Original Article

**Indications for Destructive Eye Surgeries among
Children in a Tertiary Eye Care Center in North-Central
Nigeria: A Ten Year Review**

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ABSTRACT

This study assessed the indications for destructive eye surgeries (DES) among children and ascertained the proportion avoidable. The Eye theatre register was retrospectively reviewed. Data on children who had DES from 1st January 2008-31st December 2017 was retrieved. These included biodata; clinical presentation, diagnosis, indication and type of surgery, and outcome of management. The total number of paediatric ophthalmic surgeries within the study period was computed. The data were entered into Epi Info statistical software, version 3.4 for analysis. Descriptive and analytical statistics were applied, p-values < 0.05 were considered statistically significant. A total of 634 ophthalmic surgeries were performed on children within the study period, 50(7.9%) eyes of 49 children had destructive eye surgeries. Thirty-three (67.3%) were males and 16(32.7%) were females; M:F ratio was 2.1:1. The mean age was 6.7±5.0 years with a range of 1.7-11.7years (Mean±SD). Most, 27(55.1%) of the participants had evisceration, 15(30.6%) had enucleation while 7(14.3%) had exenteration. More males, 24(72.7%) had evisceration while more females 10(62.5%) had enucleation (Fisher's exact test=13.8, p=0.001). The main indications for DES included tumour in 22(44%) eyes, trauma to eyes in 13(26%) and intractable infections in 8(16%) eyes. All the 15 eyes enucleated were confirmed cases of retinoblastoma. Seven (14.3%) persons had orbital exenteration of which 6(85.7%) were retinoblastoma. In all, 42(84%) destructive eye surgeries in this study were avoidable. There is a need for improved enforcement of the "Child's Right Act" in our environment.

Keywords: Enucleation, Evisceration, Exenteration, Indications.

INTRODUCTION

Destructive eye surgery (DES) comprise evisceration, enucleation, and exenteration.¹ It is a surgical intervention offered when further retention of the globe is likely to either affect ocular and general health or jeopardize the patient's survival. Indications for DES are variable and does reveal the pattern of severe or end stage ocular morbidities

in a given community.² They also serve as an indicator of the causes of uniocular blindness in a particular environment. The removal of an eye is often a difficult decision for both surgeon and parents due to the enormous psychological sequelae that ensues. An eye could be lost suddenly due to trauma, infection or unsuspected malignancy. Affected patients and family

2018 Journal Impact Factor: 1.10
Print ISSN: 2636-7378 | Online ISSN: 2651-5865

members are often not adequately prepared to cope with the decision to have an eye removed. This is worse still when the second eye is a non-seeing eye. Apart from being the organ for sight, the eyes contribute immensely to an individual's overall appearance and self-image.

The surgical removal of the intraocular contents of the eye is termed "evisceration". The conjunctiva, sclera and orbital contents are not removed in the process. Indications for evisceration include intractable ocular infections, pthisis bulbi, an unsightly blind eye, and the need for prophylaxis against sympathetic ophthalmia following a globe rupture. Sympathetic ophthalmitis is an autoimmune, lymphocytic attack on the uveal tract of both eyes due to sensitization of lymphocytes to uveal tissue after a penetrating trauma to one eye.^{1,3} Evisceration of the ruptured globe before the onset of sympathetic ophthalmitis is of utmost importance. Thereafter, it has no beneficial effect.¹ A blind eye with intractable infection (endophthalmitis or panophthalmitis) is also a very important indication for evisceration. The procedure is least likely to enhance the spread of infection from the eye to the cerebrospinal fluid.⁴

Enucleation refers to the surgical removal of the eyeball from the orbit with severing of the optic nerve.¹ Indications include intraocular malignancy (e.g. retinoblastoma), a painful blind eye and unsightly blind eye.¹ In order to achieve acceptable cosmetic outcome and symmetrical growth of the face, both enucleation and evisceration are usually accompanied by surgical placement of an orbital implant.

Exenteration (which could be radical or modified) involves removal of the eyeball and all orbital contents which include the orbital fat, lacrimal gland, extraocular muscles, periorbital, eyelids and surrounding skin and bone in a varying amount. The procedure disfigures the patient with consequent devastating functional, aesthetic and psychological sequelae.⁵ Indications include potentially life-threatening malignancies arising from the eyeball, ocular adnexa, orbit and paranasal sinuses.

An audit of the indications of DES among children is useful in determining the proportion preventable. Destructive eye surgeries among the paediatric age group was last audited in our center 15 years ago.⁶ With the socio-political and economic changes that have occurred over time in states served by our institution, the indications for these procedures may have changed hence a need for another audit. Information obtained from this study will be used for further planning and implementation of promotive, preventive, curative and

rehabilitative eye care services with an enhanced paediatric eye care being of import in this regard.

MATERIALS AND METHODS

The Eye theatre register of the center was retrospectively reviewed. Data on children who had any form of destructive eye surgery from 1st January 2008-31st December 2017 was retrieved. These included bio data; mode of presentation, diagnosis, indication for surgery, type of destructive eye surgery and outcome of management. The total number of paediatric ophthalmic surgeries within the study period was also computed. The data obtained were categorized and entered into Epi Info statistical software, version 3.4 (Epi Info TM, Atlanta, Georgia, USA) for analysis. The data input was done twice to validate entries. Frequencies and percentages were determined for qualitative variables; mean and standard deviation were calculated for quantitative variables. Results were presented in form of tables and charts. Analytical statistics was used to test association between the variables. A 95% confidence interval was used, p-values <0.05 were considered statistically significant. Ethical approval was obtained from the Research Ethics Committee of the hospital.

RESULTS

A total of 634 paediatric (age ≤18years) ophthalmic surgeries were performed during the study period. Of these, 50(7.9%) eyes of 49 children had DES with an annual average of 5. One child had DES in both eyes.

Figure 1 revealed the highest and lowest proportion of DES among the paediatric age group were observed in the year 2008(17.7%) and 2016(3.9%) respectively.

Figure 1: Proportion of surgeries attributed to DES among children

Of the 49 children, 33(67.3%) were males while 16(32.7%) were females with a male:female ratio of 2.1:1 (Table 1). The mean age was 6.7±5.0 years with an age range of 1.7-11.7years (Mean±SD). The highest proportion of the study group 22(44.9%) were of the pre-school age group while only 4(8.2%) were of the senior secondary school age group (Fischer's exact test =12.5, p=0.01)

Table 1: Age-Sex distribution of the study population

Age Group(years)	Male		Female		Total	
	No	%	No	%	No	%
<1	0	0.0	1	6.2	1	2.1
1-5	13	39.4	9	56.3	22	44.9
6-10	5	15.2	6	37.5	11	22.4
11-15	11	33.3	0	0.0	11	22.4
16-17	4	12.1	0	0.0	4	8.2
Total	33	100	16	100	49	100

Most 27(55.1%) study participants had evisceration, 15(30.6%) had enucleation while 7(14.3%) had exenteration. A higher proportion 24(72.7%) of male participants had evisceration while a higher proportion 10(62.5%) of females had enucleation (table 2). Table 2 also revealed that a male child is 8 times (24:3) more likely to have an evisceration compared to a female child while a female child is twice (10:5) more likely to have an enucleation compared to a male. (Fisher's exact test=13.8, p=0.001)

Table 2: Distribution of type of destructive eye surgery by gender

Procedure	Male		Female		Total	
	No	%	No	%	No	%
Evisceration	24	72.7	3	18.8	27	55.1
Enucleation	5	15.2	10	62.5	15	30.6
Exenteration	4	12.1	3	18.8	7	14.3
Total	33	100	16	100	49	100

Table 3 showed the distribution of participants who had DES by age group and gender. There was no statistically significant difference in the age distribution of participants who had evisceration (Fischer's exact test =9.6, p>0.05) and that of participants who had enucleation (Fischer's exact test =6.1, p>0.05). All participants who had exenteration were aged ≤5 (Fischer's exact test =10.5, p<0.05).

Table 3: Age-sex distribution by type of destructive surgery

Age Group (Years)	Evisceration		Enucleation		Exenteration		Total No (%)
	Male No (%)	Female No (%)	Male No (%)	Female No (%)	Male No (%)	Female No (%)	
<1	-	-	-	-	-	1(33.3)	1(2.1)
1-5	7(29.2)	2(66.7)	3(60)	5(50)	3(75)	2(66.7)	22(44.9)
6-10	5(20.8)	1(33.3)	-	5(50)	-	-	11(22.4)
11-15	9(37.5)	-	2(40)	-	-	-	11(22.4)
16-17	3(12.5)	-	-	-	1(25)	-	4(8.2)
Total	24(100)	3(100)	5(100)	10(100)	4(100)	3(100)	49(100)

The main indications for destructive eye surgeries included tumour in 22(44%) eyes, trauma to 13(26%) eyes and intractable infections in 8(16%) eyes. Other indications included anterior staphyloma 4(8%), painful blind eye 2(4%) and phthisis bulbi 1(2%) (Table 4).

Table 4: Indications for destructive surgery (eyes)

Indication	Type of Destructive Surgery						Total	
	Evisceration		Enucleation		Exenteration			
	No	%	No	%	No	%	No	%
Tumour	-	-	15	100	7	100	22	44
Trauma	13	46.4	-	-	-	-	13	26
Infections	8	28.6	-	-	-	-	8	16
Anterior Staphyloma	4	14.3	-	-	-	-	4	8
Painful blind eye	2	7.1	-	-	-	-	2	4
Phthisis bulbi	1	3.6	-	-	-	-	1	2
Total	28	100	15	100	7	100	50	100

Of the 28 eyes that were eviscerated, trauma and infections were the main indications accounting for 13(46.4%) and 8(28.6%) eyes respectively (table 4).

Table 5: Indication for evisceration by age group and gender

Age Group (years)	Trauma		Infections		Anterior staphyloma		PBE		Pthisisbulbi		Total	
	M	F	M	F	M	F	F	M	M	F	No	%
1-5	2(20)	-	3(37.5)	-	2(66.7)	1(100)	-	-	-	1(100)	9	33.3
6-10	4(40)	1(100)	1(12.5)	-	-	-	-	-	-	-	6	22.2
11-15	2(20)	-	3(37.5)	-	1(33.3)	-	-	2(100)	-	-	8	29.6
16-17	3(20)	-	1(12.5)	-	-	-	-	-	-	-	4	14.8
Total	11(100)	1(100)	8(100)	-	3(100)	1(100)	-	2(100)	-	1(100)	27	100

*PBE: Painful blind eye

Twelve participants had evisceration due to trauma. Of these 11(91.7%) were males while 1(8.3%) was a female, with a male: female ratio of 11:1. This study showed that a male child is eleven times more likely to lose an eye from trauma than a female child. This finding was however not statistically significant (Fisher's exact test =5.2, $p>0.05$).

The causes of injury to the 13 traumatized eyes as shown in figure 2 included assault 5(38.5%), stick injury 4(30.8%), stone injury 2(15.4%), bomb blast 1(7.6%) and nail injury 1(7.6%). A seven year old male child had both eyes mutilated in an attempt to remove the eyes for ritual purpose.

Figure 2: Causes of trauma to 13 eyes

Eight (15%) children had evisceration due to intractable infection. Of these, 6(75%) had endophthalmitis and 2(25%) had panophthalmitis. All participants who lost an eye due to intractable infection were males with 3(37.5%) aged ≤ 5 years.

Fifteen (30.6%) children had enucleation due to intraocular malignancy; all were confirmed cases of retinoblastoma.

Of the 7 persons who had orbital exenteration 6(85.7%) had retinoblastoma and 1(14.3%) had rhabdomyosarcoma as confirmed by histopathology reports. Of the 6 cases of retinoblastoma that had exenteration, 5 presented with fungating mass and had chemo-reduction before DES. Up to 95.5% of malignancies observed in this study were retinoblastomas.

In all, at least 42(84%) of the DES in this study were avoidable.

DISCUSSION

In our center, there was a reduction in the mean age of children who had DES (6.7 years) compared to a previous report of 7.7 years; however the standard deviation of the age distribution essentially remained the same: 5.0 vs 4.7. A higher proportion (47%) of children aged 0-5 years had DES in contrast to 37.3% reported in our center 15 years earlier.⁶ The pattern of DES observed in our center remained unchanged with evisceration as the most common DES.⁶ However, this study revealed a change in the indications for DES among children in our facility with tumour accounting for (44%), trauma (26%) and infections (16%). This is at variance with what was observed 15 years ago which included trauma (34.3%), tumour (32%) and Infections (19.4%).⁶ Other more recent studies in Nigeria by Chinda *et al.*, Eze *et al.*, Enoch *et al.*, Ibanga *et al.*, and Adeoye *et al.*, all reported malignancy as the most common indication for DES among children.⁷⁻¹¹

The age distribution of ocular and adnexal malignant tumours is known to be bimodal with one peak during early childhood and another peak during adulthood. Retinoblastoma, Burkitts' lymphoma and rhabdomyosarcoma constitute the bulk of malignancies in childhood.¹² We observed that up to 95.5% of malignancies were retinoblastomas. Studies of orbito-ocular lesions in Nigeria and other African countries suggest that retinoblastoma remains the most common ocular malignancy among the paediatric age group.¹¹⁻²⁰ Retinoblastoma is the most common malignant ocular tumour of childhood, nonetheless it is quite rare at 1 in 20,000 live births. The tumour arises from primitive retinal cells so the majority of cases occur in children under the age of 4 years.²¹ Untreated, the tumour is almost universally fatal but with modern methods of treatment, the survival rate is over 90%. The best results are achieved when cases are referred to specialist centers where ophthalmologists, paediatric oncologists and radiotherapists collaborate in management.²¹

Of the 6 cases of retinoblastoma that had orbital exenteration (OE) in this study, 5(83.3%) presented late with fungating mass

and had chemoreduction before DES. The fact remains that OE does not produce a cure in most cases but controls local disease and thus prolong life when used in combination with other adjuvant therapies like chemotherapy and radiotherapy.²⁰ Early presentation and commencement of treatment can improve prognosis, save eyes and the patients' lives in the long term.²¹⁻

²² Ocular trauma was the second most common indication for DES observed in this study. Generally, children are more prone to severe ocular injuries due to their immature motor skills and their tendency to imitate adult behavior without anticipating the attendant risks.^{23,24} Eye trauma is the most common cause of unilateral blindness in children.²⁵ The number of serious eye injuries in children has been estimated at 11.8 per 100,000 per year,²⁶ at least 35% of serious eye injuries occur in children.²⁷ We observed that close to two-thirds (58.3%) of participants with ocular trauma were aged ≤ 10 years. This is in agreement with report of studies in both developing and developed countries that the majority of eye injuries occur in children under the age of 12 years.^{23,27-30} We also observed that a male child was eleven times more likely to lose an eye from ocular trauma compared to the female child. This is in consonance with findings by Kyari *et al.*, in Nigeria and other related studies from both developed and developing countries.^{23-24,31-32} In our setting, boys are generally allowed more liberty than girls and tend to spend more time outside with their peers, with less parental supervision. Boys are allowed and even encouraged to exhibit more aggressive behavior as part of their normal development.³³⁻³⁴

The main cause of ocular trauma as observed in this study was assault (38.5%). The cases of assault were due to fighting, flogging and ritual practice. Assault as an important cause of ocular injury among children was also reported by Onyekwe in Onitsha, Nigeria.³⁵ The child who fell victim of a ritual practice was attacked, abducted and had both eyes mutilated without anaesthesia. Such cases had been reported from our center in the past with a clarion call on ophthalmologists to advocate for the inclusion of Ritual Enucleation practices into the criminal and penal code laws of the Federal Republic of Nigeria, because as it is persons caught with this grievous offence are only charged with an offence of having caused bodily harm.³⁶ Enucleation for ritual practices will continue unless urgent steps are taken by to re-address the problem. The need for an improvement and enforcement of the "Child's Right Act" in our environment cannot be over-emphasized.

Stick injury (30.8%) was the second most important cause of ocular trauma. In most of our rural settings, children use

objects in their homes and neighborhood to make toys which include sticks, broomstick, nails among others. These objects are important causes of severe ocular injuries. The child's play environment should be devoid of sharp and dangerous objects.

Delay in seeking appropriate medical care which could be due to the use of home remedies, lack of recognition of the severity of the injury by parents and inexperience of the staff at primary health care centers contribute to poor outcome of management of such injuries. The need to make the child's environment devoid of dangerous objects and for improved parental supervision of children during playtime cannot be overemphasized. Ocular health promoting programmes which should include health education aimed at preventing ocular trauma and improving the health seeking behavior of the populace should be entrenched.

The slight decline in the proportion of DES attributed to intractable ocular infections over time is worthy of mention. It may be due to the effectiveness of preventive interventions such as the Expanded Programme on Immunization (EPI) which includes measles vaccination. This in addition to mass distribution of vitamin A and its supplementation in common food items may have remarkably reduced corneal disease due to vitamin A deficiency and measles keratopathy both of which could lead to intractable ocular infections.

Apart from the obvious ramifications of vision loss, significant problems also arise as a consequence of the cosmetic problems associated with disfigurement that often accompanies a DES. Children with one eye could be victims of stigma and thus could also have problems with social integration with peers. It is difficult to place an objective value or significance on this factor, but studies on the psychological consequences of DES suggest that these could be very severe.³⁸ The young patient must adjust to the altered body image for the most cosmetically crucial part of the body. Also, because direct eye-to-eye contact is the basis for communication and self-expression, and plays a role in social-interpersonal relationships, young anophthalmic patients must be encouraged to adjust their entire method of communication and social interaction, as well as their self-image.

Paediatric anophthalmic and microphthalmic sockets pose an additional challenge. The orbit makes up most of the mid-face. A normally growing eye stimulates expansion and development of the orbit until bony growth is complete. Orbits without normal sized eyes would become hypoplastic and cause ipsilateral facial hypoplasia.³⁸ Without treatment a 60% orbital volume deficit may occur. The treatment of an anophthalmic

socket should begin as early as possible. Modalities of treatment include early placement of sequential orbital expanders. Orbital implants could be in the form of a silicon sphere, hydroxyapatite or dermis fat grafting. (An expandable orbital implant that enlarges with saline injections is an alternative to sequential replacement of orbital sphere implants). Working in conjunction with an ocularist, who enlarges the fornices with conformers, is crucial. The amount of achievable orbital expansion is inversely proportional to the age at which the expansion begins. The child remains at risk for bony asymmetry until after the age of 13 years.³⁸ Parents/guardians need to be adequately educated on the need for adequate follow up during the post-operative period as a lot more need to be done through the long term post-operative period.

CONCLUSION

We observed that majority of destructive eye surgeries are avoidable and cases of malignancies still present late. There is a need for an improved enforcement of the “Child’s Right Act” in our environment. There is also a need for an improvement in the promotive, preventive, curative and rehabilitative eye care service delivery for children in our setting.

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