SHORT REVIEW

Ocular Tumours in Childhood

V. Pam

Department of Ophthalmology, A. B. U. Teaching Hospital, Kaduna, Nigeria.

Introduction

The word "tumour" as defined by Powell White "is a mass of cells, tissues or organs resembling those normally present but arranged atypically. It grows at the expense of the organism (in this case, man without at the same time subserving any useful function)". Tumour arising from any portion of the eyeball either on the surface or within the eyeball constitutes an ocular neoplasm. Ocular tumours may be benign with a slow propensity to proliferation. Metastasis is rare. However, the function may be compromised due too compression of vital structures around the tumour. Malignant tumours on the other hand have a high propensity to rapid proliferation and metastasis to adjacent and distant structures or organs.

Benign Ocular Tumours of Childhood

Benign ocular tumours in childhood would include choristomas. There are congenital tumours composed of tissues not normally found in the region. For example, dermoid cysts of the conjunctiva and epibulbar dermoids. Epibulbar dermoid could arise from any part of bulbar conjunctiva. Other benign ocular tumours in childhood include the hamartomas. Hamartomas are congenital tumours comprising tissues normally found in the region. Such conditions include the phakomatoses, a group of congenital, heredofamilial hamartomas. Phakomatoses are benign tumours of the blood vessels or neural tissue often ocular, cutaneous or intracranial. Angiomatosis retinae, Sturge-Weber syndrome, neurofibromatosis and tuberous sclerosis are examples of some phakomatoses.

Conjunctiva nevi are extremely common benign tumours usually located near the corneo-scleral limbus. These conjuctival nevi appear as deeply pigmented masses and present before puberty. Junctional activity is likely in adulthood. Diagnosis of benign tumours in childhood is clinical. However, histopathology is of added advantage where possible and adds to the confirmation of the lesion. Other non-invasive investigations of benign ocular tumours include ultrasonography, CTScan and magnetic resonance imaging (MRI).

The prevalence of choristomas and hamartomas is low; with a range of 1 in 3000 to 1 in 10,000. Most of the hamartomas have an autosomal dominant inheritance pattern, which may be regular or irregular. [1] Racial or sex difference has not been observed.

Available mode of treatment for the choristomas is surgical excision. However, limbal dermoids may not be amenable to surgery due to complication of scarring. Treatment modalities for the hamartomas (phakomatoses) are disappointing. Prognosis is rather poor due to multisystem involvement. In tuberous sclerosis for example death occurs in 75% of patients by 20years of age. [1]
Data is lacking on the prevalence of choristomas and hamartomas in this environment. Nevertheless sporadic cases may have been seen, misdiagnosed or even missed in due probably to a low index of suspicion.

Malignant Ocular Tumour of Childhood

The commonest primary malignant ocular tumour in childhood is retinoblastoma. An intraocular neoplasm arising from immature retinal cells, which replaces and occupies the interior tissue of the eye. [2] The incidence of retinoblastoma is approximately 1 in 15,000-18,000 live births in the developed countries with a trend toward a higher prevalence than presently found because of increased survival rate.[1] However, the incidence of retinoblastoma in Africa may be unknown because of non-reporting of the disease to cancer registries which may be non-existent. Later presentation, inadequate diagnostic facilities including histopathology, makes it difficult to rely on the incidence reported in the developing countries, especially Africa. However hospital based studies indicate that retinoblastoma is the commonest primary ocular malignancy in childhood. Abiose et al, [3] in the Eye Clinic of Ahmadu Bello University Teaching Hospital Kaduna during an 8yr review of all childhood ocular malignancies found 60% to be due to retinoblastoma. Retinoblastoma has no significant racial or sex predilection. Bilaterality occurs in 20-30% of all cases. [1] The average age of presentation is 13 months with 89% diagnosed before 3 years. However it is rare after 7 years but has been reported in patients over 20years. [4] sporadic cases are common. Ninety percent of retinolastomas develop by mutation while 10% are inherited (familial) exhibiting an autosomal dominant inheritance pattern with 90% penetrance.

The clinical presentation of retinoblastoma would include any one or more of the following features: -

1. Leukocoria[5] (white pupil) or cat's eye reflex – this is the most common presentation accounting for 60% of cases.
2. Strabismus[5] (Squint) is the 2nd commonest presentation accounting for 20% of cases.
3. Spontaneous hyphaema or bleeding into the anterior chamber.
4. Proptosis, [6,7] or protrusion of one or both eyes.
5. Pain in the affected eye (late feature) due to high pressure or glaucoma, secondary to the presence of the tumour in the eye.
6. Orbital inflammation [8] mimicking orbital cellulites may occur in eyes with necrotic tumours and does not imply extraocular extension.
7. Metastases to regional lymph modes and the brain.

The tumour may have multifocal origin (spontaneous development from more than one region of the same neural retina). Both eyes may be involved. The tumour may grow towards the sub-neural retina space (exophytic) or inwards towards the vitreous (endophytic). Histologic types

include the Fexner-Wintersteiner rosettes, Home Wright rosettes, pseudo rosettes and fleurettes. Local spread anteriorly by seeding into the vitreous and acqueous while posterioly by direct extension into the subretinal space. Extraocular extension to the orbit and brain results from choroidal invasion (haematogenous) by tumour cells.

Treatment strategies for retinoblastoma has evolved from an almost uniformly fatal neoplasm to one that are cured in about 90% of cases in developed countries. [9] In Nigeria, the outlook is still gloomy due to late reporting, refusal of treatment due to illiteracy/poverty and inability to carry treatment to its logical conclusion because of lack of facilities for radiotherapy. However, in developed countries, the emphasis is changing from mere survival to survival with retention of useful vision. [10,1] This is achieved through early diagnosis, improved treatment modalities and well organized follow up facility.

More sophisticated methods of investigation have greatly enhanced the survival and retention of useful vision in patients with retinoblastoma in developed countries. Investigations such as enzyme assays of lactate dehydrogenase (LDH) and neuron specific enolase (N-SE) show raised values in the aqueous humour of patients with retinoblastoma. Ultrasonography and computed tomography, both detect the presence of intraocular calcification with high degree of accuracy. Magnetic resonance imaging does not detect the presence of calcium. However, MRI offers more information that CTscan as to the differentiation of pathological intraocular conditions that may simulate clinical retinoblastoma.

There has been a trend away from enucleation (removal of the eye) and external beam radiotherapy towards focal conservative treatment, [12] in patients with retinoblastoma. Radiation therapy continues to be an effective treatment option in this malignancy. However, external beam radiotherapy has unfortunately been associated with secondary non-ocular neoplasms in children with retinoblastoma. Recent methods of treatment include the following: -

1. Ophthalmic plaque brachytherapy (OPB)- this method offers a focal and shielded radiation field and may carry les risk. However, application of OPB is limited to small to medium sized retinoblastoma in accessible location.
2. Transpupillary thermotherapy (TTT)– an advanced laser system adapted to the indirect ophthalmoscope provides flexible, non-surgical treatment for small retinoblastoma.
3. Laser photocoagulation – used for small lesions in the retina posterior to the equator.
4. Chemoreduction– combines the principle of chemotherapeutic debulking with conservative focal therapies. Intravenous or subconjuctival chemotherapy is used to debulk the initial tumour volume followed with local treatment of TTT, cryotherapy or OPB.
5. Cryotherapy – involves freezing the tumour mass transcojunctivally. Useful for lesions anterior to the equator.
6. Enucleation – with excision of a long piece of optic nerve.
7. Exenteration - mutilating and invasive method in patients with orbital metastasis.

Most recently the use of new chemotherapeutic modalities with haematopoietic stem cell rescue or local radiotherapy[12] has increased the survival rate. In a developing country like Nigeria, the choice of treatment is

limited. Often enucleation is the mode of treatment, even in small to medium sized tumours. Late presentation of patients, inadequate radiotherapy facility often associated with long appointment at centres with facility and the prohibitive cost of treatment culminate in the enucleation of the eyeball. Enucleation is cheap and less time consuming. However, the patient goes through life with an empty, sightless socket! Majekodumi, [13] at the Lagos University Teaching Hospital, in a 10year review of causes of enucleation found 41.7% to be due to retinoblastoma. Furthermore, a more mutilating and invasive surgical procedure – exenteration still remains the method of debulking an orbit filled with metastatic tumour mass in the developing countries. Chemotherapy in third world countries is often reserved for extraocular and distant metastasis.

The survival rate for both unilaterally and bilaterally affected children with retinoblastoma in developed countries is 90-95%. [1] Unfortunately, children with genetic retinoblastoma who survive the primary intraocular tumour have a substantially increased risk of death from one or more non-retinoblastoma malignancies over the course of their lifetime. [15] The prognosis for children with intracranial extension or widespread metastasis remains dismal, even in developed countries. Untreated children with retinoblastoma almost always die of intracranial extension or widely disseminated disease within approximately 2 years of the date of tumour detection. Recognised clinical prognostic factors for mortality include age at detection, diagnosis (more advanced cases tend to be detected earlier), laterality, extent of intraocular mass and most importantly, evidence of retrobulbar or extraocular extension. [9]

Genetic counselling and health education of the populace in the developing countries will go a long way in reducing the morbidity and mortality. Survival with useful vision can be achieved in Nigeria when designated centres are equipped with appropriate technology, easily accessible and affordable to all.

References

1. Yanoff M, Fine B. Ocular Pathology 4th edition, Page 32.
2. Yanoff M, Duker JS. Ophthalmology. Mosby, 1999.
3. Abiose A, Adido J, Agarwal SC. Childhood malignancies of the eye and orbit in northern Nigeria. Cancer 1985; 55: 2889-2893.
4. Pam V, Mohammed I, Lali CA. Retinoblastoma in an adult: a case report West Afr J Med 1998; 17:280-283.
5. Shields C L. Shields JA. Shati P. Retinoblastoma in older children. Ophthalmol 1991; 98: 395-399.
6. Kanski JJ. Clinical Ophthalmology. 4th edition. Page 338.
7. Reese A: Tumours of the eye. Harper and Row, New York, 1963: 84.
8. Mullaney PB. Karcioglu ZA, Hauma AM, Al-Mesfer S. Retinoblastoma associated with orbital cellulites. Br J Ophthalmol 1998; 82: 5, 517-521.
9. Aboise A. Neoplasm in the eye – our role as women ensuring improved survival. Symposium on cancer, 1987: .4
10. Chinondu E, Palimaris G, Vehissaroponlous P. Retinoblastoma – Some aspects concerning diagnosis, heredity and treatment. J Paediatr Ophthalmol Strabismus. 1976; 16: 101-104.
11. Gerinex A. Successful treatment of retinoblastoma, Klimika detskej Oftalmologie DFNs PLF UK, Bratislava.

12. Finger PT, Czechonska G, Demircitt, Rausen A. Chemotherapy for retinoblastoma: a current topic. Drugs 1999; 58: 983-996.
13. Majekodummi AA. Causes of enucleation of the eye at Lagos University Teaching Hospital. A study of 101 eyes. West Afr J Med 1989; 8: 288-291.
14. Sanders BM, Draper G.J, Kingstone JE. Retinoblastoma in Great Britain, 1969-80 incidence, treatment and survival. Br J Ophthalmol 1988; 72: 576-583.
15. Eng G, Liff ADH. Mortality from second tumours among long-term survivors of retinoblastoma. J Natl Cancer Inst 1993; 85: 1122 – 1128.