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Frequency and Patterns of Underlying Malignancies in Choroidal Metastases: A 10-Year Cross-Sectional Study in an Iranian Population

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Abstract

Introduction: Choroidal metastases are commonly diagnosed alongside other metastatic lesions, with 67%–88% of patients presenting metastases in other parts of the body. This study aimed to assess the frequency and patterns of underlying malignancies in patients diagnosed with choroidal metastases and to explore potential associations based on the Iranian population's genetic and lifestyle factors.

Methods: This cross-sectional study was conducted at Rasool Akram Hospital, Tehran, between 2011 and 2021. Data were collected from patients diagnosed with choroidal metastases, including those with previously known underlying malignancies and those diagnosed after ophthalmological evaluation. Patients with melanoma were excluded. Statistical analysis was performed using the chi-square test, Fisher's exact test, Student's t-test, or Mann–Whitney U test, with a significance level set at $p < 0.05$.

Results: A total of 52 patients were included (37 women [71.15%] and 15 men [28.85%]), with a mean age of 54.13 ± 13.91 years. The most frequent underlying malignancies were breast cancer (24 patients, 46.2%) and lung cancer (7 patients, 13.5%), while 12 cases (23.1%) patients had an unknown primary malignancy. Bilateral ocular involvement was observed in 11 patients (21.2%). A significant association was found between female gender and breast cancer ($p < 0.001$) and between male gender and lung cancer ($p = 0.03$). Positive subretinal fluid (SRF) was identified in 67.35% of cases. Chemotherapy was the most frequently used treatment modality ($p = 0.01$).

Conclusions: This study underscores the need for regular ocular screening in patients with advanced breast and lung cancers. Significant gender-based associations in choroidal metastases highlight the importance of targeted screening and treatment strategies.

Keywords: Choroid metastases; Underlying tumours; Lung cancer; Gastrointestinal cancer.

Introduction

The uvea is the highly vascularized layer of the eye and is the most common site of eye metastatic involvement. The most common site of involvement due to metastasis in the uvea was the choroid (88%), followed by the iris (9%) and ciliary body (2%) [1]. Choroid metastases are the most common sites of intraocular neoplasms in adults [2]. The intraocular effect in

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all patients who died due to malignancies was estimated to be 12% [3]. The most common sources of primary tumours of these metastases are the lungs and breast. The occurrence of metastasis from these tumours suggests a hematogenous spread of progressive malignancy, which, as a result, has a poor prognosis [2]. Approximately 67%–88% of patients with ocular metastases have other metastatic lesions in different parts of the body. For patients diagnosed with intraocular metastasis, the average lifespan is approximately 2 to 48 months (6 to 9 months on average) from the time of diagnosis [3]. Patients with choroidal metastases experience some degree of vision loss due to exudative retinal exudation. Approximately 15-20% of patients are asymptomatic until they are detected incidentally during routine examinations. The destruction of the blood-retinal barrier in exudative retinal detachment can be a problem with pathological conditions, malignancy, or biology [4]. Early diagnosis of choroid metastases is important because an appropriate treatment method can be selected to control and improve the disease [2]. The goal of treatment is to prolong life and to restore or preserve vision. Radiotherapy or chemotherapy can achieve this goal. Surgery does not play an important role in curative treatment, except for diagnostic biopsy if necessary. There is a high risk of morbidity, and there is no need for tumour debulking [1]. The purpose of this research was to investigate the frequency of underlying tumours in patients with choroidal metastases and to conduct statistical analysis based on age, sex, and other demographic factors to diagnose and treat the condition of the disease. In addition, due to the possibility of new underlying malignancies in choroid metastases in Iranian patients that have not been mentioned in previous similar studies, another goal of this study was to identify types of malignancies according to race and lifestyle.

Methods

A cross-sectional, descriptive, and analytical study was conducted on patients referred to Rasool Akram Hospital in Tehran between 2010 and 2020 who were diagnosed with choroid metastasis. The subjects under study include patients with known underlying malignancies who developed choroidal metastasis during the course of treatment or patients who were initially diagnosed with choroidal metastasis due to eye symptoms during ophthalmological examinations and then underwent additional measures to the diagnosis of underlying malignancy. Patients with diagnosis of melanoma excluded from the subjects. After obtaining the code from the ethics committee of Iran University (IR.IUMS.FMD.REC.1401.263), patient data were collected and recorded. After completing the checklists, their information was entered into the spss26 software. In the descriptive analysis, central indices, such as mean, and dispersion indices, such as standard deviation (SD), were used. The independent t-test or Mann–Whitney test was used to compare quantitative variables, and the chi-square test or Fisher exact test was used to compare qualitative variables. A significance level of 0.05 was considered.

Results

From the total number of patients referred to Rasool Akram Hospital during the study period, 52 were selected based on the entry criteria. The average age of the patients was 54.13 ± 13.91 years (18-82 years). The highest frequency was related to the group of 50-60 years and the lowest was associated with those aged less than 30 years. Of 54 patients, 37 (71.15%) were women and 15 (28.85%) were men. Of the 52 participating patients, the highest frequency of underlying malignancies was related to breast cancer (24 patients, 46.2%) and lung cancer (7 patients, 13.5%) (Figure 1). In 12 cases (23.1%), the underlying malignancy was unknown. Of the 52 participating patients, 11 cases (21.2%) had bilateral involvement. Of the remaining 41 cases, 19 and 22 had left and right eye involvement. Seven of the 52 patients (13.5%) had nonchoroidal metastases. The average age of all underlying malignancies was investigated. In patients with breast cancer, the average age was 50.71 ± 11.07 years; in lung cancer, it was 57.43 ± 8.69 years; and in gastrointestinal cancer, it was 66.00 ± 14.14 years. All patients had breast and uterine cancers. Patients with lung cancer were female in 2 cases and male in 5 cases. All patients with gastrointestinal cancer, embryonal carcinoma, histiocytosis X, multiple myeloma, and prostate cancer were male (Figure 2). In patients with breast cancer in three cases, lung cancer in three cases, RCC in one case, uterine carcinoma in one case, embryonal carcinoma in one case, and prostate cancer in one case, bilateral ocular involvement was observed. The average maximum thickness was 3.44 ± 2.10 (0.90-12). Out of 48 patients, 33 (67.35%) had positive SRF and 15 (32.65%) had negative SRF. The highest site frequency was observed in the multiple groups and the lowest was macular (Figure 3). The average size was 9.41 ± 4.66 (2-22). The highest frequency of colour was observed in the yellow group, and the lowest frequency was

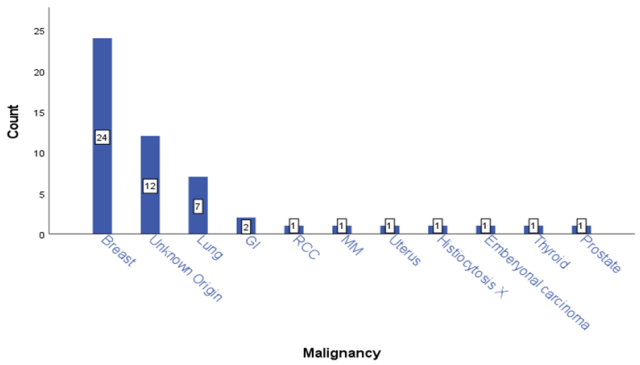

Figure 1: Distribution of the frequency of patients who participated in the study according to the presence of underlying malignancies

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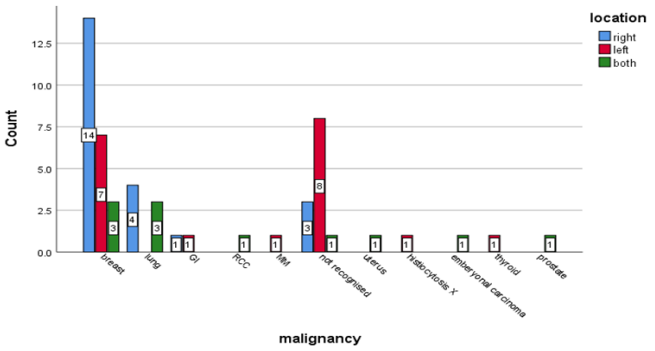

Figure 2: Distribution of the frequency of ocular involvement among patients who participated in the study according to the types of underlying malignancies.

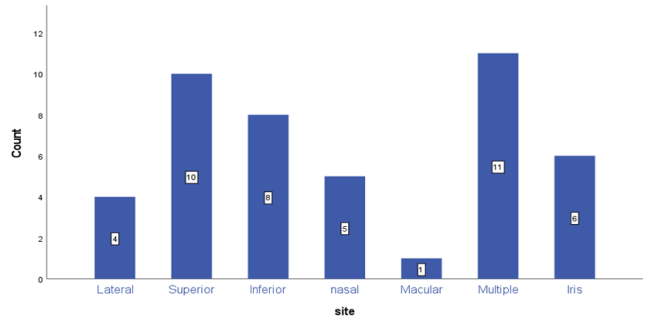

Figure 3: Distribution of site frequency among patients who participated in the study

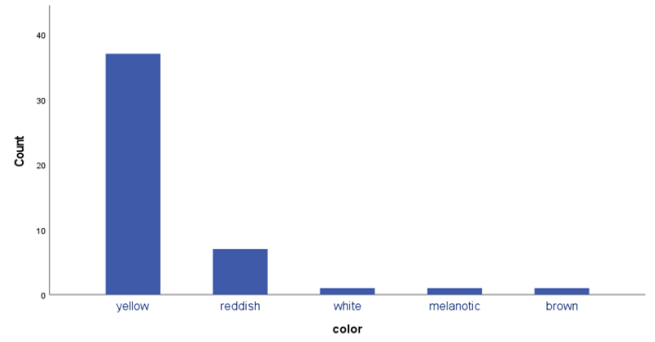

Figure 4: Mass colour distribution among patients who participated in the study

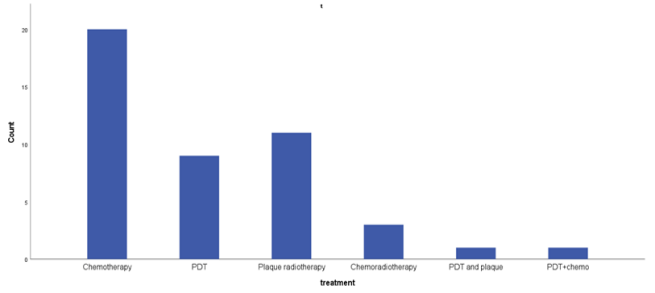

Figure 5: Distribution of treatment frequency among patients who participated in the study.

observed in white, melanotic, and brown colours (Figure 4). The highest frequency of treatment was associated with the chemotherapy group, whereas the lowest was associated with photodynamic therapy (PDT) + chemotherapy (Figure 5).

Discussion

As the population ages, the overall incidence of cancer continues to rise, and as treatment options improve, the mortality rate of cancer decreases. Therefore, it is likely to be encountered in patients with ocular metastasis. Metastases in the middle part of the eye are the most common intraocular malignancies, and up to 10% of patients with metastatic cancer have intraocular involvement [7]. The choroid is the most common site of metastasis because the hematogenous spread of the tumour from distant sites often leads to choroidal involvement [8]. Most choroid metastases originate from breast cancer in women and from lung cancer in men [9]. Choroid metastases appear as white, creamy yellow, or dome-shaped masses that are usually in physical contact with the subretinal fluid. Choroidal metastases can occur focal or multifocal with unilateral or bilateral involvement. Ultrasound can be used to evaluate the tumour's size, shape, and location and estimate the reflection, internal structure, and degree of vascularization. Angiography and depth imaging, optical coherence tomography (EDI-OCT), and OCT are used to evaluate metastases [10, 11]. The primary cancers that lead to choroid metastasis are breast cancer (40-47%) and lung cancer (21-29%) [5]. In the present study, the most common primary sites were breast and lung tumours; of the 52 participating patients, the highest frequency was related to breast cancer (24 people, 46.2%) and lung cancer (7 people, 13.5%). Of course, the underlying malignancy was unknown in 12 cases (23.1%), which may have been determined by a more detailed examination of the location. In terms of sex, most patients were female (more than 70%), which is probably related to the frequent occurrence of breast-to-choroid metastasis. Due to the high incidence of this cancer, the possibility of choroid metastasis should be considered in advanced cases. In similar studies, most cases of choroid metastasis were related to breast cancer [11]. In this study, 28% of lung cancer cases were female. Of course, this value has been reported in up to 46% of studies. The growing epidemic of lung cancer in women is mainly attributed to tobacco use. However, the rate of disease in non-smokers suggests that other factors, such as geographic-cultural, genetic, hormonal, and possibly infectious factors, may play an etiological role [12, 13]. Based on these studies, lung cancer tends to metastasize earlier to the choroid than other types of cancer. Therefore, in the presence of choroid metastasis in patients without a history of cancer, a careful examination of the lungs should be performed, especially in men [5, 13]. Some studies have shown that the interval

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between the initial diagnosis of cancer and choroid metastasis is shorter in lung cancer than in breast cancer. At the time of ocular diagnosis, systemic metastases were present in 95% of breast cancer patients and only in half of lung cancer patients [14, 15].

Conclusion

The findings of the study showed that most of the patients with choroid metastasis were middle-aged women with breast cancer and middle-aged men with lung cancer. In most cases, the choroidal metastases were one-sided. These findings advocate for more rigorous screening in high-risk groups, especially middle-aged women with breast cancer and men with lung cancer, to ensure early detection and intervention.

Authors' contributions

AA designed the study. NK, FT, AS, AS, MN reviewed the article. AA collected the data and wrote majority of the manuscript, and RA completed and edited the manuscript.

Data availability

The data supporting the findings of this study are available upon request.

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