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Orbital tumors in USA: Difference in survival patterns

Waleed M. Hassan [a], Ahmad S. Alfaar [a,b,c,1,*], Mohamed S. Bakry [a], Sameera Ezzat [a,d]

[a] Department of Research, Children's Cancer Hospital Egypt 57357, Cairo, Egypt
[b] Cairo University School of Medicine, Cairo, Egypt
[c] Ulm University, 89069 Ulm, Baden-Württemberg, Germany
[d] National Liver Institute, Menoufiya University, Shebin Elkom, Egypt

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ABSTRACT

Introduction: There is a wide range of tumors affecting the orbital adnexa. Key such tumors include lymphomas, carcinomas, melanomas and rhabdomyosarcomas. Several studies have proposed that these histological subtypes differ in their survival outcomes. In this study we aim to describe the difference in survival outcomes between such subtypes. *Methods*: The SEER database was used to gather patient information. All 18 SEER registries were used. Patients diagnosed from 1996 to 2005 were included in the analysis. Observed five-year survival rate was calculated using the SEER*Stat software version 8.1.2. Data were extracted into IBM SPSS version 20 to generate Kaplan Meier curve for each group. *Results*: There were 2180 patients in the SEER databases who met the selection criteria. Lymphomas were the most common histology in adults. The overall five-year observed survival for all lymphoma patients was 75.9% (95% CI: 73.7–78.1). There was statistically significant difference between observed survival rates of lymphoma subtypes. Carcinomas were the second most common tumors. Their five-year observed survival rate in our study was 60.4%. There was no statistically significant difference between carcinoma subtypes' observed survival rates in the 20–49 age group, while, in the older age group, the difference was found to be statistically significant. Rhabdomyosarcomas were the most common tumors in children. The overall five-year observed survival rate for rhabdomyosarcomas patients was 89.8%. There was no statistically significant difference between observed survival rates of rhabdomyosarcomas subtypes. There was no statistically significant difference between relative survival rates according to gender and treatment received except within melanomas. *Conclusion*: In adults, lymphomas have better survival rates than carcinomas. Whereas the lymphoma subtype can be used as a determinant prognostic factor in any age, the carcinoma subtype can be used as such a determinant in older age groups only. In children, rhabdomyosarcomas are the predominant tumors affecting the orbital adnexa. Further studies are needed to determine if the difference between embryonal rhabdomyosarcoma and alveolar rhabdomyosarcoma observed survival rates are statistically significant.

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1. Introduction

Tumors that occur in the orbital region are either involving intra-ocular layers or extra-ocular orbital soft-tissue structures. Whereas all affect the orbital region, only adnexal tumors are named after the orbit. The most common primary intra-ocular tumors include retinoblastomas in childhood and choroidal melanomas in adults, in addition to other rarer entities. Orbital masses comprise a wide variety of lesions depending on its site of origin.

Based on their behavior, these lesions differ in their management. Most are benign, as hemangiomas, adenoid cysts, lacrimal gland adenomas and benign skin lesions [1,2]. Others, however, are malignant and may require special treatment, as lymphomas, carcinomas and rhabdomyosarcomas. In most of these cases it is the ophthalmologist that is first to examine the lesions. Survival rates of these malignant tumors have not been studied before in a single study. In this study we review the prognosis of orbital

* Corresponding author at: Research Department, Children's Cancer Hospital Egypt 57357, 1 Seket Al-Emam Street – El-Madbah El-Kadeem Yard – El-Saida Zeinab, Cairo, Egypt. Tel.: +20 1001557426; fax: +20 226178046.
E-mail addresses: Waleed.magdy.91@gmail.com (W.M. Hassan), ahmadsfar@gmail.com, asamir@57357research.com (A.S. Alfaar), msabrybakry@gmail.com (M.S. Bakry), Sameera.ezzat@57357.com (S. Ezzat).
[1] Current address: Ulm University, 89069 Ulm, Baden-Württemberg, Germany.

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tumors (focusing on lymphomas, carcinomas, melanomas and rhabdomyosarcomas, since they are the most common orbital affecting tumors). The study focuses on survival rates and response to treatment in population-based settings. We aimed to compare survival of different histology subtypes, and were able to identify which histology subtypes could be used as a determinant prognostic factor. Moreover, response to treatment was calculated using survival rates after receiving different treatment modalities either surgery or radiological. It should be noted that proper evaluation of different treatment modalities is better evaluated using randomized controlled clinical trials. As such, the population-based results regarding treatment presented here should be interpreted with caution. Unfortunately, data on chemotherapy treatment was not available, so treatment was only classified into radiation alone, surgery alone, or both.

The study was built based on the SEER 18 population based cancer registries. SEER has been collecting patients' information since 1973. Survival rates have improved since 1973 due to advances in treatment modalities [3]. Therefore, we included patients from 1996 to 2005 to be able to describe survival in the light of these advances. We describe observed survival rates, and we use them to compare differences in survival between different histological subtypes. Observed survival rates are chosen to be presented in this paper to provide clinically relevant reference for clinicians. Relative survival rates are also presented in Table 2, and they were used to assess differences in survival regarding sex, race and treatment [4].

2. Methods

SEER databases were used to gather patients' data. All 18 SEER registries were used. The SEER 18 registries consist of Atlanta, Connecticut, Detroit, Hawaii, Iowa, New Mexico, San Francisco-Oakland, Seattle-Puget Sound, Utah, Los Angeles, San Jose-Monterey, Rural Georgia, the Alaska Native Tumor Registry, Greater California, Kentucky, Louisiana, New Jersey, and Greater Georgia. SEER*Stat software version 8.1.2 was used to extract patients' data [5].

Patients were identified as having orbital tumors using the ICD-O 3 topography codes C69.0-Conjunctiva, C69.5-Lacrimal gland and C69.6-Orbit, not otherwise specified (NOS) [6]. Only patients diagnosed from 1996 till 2005 with known age and malignant behavior were included in the analysis cohort. Patients' data was gathered up to December 2010. Patients diagnosed between 2005 and 2010 were available in the SEER database but were not included in our analysis to ensure the availability of five-year survival follow-up of the cohort.

Patients were then divided into 3 age groups (0–19, 20–49, ≥50). Each age group was further stratified by histology subtype using ICD-O 3 morphology codes. Due to the diversity in histology subtypes, patients with rare histology subtypes in each age group were excluded from the cohort analysis. A cutoff for rare histology subtypes in the 20–49 age group was set at 10 patients, while in ≥50 age group the cutoff was determined as 20. Supplementary Table 1 shows the count of excluded histology subtypes.

See Supplementary Table 1 as supplementary file. Supplementary material related to this article can be found, in the online version, at http://dx.doi.org/10.1016/j.canep.2014.07.001.

Data were then entered in IBM SPSS version 20 to generate Kaplan Meier curves for each subgroup. All comparisons between observed survival curves were done using the log rank test. Log rank chi-square statistics were generated and p-values were calculated. SEER*Stat 8.1.2 was used to check for statistical significance using the Z-test in five-year relative survival rates between different treatment modalities received (radiation, surgery or both), race and gender for each subgroup. The Z-test used by SEER*Stat compares the survival curves of two groups of cases up to a selected survival duration point, Five-year relative survival was the survival duration point chosen for comparison, and Z values more than 1.96 were considered statistically significant.

3. Results

The SEER database included 2180 patients who met the selection criteria. A summary of patients' demographic data (gender, age and treatment received) is displayed in Table 1. The overall five-year observed survival was 72.2% (95% CI: 70.2–74.1). In the 0–19 age group there were 59 patients with an overall five-year observed survival rate of 89.8% (95% CI: 82.0–97.6). The 20–49 age group (380 patients) had a comparable five-year observed survival rate of 92.0% (95% CI: 89.3–94.7). The ≥50 age group had the highest number of patients (1741 patient) with the lowest five-year observed survival rate of 67.0% (95% CI: 64.8–69.1) (data not shown).

The 20–49 age group was subdivided into 3 subgroups: lymphomas, melanomas and carcinomas. The ≥50 age group was subdivided into: lymphomas – with each histology subtype having more than 72 patients; lymphomas – with each histology subtype having less than 72 patients; carcinomas and melanomas. Carcinomas had lower observed survival rates than lymphomas. Lymphomas were separated into two groups based on the median number of patients within different histology subtypes for the sake of clear visual representation. Rhabdomyosarcomas had the highest observed survival rates. Kaplan Meier for each subgroup observed survival is shown in Figs. 1–4. Results for the log rank test, chi square, p value are shown below each curve.

3.1. Lymphomas

Lymphomas comprised 66.1% of the total number of cases. In the 20–49 age group there were five common subtypes while older age group tumors were classified into ten histological subtypes. Statistical significance in observed survival rates was noted for lymphomas in the 20–49 age group (p value < 0.001), and for lymphomas ≥50 age group with $N \geq 50$. Conversely, lymphomas in the ≥50 age group with $N < 72$ showed no statistically significant difference in observed survival rates. The most common subtypes were extra-nodal marginal zone lymphomas of mucosal-associated lymphoid tissue (MALT) and diffuse large B-cell lymphomas (DLBCL). MALT had better survival rates than DLBCL. The overall five-year observed survival for all lymphoma patients was 75.9% (95% CI: 73.7–78.1), while the relative survival was 90.7% (95% CI: 87.7–93.0). Fig. 1 shows Kaplan Meier curves for observed survival of lymphoma patients. No statistically significant difference was detected between relative survival of patients with ocular lymphoma with regards to sex, race or modality of treatment.

3.2. Carcinomas

Carcinomas were 22.0% of the total number of cases. In the 20–49 age group there were only two common subtypes. While in the ≥50 age group there were five common subtypes. There was no statistical significance in observed survival rates between carcinomas subtypes models in the 20–49 age group, while in the older age group there was a statistically significant difference between observed survival rates of carcinoma subtypes (p value < 0.001). The five-year observed survival rate for all carcinoma patients in our study was 60.4% (95% CI: 55.9–64.9), while the relative survival was 74.8% (95% CI: 68.6–80.0). Fig. 2 shows Kaplan Meier curves for observed survival of carcinoma patients.

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