Original article

Pediatric case series in an ophthalmic camp in Turkana (Kenya)☆

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ABSTRACT

Introduction: Turkana is the largest district in Kenya, situated in the Northwest of the country. It features a semi-nomadic population of 850,000. Around 60% of population lives below the poverty threshold. The ratio of doctors is 1:75,000 inhabitants. Five ophthalmologists took part in the last deployment in November. Local staff had previously selected the patients from the rural areas, as well as in Lodwar, the capital of the district. Of the 371 patients who attended the clinic, 128 required surgery.

Objective: To describe the pediatric population attended to in the last “Turkana Eye Project” Camp.

Methods: Description of the ophthalmic pathologies of the children seen in the clinic in this surgical camp, and the diagnostic and therapeutic options according to the limitations of the environment.

Results: Of the 371 patients, 54 were younger than 15 years old (14.5%). Four children had surgery (3.25% of the 128 patients). In 2 more cases surgery was indicated but not performed. Therefore, of the total of 54 cases, 6 could be considered as surgical (11.1%), and 17 suffered ophthalmic problems other than refraction defects, or mild ocular surface pathologies: traumatic cataracts, neuropathies, impetigo, exophthalmos, retinal dystrophies, dermoid cysts, or nystagmia. The etiology was traumatic in four of the 17 children (23.5%).

Conclusion: Surgical camps are increasing in the developing countries. They are usually focused on particular pathologies, such as cataracts or trachoma. Our case series shows the importance of pediatric teams and the need to be prepared to face complex pediatric pathologies.

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Serie pediátrica en una campaña oftalmológica en Turkana (Kenia)

RESUMEN

Introducción: Turkana es el distrito más grande de Kenia, situado en el extremo noroeste. Su población está en torno a 850.000 habitantes seminómadas dedicados principalmente al pastoreo. En torno al 60% de la población vive por debajo del umbral de la pobreza. La proporción de médicos por habitante es de 1:75.000.

La última campaña realizada en Turkana en noviembre de 2011, con un objetivo puramente quirúrgico, contó con cinco oftalmólogos. La selección previa fue realizada acertadamente por personal local en áreas rurales y en Lodwar. Se realizaron 128 cirugías (123 pacientes) sobre 371 pacientes vistos en consulta.

Objetivo: Describir la población pediátrica atendida en la última campaña del proyecto oftalmológico en Turkana.

Método: Descripción del perfil de afecciones oculares presentadas por los niños atendidos durante esta campaña quirúrgica. Se expondrá la actitud diagnóstico-terapéutica tomada con relación a las limitaciones impuestas por las características del lugar y de la población.

Resultados: De un total de 371 pacientes vistos en consulta, 54 eran menores de 15 años (14,5%); cuatro fueron intervenidos, del total de 123 pacientes operados (3,25%). En dos niños más se indicó la cirugía, por lo que seis de los 54 casos se podrían considerar quirúrgicos (11,1%).

De los 54 niños atendidos, 17 sufrían enfermedades distintas a defectos de refracción o problemas leves de superficie ocular: cataratas traumáticas, impético, neuropatías, proposis, distrofas retinianas, tumores dermoides, nictalopía... En 4 de los 17 niños, la causa eran traumatismos (23,5%).

Conclusiones: Las campañas quirúrgicas en países en vías de desarrollo están en auge, aunque suelen ir enfocadas a tratar afecciones concretas como las cataratas o el tracoma. Esta serie muestra la necesidad de ir equipados para intervenir a menores de edad y de estar preparados para la complejidad de la situación que pueda surgir.

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Introduction

The Turkana Eye Project began its commitment in 2003 in the Turkana region of Kenya. Considered to be one of the poorest regions in Africa, the 1999 census estimated a population of 450,860 inhabitants, although it is now estimated to be in the area of 850,000. The proportion of physicians per inhabitant in the region is of 1:75,000 and the entire population shares a single ophthalmologist with 2 other provinces. The Turkana people are grouped in nomad or semi-nomad tribes whose main livelihood is derived from grazing. According to the Welfare Monitoring Survey, 2000 (WMS-III), approximately 60% of the population lives below the poverty line, with an income estimated in 17 euros a month. In 2000, the amount of blind children in the world was estimated at 1.4 million, half of them for avoidable causes. Over 90% of these cases occurred in developing countries, and in some regions the mortality rate of these blind children reached 60% per annum. In sub-Saharan Africa and some regions of Asia, vitamin A deficiency is one of the main causes of pediatric ocular disease due to malnutrition and poor health conditions which facilitate infections.

The latest campaign, carried out in November 2011, was designed with a surgery objective because cataract and corneal opacities are the main cause of blindness in adults. In contrast with previous occasions, the project did not participate in the mobile clinic that throughout the year distributed vitamin A and routinely carried out ophthalmological examinations of children in rural area schools. In this campaign, the local clinical officers had already visited rural areas selecting patients for subsequent surgery.

The objective of this paper is to describe the range of pediatric ocular diseases that an ophthalmologist might have to face in an ophthalmological campaign in developing countries.

Subjects, materials and methods

A transversal study comprising 371 patients of various rural areas in the Turkana region, previously selected for surgery by local personnel with ophthalmological training (clinical officers, ophthalmological nurses). To this end, said personnel utilized visual acuity scales and portable slit lamps for exploring the anterior pole to diagnose drop keratopathies and cataracts, the targets for said campaign. However, if patients attend the surgeries with visual symptoms unfamiliar for the ophthalmologist, they are transported to Lodwar for assessment by the ophthalmology team. Pediatric patients were all those under 15 years of age. The ophthalmological exploration was performed by a group of ophthalmologists experts in pediatric disorders supported by local personnel. The ocular examination included visual acuity measurement with the
E Snellen optotype in children over 5, intrinsic and extrinsic ocular motility, anterior pole assessment by a fixed slit lamp or torch, funduscopy with indirect ophthalmoscopy and refraction under cycloplegia. Significant ophthalmological disorder was taken to be any disorder other than refractive problems or slight ocular surface disorders.

Slight ocular surface disorders were given full topical treatment without subsequent assessments. Patients with significant refractive defects were given optical correction prescription, even though spectacles could be obtained only ordering them from Nairobi or waiting for a campaign which included on-site spectacle manufacturing with beveler.

Results

Out of the 371 patients who visited the consulting room, 54 were under 15 years of age (14.5%). Of these, 6 were considered to be surgical patients (11.1%) and 4 were finally intervened (7.41%), representing 3.25% of the 123 patients who were surgically intervened. The 4 children were operated under general anesthesia, one for eyebrow tail cyst (case 1), 2 for traumatic cataracts (cases 2 and 3, Fig. 1) and one for limbar dermoid (case 17). In both cataract surgeries the surgical technique was lens aspiration by means of tunnelized superior scleral incision, intraocular lens implant and anterior vitrectomy. Case 10 was a girl with endotopia having 1-year evolution and myopic astigmatism. Case 13 exhibited significant horizontal torticollis associated to sensory nystagmus. In both cases surgery was indicated but without priority over other cases with options for functional improvement.

Out of the 54 children who were attended, 37 (68.52%) exhibited refraction defect or slight ocular surface problem, and 17 children (31.48%) suffered more significant disorders (Table 1). In 4 cases, two cataracts (cases 2 and 3), one hyphema (case 4) and one previously eviscerated girl (case 15), etiology was traumatic (23.5%). The clinical criteria and limited anamnesis were the only diagnostic instruments available, and for this reason cases such as bilateral keratouveitis (case 9), bilateral optic atrophy (case 5), cortical blindness associated to microcephalia (case 8) or retinal dystrophy (case 13) could not be intervened.

Case 7 visited due to bilateral proptosis with several months of evolution (Fig. 2). Visual acuity, internal and external motility and ocular fundus exploration were normal. This child, age 10, exhibited axial and symmetrical slight exophthalmos and bilateral palpebral retraction, without further complications. In the absence of papillary atrophy and without signs of craniosynostosis or neurofibromatosis, Graves disease was suspected and for this reason pediatric assessment was requested. While hypothyroidism was confirmed, the child was given medical treatment for cardiac arrhythmia.

Case 11 exhibited erosions with superficial crusts and ulcers in the skin around the upper and lower eyelids of both eyes. An infectious origin was suspected (impetigo) and the patient was given oral treatment with azithromycin and local cures every 2 days, with cleaning of injuries and antibiotic in cream (Fig. 3).

Case 12 was a 6-year-old child who visited due to an intense ciliary reaction in the right eye. Biomicroscopy revealed the presence of a large corneal ulcer with leukomatosus core fluorescent pseudo-dendritic edges. In the anamnesis assisted by a translator, we learned that the child had been taken to a local healer due to a foreign object in the eye and was given “treatment” with sugar-based creams and tobacco paste. Clinic improved with topical treatment with cyclopentolate, ofloxacin and artificial tears.

Case 15 came to the practice the last day of the campaign (Fig. 4) exhibiting right eye exophthalmos and left eye evisceration, with abundant purulent secretion. This girl, age 6, had suffered a traumatism in the left eye 2 years earlier and was taken to Nairobi. Since then, nobody had withdrawn the prosthesis. The arbitrary cavity exhibited good sac fundus, without exposure of the internal processes but multiple conjunctival granulomae. The only therapeutic approach we could take at the time was to clean the cavity, replace the prosthesis by an external one and provided topical and oral antibiotic and anti-inflammatory treatment to the patient. The exophthalmos was in the context of trigonoccephaly type craniosynostosis.

Case 16 was a 4-year-old girl who lived in an orphanage, where the nuns had observed bilateral opacities in the peripheral cornea identified in slitlamp as a broad bilateral posterior embryotoxon. Intraocular pressure was of 18 mmHg in the right eye and 19 mmHg in the left eye, while the cup-papilla ratio was of 0.7 in both eyes. Considering the possibility of an Axenfeld-type anomaly with associated juvenile glaucoma,
### Table 1 – Ocular findings and therapeutic approach for the 16 main cases seen during the ophthalmological campaign.

<table>
<thead>
<tr>
<th>Child</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Ocular pathology</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>8</td>
<td>Eyebrow tail cyst</td>
<td>Extirpation</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>5</td>
<td>Traumatic cataracts</td>
<td>SLIMCE + IOL + AV</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>12</td>
<td>Traumatic cataracts</td>
<td>SLIMCE + IOL + AV</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>13</td>
<td>Traumatic hyphema</td>
<td>Topical</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>4</td>
<td>Bilateral optic atrophy + bobbing</td>
<td>Referred to school for the deaf</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>4</td>
<td>Iris heterochromia + pigment retinitis + deafness</td>
<td>Medical, for cardiac arrhythmia</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>10</td>
<td>Bilateral proptosis</td>
<td>Medical, for cardiac arrhythmia</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>8 months</td>
<td>Microcephalia + central blindness + bilateral papilla paleness</td>
<td>Medical, for cardiac arrhythmia</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>4</td>
<td>Bilateral keratouveitis</td>
<td>Topical</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>4</td>
<td>Endotropia</td>
<td>Surgery indication</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>8</td>
<td>Impetigo</td>
<td>Oral Azithromycin + cures</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>6</td>
<td>Dendriform corneal ulcer due to sugar-tobacco</td>
<td>Topical</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>12</td>
<td>Retinal dystrophy + poor vision + nistagmus + torticollis</td>
<td>Surgery indication</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>5</td>
<td>Nystagopia + Bitot spots</td>
<td>Vitamin A, 200,000 IU: one dose immediately, one dose the following day and one dose at 2–4 weeks</td>
</tr>
<tr>
<td>15</td>
<td>F</td>
<td>6</td>
<td>Proptosis RE and evisceration due to LE trauma</td>
<td>Azithromycin + NSAID + topical</td>
</tr>
<tr>
<td>16</td>
<td>F</td>
<td>4</td>
<td>Posterior embryotoxon + IOP RE 18 LE 19 mmHg + E/P 0.7</td>
<td>Travaoprost</td>
</tr>
<tr>
<td>17</td>
<td>M</td>
<td>1</td>
<td>Limbar dermoid</td>
<td>Extirpation</td>
</tr>
</tbody>
</table>

NSAID: nonsteroid anti-inflammatory drug; F: female; IOL: intraocular lens; M: male; RE: right eye; LE: left eye; IOP: intraocular pressure; SLIMCE: sutureless large-incision manual cataract extraction; UI: international units; VA: anterior vitrectomy.

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**Fig. 3** – Case 11. Child, age 8, with impetigo at diagnostic and 1 week after beginning treatment.

**Fig. 4** – Case 15. Child, age 6, with trigonocephaly and axial proptosis in the right eye. She visited the practice with abundant purulent secretion around the prosthesis which was inserted 2 years before. All we could do was local cures and place an external prosthesis to at least improve the esthetic appearance up to the following campaign.
the patient was provided with sufficient travoprost for daily topical treatment until the next campaign.

Discussion

In 2003 a descriptive study was carried out in Ethiopia aimed at finding out the causes of poor vision in 312 students children in 3 schools for the blind. The published report indicated cornea/phthisis as the most frequent anatomic location (62.4%), followed by the optic nerve (9.8%), cataracts/aphakia (9.2%) and uveal injuries (8.8%). In what concerns etiology, the 3 most important causes were xerophthalmia due to vitamin A deficiency (31%), measles (13%) and congenital cataracts (7%). A similar study carried out in Malawi, Kenya and Uganda found that corneal involvement due to vitamin A deficiency and measles, cataracts and retinal diseases were the most prevalent causes. Due to the high prevalence of xerophthalmia in the Turkana region, since 2003 when the project began 200,000 IU of vitamin A were distributed 3 times a year in schools by local personnel trained in nutrition. This would explain that only one child in the entire series had nyctalopia associated to conjunctival Bitot spots due to vitamin A deficiency. Said vitamin A distribution campaigns have succeeded in displacing xerophthalmia as the main cause of pediatric blindness in the sub-Saharan countries such as Uganda, Tanzania and Nigeria.

The World Health Organization (WHO) has estimated that 12.8 million children between 5 and 15 years of age have visual disabilities due to incorrect refraction defects. Both in Asia and sub-Saharan Africa the most frequently found refractive defect is myopia. However, in Turkana very few people can afford spectacles which in any case must be ordered from Nairobi and in addition occlusive treatment cannot be considered for treating any cause of amblyopia. It is not practical either to consider prematurity retinopathy as could be the case in other developing countries.

In 2001 a series of 215 children operated for traumatic cataracts in Nairobi was published. The most frequent causes were traumatism due to sticks and thorns. The 2 children who underwent surgery during our campaign had perforations due to acacia thorns. In all cases it is recommended to implant an intraocular lens because the adaptation of a contact lens is unfeasible. We are not aware of the visual results of our treatments due to the inadequacy of adequate follow-up but in this series 65% of children achieved vision exceeding 20/60. Another series of traumatic cataracts in Africa described that the posterior capsule was perforated in 38% of cases, as in the second of our cases, in which the perforation was increased by the sharp tip of the thorn. The other case was inter- vented for posterior capsulotomy with vitrectome due to the patient age and the impossibility of following up. In both series the most frequent complication was fibrinoid anterior uveitis in the immediate post-surgery period in approximately 40% of cases. None of our cases exhibited significant inflammation the day after surgery. We recommend posterior capsulotomy in all children due to the higher frequency of secondary posterior capsulotomy, together with follow-up limitations. One of the main limitations for carrying out these surgeries is the need of an anesthetist which, in this campaign, were regional Hospital workers. Pre-anesthesia studies are not performed and the main precaution we took was to avoid surgery on children with bilateral congenital cataracts due to the risk of associated neurological disorders.

Case 13 exhibited poor vision with nystagmus and toricollis associated to retinopathy and psychomotor retard. Funduscopy revealed hypopigmentation in spots predominantly in the mid-periphery. In addition to retinal dystrophy, differential diagnostic should consider malaria due to *Plasmodium falciparum*. Among retinal involvements, hypopigmentation in spots is most prevalent and appears in 50% of children with brain conditions caused by malaria.

In the case of the child with iris heterochromia, deafness and RPE alterations (Fig. 5), a differential diagnostic should be carried out to include several syndromes, mainly the Usher and Waardenburg syndromes. The former is associated to deafness with pigmented retinitis which usually courses with progressive visual deterioration, although in types II and III retinopathy can have delayed onset. However, iris pigmentation anomalies have not been described and are distributed mainly in the European or Jewish populations. In the Waardenburg syndrome type II, neurosensory deafness (77% of cases) and iris heterochromia (47%) are the main findings. Retinal pigment alterations, either hypopigmentation or spotted pigmentation, have also been described in these children but without repercussions on the visual function and fit better in the profile clinic of our case. In northern Nigeria, 0.6% of deaf children exhibited the Waardenburg syndrome.

The differential diagnosis of proptosis in children is broad, having to discard tumors and orbital abcesses, above all in subacute and unilateral cases. In an Australian series comprising 57 children with proptosis, the main causes described in order of frequency were orbital cellulitis (39%), thyroid disease (14%), optic nerve gliomas (14%) and other tumors to a lesser extent. In Nigeria, 19% of retinoblastomas express with proptosis.

Graves disease is rare in children and ocular expressions even more so (described in 17% of cases in a series comprising 152 children). The majority of signs are slight although up to 7% of children exhibited proptosis and 4% palpebral retraction (Fig. 2). Cases with strabismus or optic neuropathy are exceptional.
Sporadic optic nerve gliomas are rare and unilateral. However, up to 15% of children with neurofibromatosis type 1 have gliomas. In a review of 69 children with NF1 and gliomas, only 12 cases were symptomatic: two forms with proptosis and even though 5 children had both optic nerves involved, none presented unilateral proptosis. The mean age at diagnosis was 20 months. Accordingly, as in both cases, proptosis was bilateral and symmetrical and considering the absence of cutaneous stigmata, iridial nodules and optic atrophy, neurofibromatosis was not considered in the differential diagnosis.

Premature closures of cranial sutures give rise to a range of malformations known as craniosynostosis. Bilateral proptosis with predominant premature closure of the sagittal suture without associated syndactylyia points toward trigonocephaly in case 15 (Fig. 4). Out of 182 children who were seen due to ocular trauma in Nairobi, 7 (4%) were eviscerated/enucleated. In general, the visual results of childhood ocular trauma series were considered to be poor, partly due to the delay in visiting a specialized center and the poor attention received in the reference center.

Surgical campaigns in developing countries are on the rise, although they generally focus on specific conditions such as cataracts or trachoma. Pediatric involvement is a significant percentage in populations with high birth rates such as Turkana. The treatment of refractive defects is restricted by the difficulties in obtaining and paying for spectacles. However, the most striking development of this campaign, which was initially focused on cataract surgery, was the high percentage of pediatric ophthalmological involvement. This pediatric series is purely descriptive as it was unable to draw prevalence data for any disease or condition. The intention is to emphasize pediatric attention and therefore the authors suggest to all those who participate in ophthalmological campaigns to carry equipment for intervening children and to be ready for the complexity of the disorders which may be encountered.

Restoring the visual function as much as possible is crucial in these countries, in which children with moderate and even unilateral visual deficits are educated in special schools for the blind, thus limiting their social integration options.

Conflict of interests

No conflict of interests has been declared by the authors.

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