347/sjmcr.2025.v13i02.023 | **Received:** 07.01.2025 | **Accepted:** 12.02.2025 | **Published:** 27.02.2025

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Abstract **Case Report**

***Introduction*:** Choroidal metastases are malignant intraocular tumours that typically occur in the advanced stages of cancer. In rare instances, they may serve as the first indicators of cancer or a recurrence of the disease. Pancreatic adenocarcinoma is an exceptionally uncommon cause of choroidal metastases. Diagnosing choroidal metastases can be challenging and relies on findings from various modalities, including clinical assessments, ultrasonography, tomography, angiography, and ocular magnetic resonance imaging. ***Objective*:** The objective of this study is to diagnose choroidal metastasis and exclude differential diagnoses through a range of complementary examinations. ***Observation*:** We report the case of a 46-year-old man who had experienced weight loss for three months and jaundice for one month. He subsequently presented with an acute loss of vision in his right eye, which persisted for one week. Ophthalmological examination revealed bilateral choroidal masses accompanied by an exudative retinal detachment in the right eye. An endoscopic biopsy confirmed the diagnosis of pancreatic adenocarcinoma. Further systemic evaluations revealed multiple metastatic nodules in the brain, lungs, and liver. Consequently, systemic palliative chemotherapy was initiated, while specific ophthalmological treatment was deemed inappropriate given the patient's condition. ***Conclusion*:** Choroidal metastasis from pancreatic adenocarcinoma is extremely rare, with very few cases reported in the literature to date.

Keywords: Choroidal metastasis, pancreatic adenocarcinoma, multimodal imaging.

INTRODUCTION

Choroidal metastases are the most common type of ocular malignancy, occurring in approximately 12% of patients who die from cancer [1]. These metastases predominantly originate from adenocarcinomas, most commonly from the breast in women and the lung in men. However, other less frequent sources include primary tumors of the gastrointestinal tract, which account for roughly 4% of cases [2]. The most frequent primary sites are the colon, small intestine, and stomach, while the pancreas is a rare source of these metastases.

Choroidal metastasis from pancreatic adenocarcinoma is an exceptionally rare occurrence, with only a few cases reported in the literature. Metastases from pancreatic carcinoma most commonly occurs in the liver, as well as the peritoneum, lungs, and bones [3]. Less frequently, they may spread to other locations, such as the skin [4], and the central nervous system (CNS) [5]. Therefore, it is essential to conduct a thorough evaluation in every case of pancreatic carcinoma, including systemic imaging, as well as a detailed medical history and physical examination.

The prognosis for patients with choroidal metastases is generally poor, with a median survival ranging from two to eleven months, depending on the stage of the tumor at the time of detection [6].

In this report, we present a case of choroidal metastasis revealing pancreatic adenocarcinoma, accompanied by multimodal imaging.

CASE PRESENTATION

A 46-year-old man with no significant medical history presented to our ophthalmological emergency department with a one-week history of sudden unilateral visual acuity loss, accompanied by significant weight

loss of 20 kilograms, conjunctival and cutaneous jaundice, and right hemiparesis.

On ophthalmologic examination, his best corrected visual acuity was 2/10 in the right eye and 10/10 in the left eye. Intraocular pressure and anterior segment examinations were normal in both eyes.

Fundus examination of the right eye revealed several multifocal masses. The largest mass (indicated by a star) was highly elevated, pale yellow-white in color, and located superiorly, extending towards the posterior pole. This lesion caused an exudative retinal detachment in the macular region. Additional smaller masses (indicated by an arrows) were also pale yellow and located inferonasally and inferiorly (Figure 1).

In the left eye, fundus examination revealed a large sub-retinal mass (indicated by a star) which was pale yellowish-white and situated nasal to the optic disc, in direct contact with its nasal margin. Additionally, a small whitish lesion (indicated by an arrow) was observed at the posterior pole, approximately one disc diameter superior to the inferior temporal vascular arcade (Figure 2).

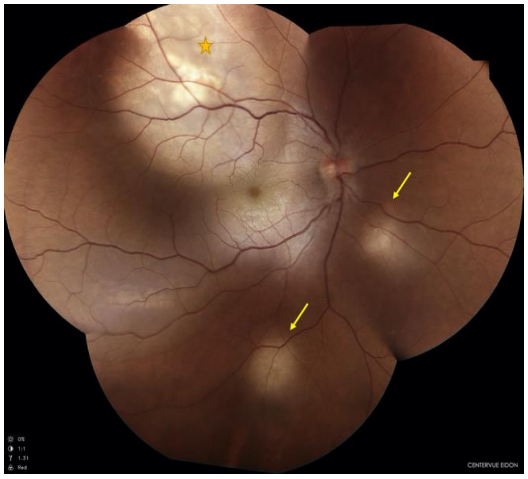

Figure 1: Fundus photograph of the right eye showing multiple choroidal masses with exudative retinal detachment in the macular area (Eidon multimodal retinal imaging, Ophthalmology Department, Hassan II University Hospital of Fez)

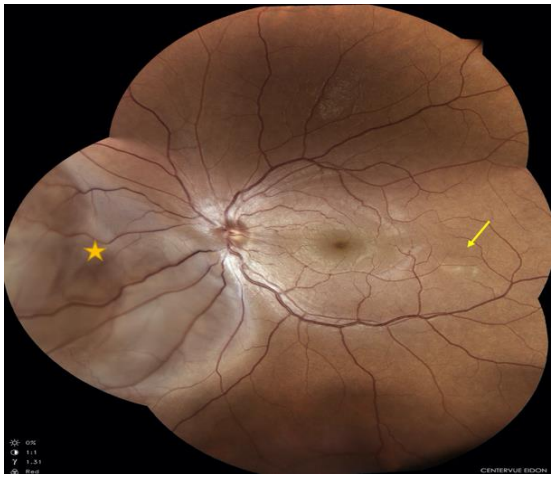

Figure 2: Fundus photograph of the left eye showing multiple choroidal masses (Eidon multimodal retinal imaging, Ophthalmology Department, Hassan II University Hospital of Fez)

This medical history and clinical finding are most consistent with choroidal metastasis. The patient was urgently referred to the gastroenterology department, where further investigations were conducted.

Laboratory tests revealed an elevated cancer antigen 19-9 (CA 19-9) level of 1100 U/ml. An abdominal computed tomography (CT) scan with contrast identified a mass in the head of the pancreas. Subsequently, the patient underwent an endoscopic retrograde cholangiopancreatography (ERCP), during which a biopsy confirmed the diagnosis of pancreatic adenocarcinoma.

Additionally, a brain MRI and a CT scan of the abdomen and pelvis (CTAP) revealed widespread metastases, including lesions in the brain, lung parenchyma, liver, and bones.

Upon re-examination of fundus, evidence of very rapid progression, including an increase in the size of the choroidal lesions and the development of grade 3 stasis papilledema (Figure 3 and 4).

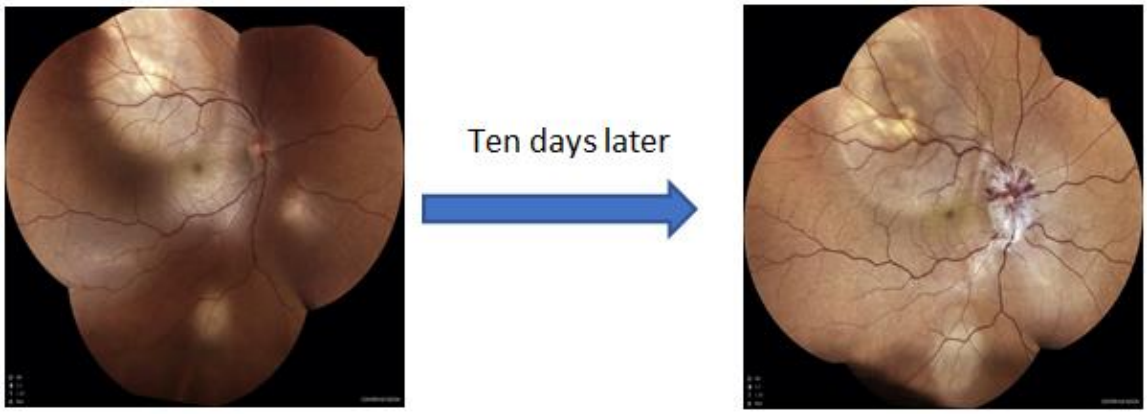

Figure 3: Observation of the progression of lesions in the right eye after ten days

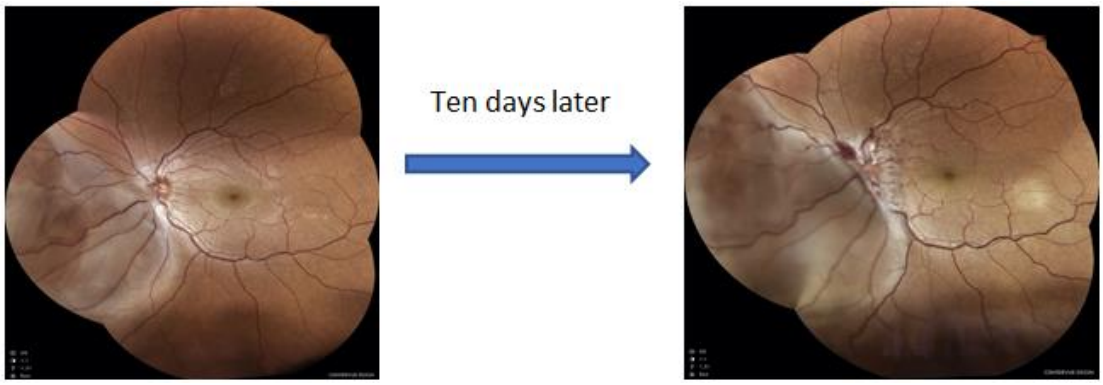

Figure 4: Observation of the progression of lesions in the left eye after ten days

Ultrasonography demonstrated the choroidal origin of the lesions. In this case, the presence of multiple lesions allowed us to observe the different ultrasound characteristics of the choroidal metastases (Figure 5).

A-mode ocular ultrasound showed low signal attenuation (Figure 6), unlike choroidal melanomas, which appear hypoechoic with downward signal attenuation [7].

Due to the patient's overall condition, retinal fluorescein angiography could not be performed. However, auto-fluorescence images were obtained, revealing that these lesions were hyper auto-fluorescent, a characteristic suggestive of ocular metastasis (Figure 7).

Concerning cross-sectional optical coherence tomography (OCT) and OCT-angiography (OCT-A), several pathognomonic signs were noted (Figure 8). OCT-angiography is particularly useful for differentiating diagnoses, as it reveals the loss of blood flow at the level of the lesion due to compression of the choriocapillaris, while showing no flow anomalies in the outer retin, a feature not typically observed in other types of tumors [8] (Figure 9).

Cranio-orbital MRI demonstrated choroidal lesions with T1 hypersignal and T2 hyposignal showing moderate enhancement after Gadolinium injection, along with brain metastases (Figure 10).

After a multi-disciplinary meeting, it was decided to proceed with palliative chemotherapy. Unfortunately, the patient passed away two months after the diagnosis.

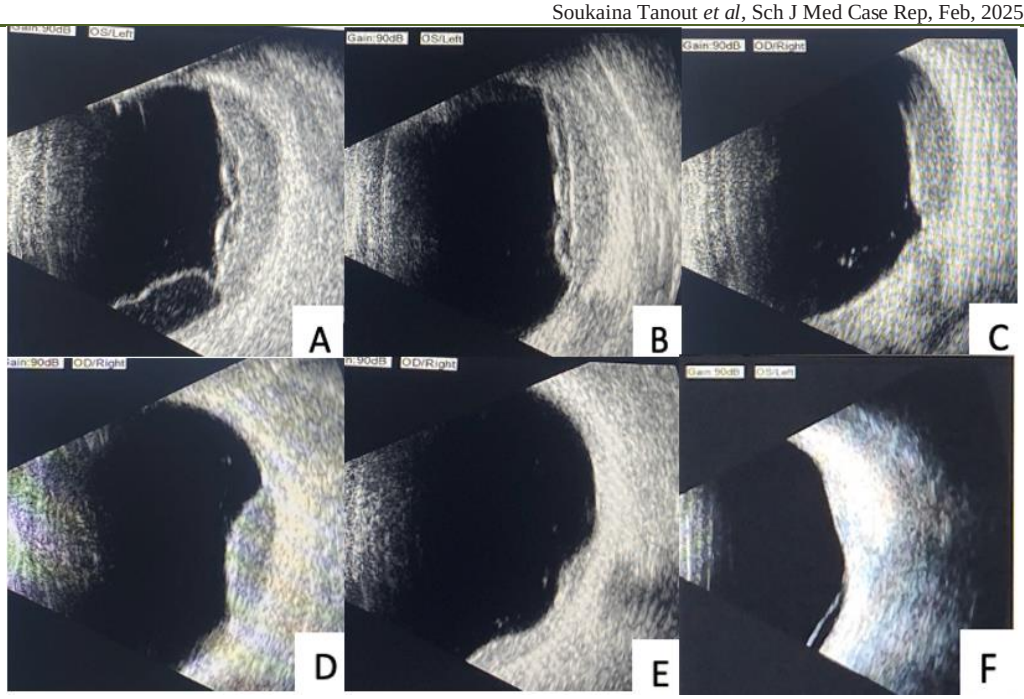

Figure 5: Ultrasound images of choroidal masses in both eyes; Isoechoic polylobed lesions with a bumpy surface, accompanied by exudative retinal detachment (A-B); Typical umbilicate lesion of choroidal metastasis (C); A raised isoechoic lesion (D); A domed choroidal mass without central excavation, which distinguishes it from choroidal melanoma (E); An iso-echoic lesion wider than tall (F); (AVISO echography, Ophtalmology Department, Hassan II University Hospital of Fez)

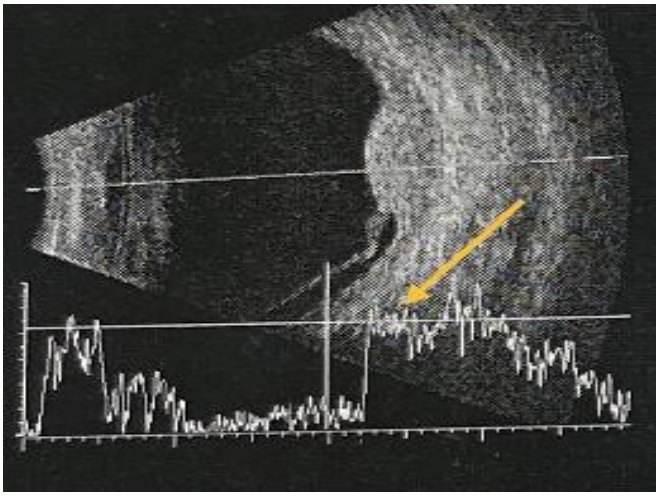

Figure 6: A-mode ocular ultrasound shows low signal attenuation suggesting ocular metastasis (AVISO echography, Ophtalmology Department, Hassan II University Hospital of Fez)

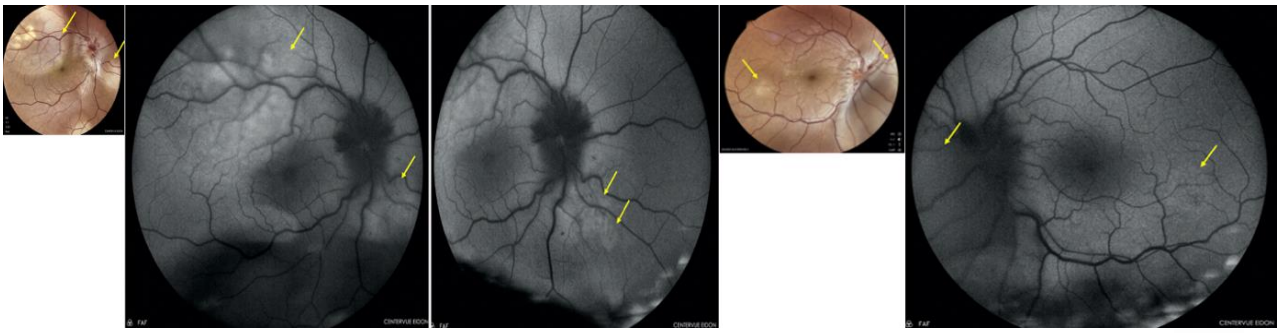

Figure 7: Auto-fluorescence images of both eyes revealing hyper-autofluorescent metastasis lesions (Eidon multimodal retinal imaging, Ophtalmology Department, Hassan II University Hospital of Fez)

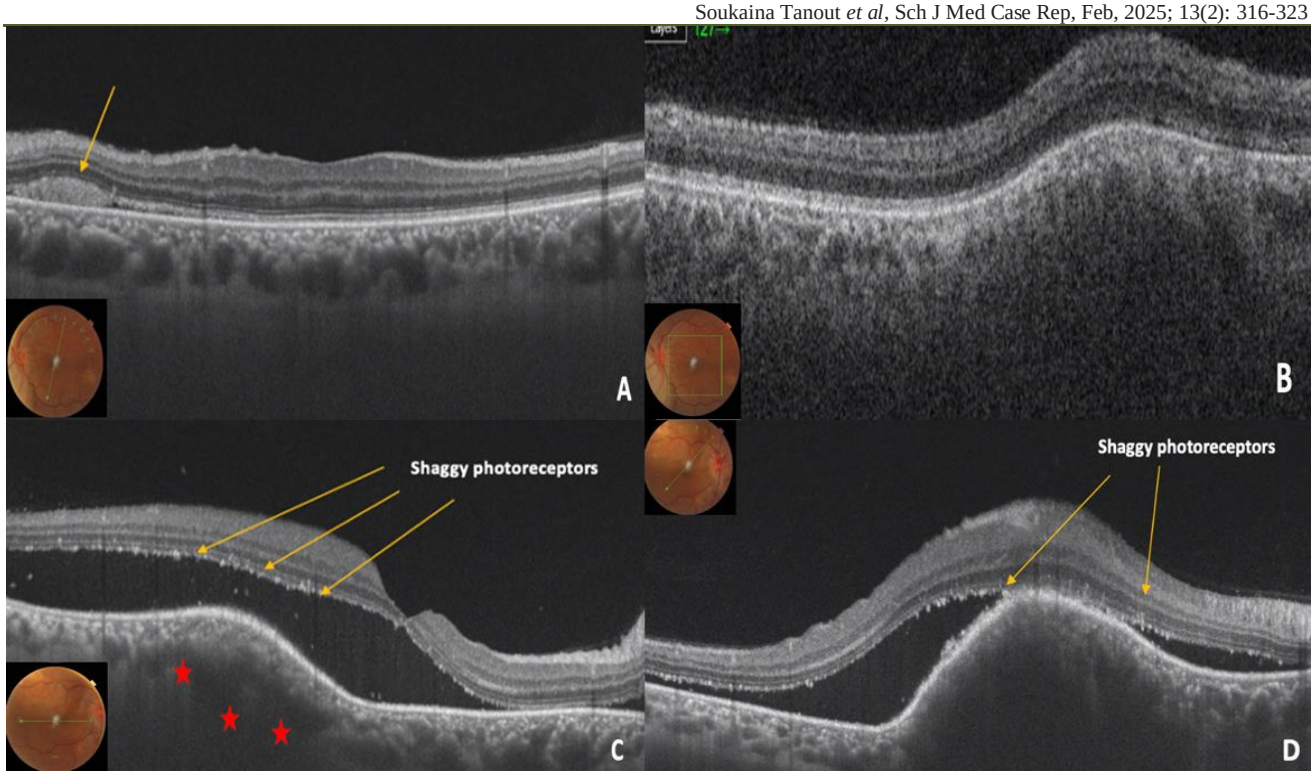

Figure 8: OCT Images of choroidal metastasis lesions; The primary focus is on detecting small, subclinical lesions (A, yellow arrow). The lumpy-bumpy appearance (B) is characteristic of choroidal metastasis. Convex bulging of the pigment epithelium and exaggeration of choroidal reflectivity, accompanied by subretinal exudation (C-D). The boundary of the tumor is clearly visible (red star), making it possible to measure its size (C). Additionally, shaggy photoreceptors are observed (C-D); (Topcon Dri OCT Triton plus, Ophtalmology Department, Hassan II University Hospital of Fez)

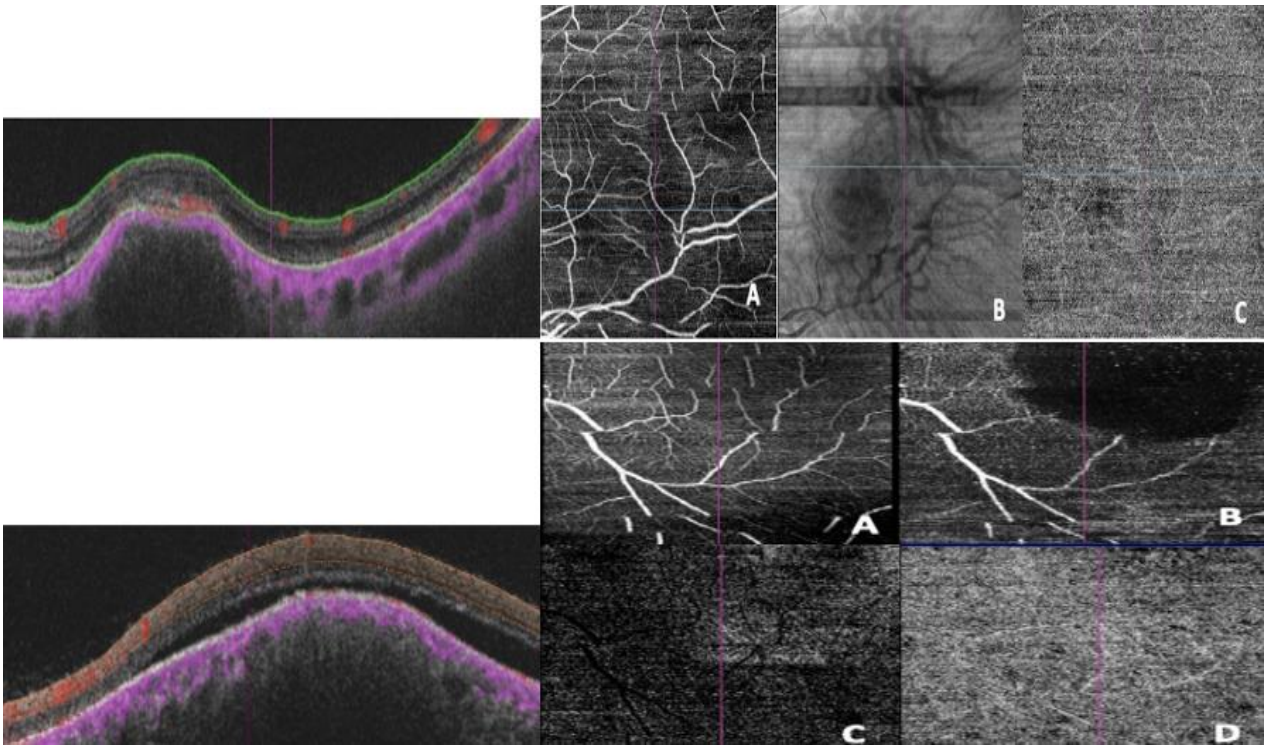

Figure 9: OCT-Angiography: There is a loss of flow at the lesion level without any abnormalities in the outer retina, which differentiates it from hemangioma or uveal melanoma that shows intra-tumor vascularization [8] (Topcon Dri OCT Triton plus, Ophtalmology Department, Hassan II University Hospital of Fez)

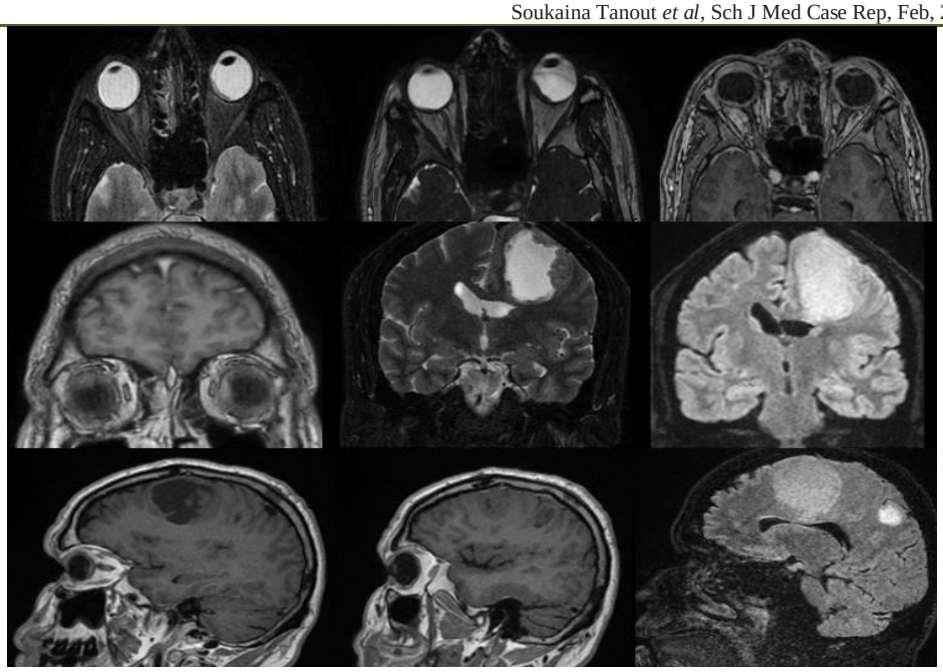

Figure 10: Craniorbital MRI: T1, T2, T1C+, T2*, FLAIR, and diffusion sequences in axial, coronal, and sagittal sections

DISCUSSION

Most of metastatic tumors that reach the eye typically affect the uveal tract, while occurrences of metastases in the orbit and retina are quite uncommon.

The first case of choroidal metastasis was reported by Perls in 1872 [9]. In 33% of cases, these metastases are found in patients whose primary cancer remains unidentified. Choroidal metastases occur due to the spread of tumor cells through the bloodstream. The abundant blood supply in the posterior choroid provides an ideal environment for these metastases to develop [10].

Choroidal metastasis is a rare manifestation of pancreatic carcinoma , with limited documentation in literature. Earlier research on the features of choroidal metastasis indicates that primary tumors originating from the pancreas represent only 1-7% of such cases [11]. Additionally, Shields and al. reported that patients with pancreatic adenocarcinoma have the shortest survival rates when associated with choroidal metastasis, averaging just 4.2 months [12], in our case, survival was two months.

Patients may remain asymptomatic for an extended period, and the progression of the lesion is often indicated by a decrease in visual acuity. More than 90% of these lesions are located at the posterior pole, and in approximately 50% of cases, they are bilateral [10].

Choroidal metastases can present as isolated or multiple flat or slightly elevated, non pigmented lesions with poorly defined margins. They may be associated with overlying pigment epithelial alterations, subretinal fluid and lipofuscin accumulation [13]. In our case, multiple metastasis were observed posterior to the equator, which is the most common site, due to the major blood supply to choroid being provided by the posterior ciliary arteries.

A variety of differential diagnoses should be considered, such as choroidal melanoma, choroidal osteoma, choroidal hemangioma, rhegmatogenous retinal detachment, posterior scleritis, and choroidal neovascularization accompanied by an irregular scar. Differentiating these conditions from achromic melanoma can be particularly challenging, highlighting the need for additional examinations [14].

Ultrasonographically, the internal acoustic reflectivity of these intraocular metastatic tumors is greater than most of uveal melanomas, but not as high as that seen in choroidal hemangiomas. The lateral borders of the choroidal metastases are usually poorly defined [15].

Enhanced depth imaging -OCT reveals an elevation in the choroid accompanied with compression of the choriocapillaris, resulting in a lumpy-bumpy appearance of the retinal pigment epithelial layer, typically associated with choroidal metastatic tumors. This contrasts with the smoother, dome-shaped contours seen in nevi and melanomas.

Significant subretinal fluid is often present, along with a distinct line of disrupted photoreceptors. Imaging also shows speckles, which are either shed outer segments of photoreceptors or pigment aggregates within the subretinal fluid, appearing as highly reflective spots [16].

FAF reveals hypo-autofluorescent patches on the tumor surface, surrounded by areas of hyper-autofluorescence indicative of subclinical lipofuscin in the RPE. This suggests that the RPE cells surrounding the lesion are affected [17].

A previous case report highlighted the misdiagnosis of Central Serous Chorioretinopathy (CSC) in a 45-year-old male patient, who was later found to have pancreatic metastasis [18].

This emphasizes the importance of accurate diagnosis in cases presenting with seemingly typical symptoms. Another report discussed a 47-year-old male patient with no history of diabetes mellitus, in whom pancreatic choroidal metastasis manifested as cotton-wool spots. These cases underscore the necessity for thorough evaluations when faced with atypical presentations [19].

The treatment for choroidal metastasis is palliative, and the choice of therapy must be discussed at a multi-disciplinary consultation meeting within a reference center. In some cases, therapeutic abstention with monitoring is proposed for patients with limited life expectancy [20].

The primary focus is on systemic therapies, including chemotherapy, immunotherapy, and hormonal treatments, tailored to the primary diagnosis. The success of these systemic therapies is largely due to their effective penetration of the choroid, facilitated by the natural openings in the choroidal blood vessels. It is recommended to evaluate the efficacy of systemic treatment before considering local interventions.

Local therapies may be considered if a localized metastatic tumor is causes significant vision decline or if systemic treatment fails. Various options include, irradiation, transpupillary thermal therapy, and laser photocoagulation [20], enucleation is reserved for the pain relief.

In our case, no specific ocular treatment was preformed because the disease was at an advanced stage and no eye pain was reported. the patient reveived systemic chemotherapy, which improved their quality of life despite the unfavorable overall prognosis.

CONCLUSION

This clinical situation underscores the vital role of ophthalmologists in identifying specific extraocular cancers, especially when eye-related symptoms are prominent, and the underlying condition remains unidentified.

Pancreatic adenocarcinoma is an uncommon cause of choroidal metastases. However, when ocular symptoms occur, a thorough ophthalmological evaluation is essential.

Multimodal imaging has significantly enhanced our understanding of the anatomical and vascular characteristics of choroidal metastasis. It enables the collection of valuable information necessary for accurate diagnosis and effective follow-up.

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