INTRODUCTION

A considerable advances have been made in recent years in the diagnostic accuracy and management of ocular and orbital neoplasms (Rootman 1988).

Neoplasms in childhood have lately excited much attention and there are a number of interesting studies in recent literatures.

In many respects ocular and orbital neoplasms parallel the same kinds of lesion in other sites (Spencer, 1986).

AIM OF THE WORK

This study is aiming at visualization of the problem of childhood neoplasms and performance of an analytical approach to the subject.

PATIENTS AND METHODS

The present study is based on analysis of different ocular and orbital neoplasms in 120 children below the age of 15 years.

The diagnosis of these cases was based on clinical as well as on histopathological bases.

All children were admitted in the ophthalmic department at Assiut University Hospital between the years 1978 to 1991.

After a detailed history was obtained, clinical examination was carried out and included, ocular, orbital and systemic examinations. Blood analysis was performed when indicated. X-rays studies were performed in most cases. Since 1987 CT-scan was carried out for all lesions and supplemented in some cases with B-scan ultrasonography.

Following evaluation of the patient a decision was made either to wait and observe or perform surgery or non surgical therapy.

The type of surgery performed in this study was in the form of:

1. Biopsy for orbital lesions with unknown diagnosis.
2. Enucleation for malignant intraocular neoplasms with no evidence of extraocular extension or distant metastasis.
3. Orbitotomy (anterior or lateral) for benign intraorbital lesions that tend to threat vision.
4. Orbital exenteration for intraorbital malignancies without involvement of the orbital bones and without metastasis.
5. Debulking surgery for diffuse infiltrative lesions and frequently before non surgical therapy such as irradiation or chemotherapy.

Surgery was advised in some cases but the parents disregarded this advice.

Histopathological studies were done for all cases underwent surgery. The specimens were divided into 2 parts, each part was fixed in 10% formaldehyde and was referred to a separate Lab. follow up data were recorded.

RESULTS

The causes of ocular and orbital neoplasms are listed in table 1 in decreasing order of frequency and will be discussed in this order.

In view of the findings in table 1, primary intraocular retinoblastoma was the most common entity, it accounted for 42.5%. Even in orbital
neoplasms it maintained its highest incidence and constituted 38.8%. The overall incidence was 60%. Hemangioma was the second major category (13.3%) followed by Rhabdomyosarcoma (7.5%). Neurofibromatosis was the fourth in order of frequency (5.8%). Finally, glioma, meningioma, fibrous histiocytoma, neuroblastoma, leukemia, lymphangioma and undifferentiated sarcoma were rare in frequency.

<table>
<thead>
<tr>
<th>Lesion</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retinoblastomas</td>
<td>72</td>
<td>60.0</td>
</tr>
<tr>
<td>Ocular</td>
<td>51</td>
<td>42.5</td>
</tr>
<tr>
<td>Orbital</td>
<td>16</td>
<td>13.3</td>
</tr>
<tr>
<td>Recurrent</td>
<td>5</td>
<td>4.2</td>
</tr>
<tr>
<td>Hemangiomas</td>
<td>16</td>
<td>13.3</td>
</tr>
<tr>
<td>Capillary</td>
<td>10</td>
<td>8.3</td>
</tr>
<tr>
<td>Cavernous</td>
<td>6</td>
<td>5.0</td>
</tr>
<tr>
<td>Rhabdomyosarcoma</td>
<td>9</td>
<td>7.5</td>
</tr>
<tr>
<td>Neurofibromatosis</td>
<td>7</td>
<td>5.8</td>
</tr>
<tr>
<td>Optic nerve glioma</td>
<td>4</td>
<td>3.3</td>
</tr>
<tr>
<td>Intraorbital meningioma</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>Fibrous Histiocytoma</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Neuroblastoma</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Leukemia</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Lymphangioma</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>undifferentiated sarcoma</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>120</td>
<td>100</td>
</tr>
</tbody>
</table>

N.B : Recurrent retinoblastoma in this series included 5 children underwent enucleation elsewhere and they presented after a variable time with recurrent orbital lesions.

<table>
<thead>
<tr>
<th>Retinoblastoma</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>10+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocular</td>
<td>15</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>51</td>
</tr>
<tr>
<td>Orbital</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Recurrent</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
<td>12</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>72</td>
</tr>
</tbody>
</table>

**RETINOBLASTOMA**

The maximum incidence of retinoblastoma was seen in the first and second years of life (Fig. 1-A). The youngest child was 6 months old while the oldest was 9 years old. None was seen above the age of 10 years. Of the 72 patients seen with retinoblastoma 34 were girls and 38 were boys. Cases with orbital and recurrent retinoblastoma presented lately as shown in table 2.

None of the patients gave a family history of retinoblastoma. We had 2 sisters and 2 brothers in this series and their parents had normal eyes. In this group bilateral retinoblastoma was seen in 12 patients (10%) (Fig. 1-B) and there was no significant sex predilection.

The wide spectrum of retinoblastoma in 84 eyes is illustrated in table 3.

White pupillary reflex (cat's eye) (Fig. 1-C) was the initial clinical presentation in 43%. Advanced proptosis with orbital inflammation was the second mode of presentation in 19% (Fig. 1-D). Strabismus, uveitis, red painful eye, and poor vision were occasionally the first manifestations. Tragically, only few cases were discovered early on routine examination 8.3%.

In this series 54 eyes with retinoblastomas underwent surgical procedures. Their distribution is illustrated in table 4.

In the present study enucleation was performed for advanced monocular lesion and for eyes with the advanced neoplasm in binocular tumors. Exenteration was carried out for all orbital and recurrent lesions. Early cases whether unilateral or bilateral were treated by non-surgical therapy. The
Table 3: Clinical Presentation of retinoblastoma

<table>
<thead>
<tr>
<th>Presentation</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- White pupillary reflex (Leukokoria)</td>
<td>36</td>
<td>43.0</td>
</tr>
<tr>
<td>2- Proptosis with severe orbital inflammation</td>
<td>16</td>
<td>19.0</td>
</tr>
<tr>
<td>3- On routine examination</td>
<td>7</td>
<td>8.3</td>
</tr>
<tr>
<td>4- Strabismus</td>
<td>6</td>
<td>7.1</td>
</tr>
<tr>
<td>5- Uveitis</td>
<td>6</td>
<td>7.1</td>
</tr>
<tr>
<td>6- Red painful eye with secondary glaucoma</td>
<td>5</td>
<td>6.0</td>
</tr>
<tr>
<td>7- Recurrent</td>
<td>5</td>
<td>6.0</td>
</tr>
<tr>
<td>8- Poor vision</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>84</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4: Surgery of retinoblastoma

<table>
<thead>
<tr>
<th>Retinoblastomas</th>
<th>Surgical Procedures</th>
<th>No of Enucleation (%)</th>
<th>No of Exenation (No)</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocular</td>
<td>Enucleation</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>61.1</td>
</tr>
<tr>
<td>Orbital</td>
<td>Exenation</td>
<td>0</td>
<td>16</td>
<td>29.7</td>
<td>29.7</td>
</tr>
<tr>
<td>Recurrent</td>
<td>Exenation</td>
<td>0</td>
<td>5</td>
<td>9.2</td>
<td>9.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>Enucleation</td>
<td>33</td>
<td>21</td>
<td>38.9</td>
<td>100</td>
</tr>
</tbody>
</table>

Fig. (1) A- A child presented with retinoblastoma. B- A young girl presented with enucleated R. eye because of retinoblastoma and retinoblastoma in the L. eye. C- Leukokoria the commonest clinical presentation in retinoblastoma. D- Advanced retinoblastoma.

Fig. (2) A- Axial CT-scan illustrated calcification in an intraocular retinoblastoma. B- B-scan ultrasonographic image of intraocular retinoblastoma. C- Mixed exophytic, endophytic growth in retinoblastoma.
Fig. (3) A- Photograph of a child with deep orbital capillary hemangioma. B- The characteristic CT-scan picture of orbital capillary hemangioma. C- A girl had a rhabdomyosarcoma. D- The same girl in Fig 3-C after exentration.

Fig. (4) A- Neurofibromatosis in a 12 year-old boy. B- Neurofibromatosis with pulsating exophalalhes. C- The same child in Fig. 4-A after debulking surgery. D- The histopathological feature of neurofibromatosis.

Fig. 5 A: A child presented with benign fibrous histiocytoma and the CT-scan picture. B: The histopathological characteristic of benign fibrous histiocytoma. C: Recurrent benign fibrous histiocytoma. D: The same child in Fig. 5-C after exentration.

Fig. (6): Retinoblastoma in a young child misdiagnosed and treated as uveitis. huge number of exentration in this study was because many patients presented with late orbital involvement.

As regards the investigative examinations. X-rays revealed the presence of calcification when present. CT-scanning disclosed the anatomic pattern of the lesion and occasionally calcification (Fig.2-A) B-scan ultrasonography sometimes demonstrated solid pattern in early cases and cystic pattern in advanced cases(Fig.2-B).

Analysis of the macroscopic growth pattern in 63 eyes with retinoblastoma in the present study revealed that the mixed endophytic and exophytic type was the commonest 75%(Fig. 2-C). The endophytic pattern came next 22% while the exophytic type was rare 3%.

The histopathological studies revealed that true rosette formation was the commonest histopathological picture in early cases. Pseudo rosettes.
calcification and necrosis were a common findings in advanced lesions.

We had 2 cases underwent enucleation on the suspicion of retinoblastomas but the histopathological examination showed that they had endophthalmitis.

Adequate data for follow-up could not be obtained in all cases. The data could be taken in patients with postoperative problems and with complications related to irradiation.

In this study recurrent retinoblastomas were seen in 7 patients few months to 3 years after enucleation. Unfortunately all cases underwent enucleation died few years after surgery.

INFANTILE CAPILLARY MEMANGIOMA

Ten children with infantile capillary hemangiomas were seen (Fig. 3-A). The youngest was 6 months old, the oldest was 5 years old. 6 patients had superficial capillary hemangiomas involved the eyelids only (strawberry nevus). The tumor was bluish ill defined & compressible. We had 3 children of the combined type with lid component and orbital component. The diagnosis of both the superficial and combined types was made on its unique diagnosable features. The deep orbital type was seen in one child presented with compressible mild proptosis with spongy feel on palpation. CT-scan disclosed poorly circumscribed non infiltrative benign looking intraorbital mass (Fig. 3-B).

Seven children were lost to follow up, 2 children were safely observed and spontaneous involuion occurred after 2 and 5 years respectively. In the remaining child, partial tumor removal through anterior orbitotomy was required because proptosis led to exposure keratitis.

Cavernous hemangioma

We have seen 6 patients in this category. The youngest was 8 years old, the oldest was 15 years old. They presented with the characteristic very slowly growing unilateral proptosis. CT-scan demonstrated the characteristic well defined well encapsulated orbital mass, lateral orbitotomy and tumor delivery was required in 2 children developed optic nerve edema. The edema subsided few days after surgery. The remaining 4 children were observed periodically with no evidence of progression.

Embryonal Rhabdomyosarcoma

It was the most common and the most aggressive primary malignant orbital neoplasm. 9 cases were seen in this series 7.5%. The clinical diagnosis was confirmed histopathologically in all cases. All except one were treated by irradiation. The remaining child which was the first case in this group (Fig. 3-C) was treated by orbital exentration (Fig. 3-D).

NEUROFIBROMATOSIS

We have encountered with 7 cases of neurofibromatosis (5.8%). All presented with unilateral diffuse involvement of the entire orbit with thickening and deformity of the eyelids (Fig. 4-A). The average age was 9 years. Cafe au lait patches were seen in all cases. Pulsating proptosis due to bone defect was noted in one child (Fig. 4-B). Two children had optic atrophy and motility disturbances. In one child the tumor extended to the temporal fossa due to bone defect. In another child neurofibromatosis was accompanied with glioma of the optic nerve.

Debulking surgery was performed in 3 children and the cosmetic results were satisfactory (Fig. 4-C).

Grossly the tumor was firm white in colour and not encapsulated. Histopathologically it was consisted of diffuse bundles, each bundle was made of Schwann's cells axons and endoneural fibroblast and surrounded by cellular perineural sheath (Fig. 4-D).

PRIMARY INTRAORBITAL GLIOMA

In our group 4 children below the age of 6 years were seen in this category. Visual loss preceded the appearance of proptosis in all cases. Proptosis was characteristically axial, mild and slowly progressive. CT-scan demonstrated fusiform enlargement of the optic nerve with smooth well defined intact dural covering. In one child glioma was associated with neurofibromatosis. Three children had useful vision and they required only observation. The remaining child presented with complete visual loss and skull radiographs revealed widening of the optic canal. Although CT-scan demonstrated no intracranial extension, resection of the involved nerve was carried out through lateral orbitotomy to prevent tumor spread to the CNS.
Primary intraorbital meningioma

Of this entity we saw 3 cases. They characterized by slowly progressive unilateral proptosis always preceded by signs of optic nerve compression. CT-scan revealed swelling of the optic nerve with irregular margins. X-rays examinations showed the absence of hyperostosis in the three children.

The 3 patients were observed for several years without evidence of progression in proptosis.

**BENIGN FIBROUS HISTIOCYTOMA**

We had 2 patients presented with benign fibrous histiocytoma. The first child was 38 months old, he had a slowly progressive unilateral proptosis with limitation of the ocular motility (Fig. 5-A). CT-scan disclosed a large oval extraconal mass without bone changes (Fig. 5-A). Biopsy was performed and the histopathological feature was that of benign fibrous histiocytoma which was consisted of benign-looking histiocytic cells mixed with elongated fibroblastic cells and arranged in a cartwheel pattern (Fig. 5-B).

Complete excision of the tumor could be performed through anterior orbitotomy. Grossly the tumor was grey, soft, friable and non encapsulated. Follow-up could be made for 9 months and the child seemed well with no signs of recurrence.

The second child was a 12-year-old boy presented with a painful firm mass at the region of the lacrimal sac. The histopathological examination of a biopsied material from the lesion revealed that it was benign fibrous histiocytoma. Wide excision of the lesion was performed. Seven months later, the child came to the hospital with an infiltrative lesion involved the whole orbital cavity (Fig. 5-C) and destroyed the globe completely to the extent that it made orbital exenteration the only accepted therapy (Fig. 5-D).

**NEUROBLASTOMA**

In this study 2 children with neuroblastoma were seen. They had unilateral proptosis associated with severe edema of the eyelids and ecchymosis. The orbital lesion preceded the diagnosis of the primary lesion in both conditions. The suprarenal gland was the primary site. The diagnosis of neuroblastoma was confirmed by biopsy.

**ACUTE LYMPHATIC LEUKEMIA**

We have 2 children in this category one had bilateral proptosis and the other presented with unilateral proptosis. The clinical manifestations were quite similar to orbital neuroblastoma. Blood analysis revealed the cause.

**LYMPHANGIOMA**

Two young children with lymphangiomas were seen in this series. They presented with unilateral proptosis. B-scan ultrasonographic studies illustrated a mass with irregular outline and containing a large cystic spaces filled with clear fluid. The clinical diagnosis was confirmed histopathologically in one child developed sudden increase in proptosis that required partial excision of the lesion.

**UNDIFFERENTIATED SARCOMA**

We had one child presented with rapid aggressive proptosis. The histopathological examination showed that undifferentiated sarcoma was the underlying etiology.

**DISCUSSION**

As regards the philosophy of listing diseases, it is only useful to provide some broad concept of the overall incidence. All the clinicopathological series should be viewed in the context that any series is biased by factors of regional epidemiology, classification, referral pattern and the need for biopsy (17-18).

**RETINOBLASTOMA**

As noted by Ali, Brown and Harley (24'8), we had also noted that retinoblastoma was the commonest primary intraocular malignant neoplasm.

According to the statement of Daune: (6) retinoblastoma is responsible for approximately 1% of all death from cancer in the age group under 15 years.

Its incidence has been doubled in the last 50 years. This change in the incidence is related to an increasing in the gene pool as a result of prolonged survival and increased mutation rate related to environmental factors (Rootman) (17).

In the present study bilateral retinoblastoma was found in 10% of cases. The bilaterality of retinoblastoma is a common feature. In review of several pediatric series by Harley, Kodilinye and Stannard (8'12-19) its incidence ranged from 10:30%. The occurrence of the disease in the fellow eye is due to independent foci (12). Our findings concerning male /Female ratio confirmed the observation made by El-Massri, Harley and Rootman (78'17). All patients in this study could be...
considered as sporadic, because the relatives were not affected by the disease and the parents had normal eyes. This could be attributed to the fact that in the developed countries none of the patient survive to reach the reproductive age to produce retinoblastoma offspring(12).

In the present study, white pupillary reflex (leukokoria) was the initial mode of presentation in 43%. This clinical presentation was also the first presentation seen by other authors, Ayoub & Shoukry and Stannard(3'9). Surprisingly the second mode of presentation was proptosis with advanced orbital involvement 18%. This clinical presentation was rarely seen in advanced countries(8) but commonly seen in developed countries(2'12).

The late presentation in our series occurred because children were very difficult to be examined and the ominous significance of the white pupillary reflex usually was not appreciated by the parents, frequently, they thought to be cataract and may be ignored for several years. Furthermore, red painful eyes with secondary glaucoma were frequently treated as uveitis before the correct diagnosis was made(Fig. 6).

The most significant factor in treatment of retinoblastoma is the stage of the disease at the time of treatment is undertaken. When the disease has spread outside the eye into the orbit, there is little chance for cure. With systemic dissemination the prognosis is completely hopeless.

As noted by many authors(2'4'6'9) we had also noted that the mixed multifocal growth of retinoblastoma was the main growth pattern and the true rosette formation was the commonest histopathological picture.

It should be mentioned, that diagnostic errors sometimes occur because intraocular biopsy is difficult and the diagnosis is usually based on clinical and diagnostic tests.

Whereas the mortality rate of retinoblastoma in advanced countries ranged from 10 : 20%(6'17). It ranged from 90 : 100% in developed countries(12). In our series the mortality rate in group of patients underwent enucleation was 100%.

INFANTILE CAPILLARY HEMANGIOMA

It is one of the most common tumors in infancy, although it is congenital it may appear late in childhood. Its incidence varies among different childhood series from 9 : 26%(8'15). In our series its incidence was 8.3%. The best treatment is to wait for spontaneous involution. Surgery should be limited to the non involuted type if it is associated with complications. Repeated intralcaleral steroid injection is not recommended in young infants(6).

Rhabdomyosarcoma

It is a well recognized fact that the orbit is one of the principal site for rhabdomyosarcoma(11). Our findings concerning its incidence confirmed the observation of Daune(6) that rhabdomyosarcoma is the most common primary malignant orbital neoplasm in childhood. The proptosis associated with rhabdomyosarcoma was virtually unseen in any other primary orbital malignancy. Until recently the outcome was rapidly fatal. The road to recovery was paved by the introduction of irradiation and chemotherapy.

Neurofibromatosis

Both diffuse and plexiform neurofibromas commonly occur in the orbit with variable incidence among different childhood series from 1.5 : 4%(8'17). Although it is congenital it may appear in late childhood. The average age in our series was 9 years. The absence of orbital bones was a characteristic feature Mortada(14). The clinical manifestations of neurofibromatosis is governed by its anatomic pattern of location.

Intraorbital glioma

Gliomas appear to have a self-limited pattern of growth and morbidity(9). Usually the clinical diagnosis was sufficient to permit appropriate diagnosis without necessitating biopsy(6). In most cases no therapy was required apart from observation. Resection of the involved nerve should be limited to progressive lesion once useful vision has gone. Practically speaking it has a good prognosis for life but a bad one for sight(15).

Primary intraorbital meningioma

It has a singular predilection for pediatric age group but rarely encountered(5). The reported incidence varies among different childhood series from 0% to 2.3%. Its growth is generally measured in years. Hyperostosis was absent in our series and was extremely rare in Wright's(20) series. The major reasons for surgical interventions are evidence or risk to spread to the CNS and aggressive growth with visual deterioration.
BENIGN FIBROUS Histiocytoma

This rare mesenchymal tumor is very rarely encountered in the orbit.(13) In review of several major pediatric series(6’8’18) no single case was reported. In few series only one case was found(17). In the present study we saw 2 cases. Radiotherapy is ineffective and its management is essentially surgical and should be aimed at complete excision to prevent recurrence.

ORBITAL NEUROBLASTOMA AND LEUKEMIA

Metastatic neuroblastoma and acute lymphatic leukemia were rarely seen in the orbit. Sometimes orbital lesion declare itself before the primary tumors manifest themselves Mortada.(14) It was striking that no single case of clinical metastasis from a tumor elsewhere to the eye of an infant either in this study or in review of literature. It seems that the local environment in the child’s eye is unsuitable for metastasis (1).

LYMPHANGIOMA

This uncommon congenital tumor usually affects the eyelids and rarely involves the orbit.(6) The fluctuating course is typical of orbital lymphangioma.

CONCLUSION

1- When all is said and done a good analytical approach is the best tool for patient cure.

2- The key to successful management is to provide the maximum effective therapy with the minimum amount of delay.

3- Surgery should be non-destructive. It should be a fine art.

REFERENCES


(5) Deen H.G., Schettauer B.W. and Ebersold M.J.: Clinical and pathological study of meningiomas of the first 2 decades


