WEST AFRICAN JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Experience with Extra-capsular Cataract Exraction and Intra-ocular Lens Implant in Children

Expérience avec les extra capsulaire de la cataracte et Exraction intra oculaire Lens implants chez les enfants

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ABSTRACT

BACKGROUND: **In developing countries congenital cataract has become an important cause of treatable blindness in childhood. However, difficulty in correcting aphakia is one of the reasons for poor visual outcome.**

OBJECTIVE: **To determine the visual outcome after extra capsular cataract extraction and intra ocular lens implant and factors militating against good visual outcome in children.**

METHODS: **A prospective interventional study of cataract extraction in children with intra ocular lens implant. Extra capsular cataract extraction with intra ocular lens implant was performed using the superior limbal approach. Polymethyl Methacrylate lenses were inserted. Posterior capsulotomy was done with a 25G needle bent at the tip in 26 eyes.**

RESULTS: **Thirty two eyes of twenty five children aged between 4 months and 16 years were operated. Extra capsular cataract extraction with posterior chamber intraocular lens implant was done in 27 (83.4%) eyes, plain extra capsular cataract extraction in 3 (9.4%) eyes, extra capsular cataract extraction with anterior chamber intraocular lens implant in 1 (3.1%) eye and vectis extraction in 1 (3.1%) eye. Twenty six eyes had primary posterior capsulotomy. Thirty-two (100%) eyes and 15 (60%) children were blind before surgery. Result of post operative visual acuity in 18 children after refraction was 6/18 or better in 4 (22.2%) children 6/24-6/60 in 11 (61.1%) and< 3/60 in 3 (16.7%) children.**

CONCLUSION: **Visual rehabilitation following extra capsular cataract extraction with Intra Ocular Lens Implant is encouraging in children. WAJM 2010; 29(5): 309–313.**

Keywords: **Cataract Extraction, Intraocular Lens Implant, Children, Vision.**

RÉSUMÉ

CONTEXTE: *Dans les pays en développement de la cataracte congénitale est devenue une cause importante de cécité curable dans l'enfance. Cependant, la difficulté à corriger l'aphakie est l'une des raisons pour lesquelles le résultat visuel pauvres.*

OBJECTIF: *Déterminer le résultat visuel après extraction de la cataracte capsulaire extra et intra implant lentille oculaire et les facteurs qui militent contre le bon résultat visuel chez les enfants.*

MÉTHODES: *Une étude prospective d'intervention de l'extraction de la cataracte chez les enfants avec un implant intra oculaire lentille. Extra extraction capsulaire de la cataracte avec implant lentille intra oculaire a été effectuée en utilisant l'approche supérieure du limbe. Polyméthacrylate de lentilles méthacrylate ont été insérés. capsulotomie postérieure a été fait avec une aiguille 25G plié à la pointe dans 26 yeux.*

RÉSULTATS: *Trente-deux yeux de vingt-cinq enfants âgés entre 4 mois et 16 ans ont été opérés. Extra extraction capsulaire de la cataracte avec implant intraoculaire de chambre postérieure du cristallin a été réalisée dans 27 (83,4%) des yeux, plaine de l'extraction extra capsulaire de la cataracte dans 3 (9,4%) yeux, l'extraction extra capsulaire de la cataracte avec implant de chambre antérieure du cristallin intraoculaire chez 1 (3,1%) des yeux et l'extraction Vectis dans 1 (3,1%) des yeux. Vingt-six yeux avaient primaires capsulotomie postérieure. Trente-deux (100%) les yeux et 15 (60%) des enfants étaient aveugles avant l'intervention chirurgicale. Résultat du post acuité visuelle opératoire chez 18 enfants après la réfraction est 6 / 18 ou mieux en 4 (22,2%) des enfants 6/24-6/60 dans 11 (61,1%) et <3 / 60 à 3 (16,7%) des enfants.*

CONCLUSION: *la réadaptation visuelle à la suite d'appoint extraction capsulaire de la cataracte avec implant oculaire intra Lens est encourageant chez les enfants. WAJM 2010; 29 (5): 309–313.*

Mots-clés: *extraction de la cataracte, implant de lentilles intraoculaires, les enfants, Vision.*

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Abbreviation: **ACIOL,** Anterior Chamber Intraocular Lens; **AV,** Anterior Vitrectomy; **ECCE+IOL,** Extracapsular Cataract Extraction with Intraocular Lens Implant; **LAV,** Lensectomy with Anterior Vitrectomy; **PCIOL,** Posterior Chamber Intraocular Lens; **PPC,** Primary Posterior Capsulotomy;

INTRODUCTION

In developing countries where preventable causes of blindness in children have been reduced or eradicated, treatable causes such as childhood cataracts are becoming a burden. In countries where preventable blindness is prevalent cataract was the commonest treatable cause in schools for the blind.[1,2] In The Gambia preventable causes of blindness had been reduced as reflected in the prevalence of blindness which had decreased from 0.7% in 1986 to 0.4% in1996, age specific prevalence in children 0–9 years had become 0.02% comparable to that of developed countries.[3,4] It had been estimated that prevalence of blindness from cataracts in developing countries was about 1 to 4/10000 children.[5] In this setting; paediatric cataract blindness was problematic in terms of morbidity, economic loss and social burden. Prevention and management of childhood blindness is one of the goals of Vision 2020 a global initiative to reduce prevalence of blindness worldwide.

Cataract Extraction in Children

Cataract in children is not a miniature of adult cataracts. The aim of cataract surgery in children is to provide and maintain a clear visual axis and a focused retinal image without which the child would develop amblyopia.[6] In general the younger the child is at diagnosis the more impact it will have on vision. Children with bilateral congenital cataracts are at risk of having nystagmus which further reduces the prognosis of good visual outcome after cataract surgery. Children with unilateral cataracts develop amblyopia earlier than those with bilateral cataracts because of competition between the two eyes. When childhood cataract is not properly managed the number of blind years in the affected child is a burden to the family and society. In developing countries result of surgical treatment has been likened to what obtained in the developed countries thirty to forty years ago.[7] Then, post operative secondary glaucoma, unclear pupillary opening, and difficulty in correcting high hyperopia invariably resulted to blindness in the child. Recent advancements in ophthalmic surgery in the form of operating microscope for clarity of surgical field, finer and better instruments especially the vitrector, visco elastics and the intraocular lens have led to improvement in post operative visual acuity.

Various procedures have been used for surgery of paediatric cataracts: lens aspiration and extra capsular cataract extraction techniques which are, automated lensectomy with anterior vitrectomy (LAV), extracapsular cataract extraction with intraocular lens implant (ECCE+IOL) manual or automated with an intact posterior capsule), and ECCE, primary posterior capsulotomy, anterior vitrectomy with intraocular lens implantation ((ECCE+PPC+AV+IOL), manual or automated posterior capsulectomy with automated vitrectomy).[6] The method most suitable as suggested by Wilson *et al*[6] is ECCE,primary posterior capsulectomy and anterior vitrectomy when long term follow up is not possible and Nd:YAG laser is not available. Often times the method used depends on availability of modern instruments, the expertise of the surgeon, and avoidance of known complications. Modern cataract instruments are expensive for developing countries to afford. There is also the rarity of paediatric ophthalmic surgeons and so nearly all ophthalmologists in this setting operate paediatric cataracts. Cataracts in children in The Gambia are operated only in The Royal Victoria Teaching Hospital where there are ophthalmologists. The aim of this study is to find the visual outcome after cataract surgery in children in a developing country and factors affecting the outcome.

SUJECTS, MATERIALS, AND METHODS

A one year prospective study of cataract surgery in children aged 0–16 years from December 2005 to November 2006 was conducted at Royal Victoria Teaching Hospital The Gambia. The study was approved by the ethical committee of the Royal Victoria Teaching Hospital. The age, cause of cataract, family history, visual acuity, ocular and systemic morbidity pre surgery, type of surgery and visual outcome were analyzed. The time the parents or guardian noticed a white opacity in the eye was also recorded. Visual acuity was assessed in verbal children with Snellens E chart. In younger preverbal children visual acuity was assessed by preferential looking. The eyes were examined with bright pen torch in babies and toddlers. Older children were further examined with slit lamps. Where diagnosis was in doubt in young children, they were examined under general anaesthesia. The children's pupils were dilated with Tropicamide 1% for funduscopy. All children were sent for paediatric assessment. There was no attempt to calculate the intra ocular lens power as no instrument for lens selection was available.

Consultant ophthalmologists including NI and OO operated the patients.

Surgical Procedures

Surgical interventions included plain Extracapsular Cataract Ectraction (ECCE), Extracapsular Cataract Extraction with Posterior Chamber Intraocular Lens (ECCE /PCIOL), Extracapsular Cataract Extraction with Anterior Chamber Intraocular Lens (ECCE/ACIOL), and VECTIS extraction. Superior limbal approach was used and anterior capsulotomy made under visco elastic with a 25 g needle bent at the tip. Polymethyl methacrylate lenses were inserted. Powers of the posterior intraocular lenses ranged from 20 to 23 diopters which were the ones commonly available. The fashioned cystitome was used to make a small tear behind the intra ocular lens in the center of the posterior capsule. A vitrector was used only in the 4 months old child. The limbal incision was closed with interrupted sutures of 9/0 ethylon or 9/0 silk depending on availability. All the children had subconjunctival injection of gentamycin and dexamethasone. Post operatively the eyes were treated with cyclopentolate/phenylephrine eye drops, topical hydrocortisone 1% and gentamicin or chloramphenicol. When inflammation was moderate to severe topical atropine was added. Complications intra operatively and post operatively were recorded. Patients were followed up every two weeks until the inflammation subsided and thereafter every month until the child was cooperative enough to be refracted and prescribed glasses. Children were

included in the study if they came for at least three postoperative visits.

RESULTS

Out of 633 people who had cataract extraction during the study period 40 (6.42%) were in children. Twenty-five children who came at least three times after discharge were analysed. Their ages ranged from four months to 15 years with a mean of 8.4(4.4) years . There were 15 (60%) males and 10 females, M: F 3:2. There was a positive family history of congenital cataract in one(4%) child and positive consanguineous marriage in parents of 18 (72%) children. Fifteen (60%) children had bilateral cataracts and 10 (40%) had uniocular cataracts.

Aetiology of the cataracts included congenital in one (4%) child, developmental in 15 (60%) children, trauma in 8 (32%) children, and secondary to inflammation in one child (Table 1). Co-morbidity included microcephally one (4%), nystagmus three (12%) exotropia two (8%) and one (4%) has had both cataracts couched.

Three children with nystagmus had developmental cataracts, and the two with exotropia had past history of ocular trauma.

Six children with trauma presented within one month from the time of injury while two presented more than a year later. Fifteen (60%) children with developmental cataracts presented from one year to five years after noticing the opacity in the eye. One child with congenital cataract presented four months after birth because her elder brother also had congenital cataract which had been operated. It was common to find grandmothers escorting ill children to hospitals including those with cataracts. The pre operative visual acuities were counting fingers or less. All eyes (100%) and 15(60%) children were blind before surgery.

Thirty-two eyes of 25 children were operated. Fifteen (60%) children had bilateral cataracts of which eight children had both eyes operated while seven had surgery in one eye. Two of these seven un-operated eyes had inoperable cataracts. Twenty-four (96%) children were operated under inhalational general anaesthesia, while one 14-year-old child had surgery under local anaesthesia.

Concerning the operations extra capsular cataract extraction (ECCE) with posterior chamber intraocular lens implant (PCIOL) was done in 27 (83.4%) eyes, plain ECCE in 3 (9.4%) eyes, ECCE with anterior chamber intraocular lens implant (AC IOL) in one (3.13%) eye and vectis extraction in one (3.13%) eye. Twenty-six (81.25%) eyes had primary posterior capsulotomy. Intra-operatively three (9.4%) eyes had posterior capsule rupture with vitreous loss. Other complications are shown in Table 2.

Post-operative Visual Acuity

Post operative visual acuity (Va) in the better eye was measured objectively in 18 children. Four (22.2 %) children out of 18 had Va 6/18 or better, 11 (61.1%) had Va 6/24–6/60, while three (16.7%) remained blind. Out of these 18 children nine (50%) were developmental cataracts while one was secondary to uveitis and eight (44.4%) were due to trauma. Table 3 and Table 4. Seven children with subjective vision had good ambulatory vision. Longest follow up was four months.

DISCUSSION

Prognosis for good visual outcome after cataract surgery in children continues to improve in economically advanced countries.[8] Although previous anecdotal reports from developing countries were discouraging, recent reports from East Africa showed that more than 30% of children attained 6/18 vision. This improvement could be attributed to modern technology, type of surgery and availability of paediatric ophthalmologists. The recommended surgery of exracapsular cataract extraction with posterior capsulectomy (using a mechanical vitrector), anterior vitrectomy and intraocular lens implant was performed in these settings. In our study 22.2% attained 6/18 vision. Militating factors in this study were late presentation, operative complications and inadequate refraction. Also the vision was expected to improve further as longest follow up was only four months.

Previous studies had shown that timing is important in surgery for

Table 1: Aetiology of Cataracts in Children in The Gambia

Aetiology	Number(%)
Congenital	1(4)
Developmental	15(60)
Trauma	8(32)
Inflammatory	1(4)
Total	**25(100)**

Table 2: Intra and Post-operative Complications

Complication	Number(%)
Vitreous loss	3(9.4)
Retained lens matter	3(9.4)
Gaping wound	2(6.3)
Dense PCO*	2(6.3)
Retinal detachment	1(3.1)
Total	**11(34.5)**

***PCO,** Posterior Capsular Opacity

Table 3: Visual Acuity in 9 Children with Developmental Cataract

Serial/No	Age	Sex	Va Pre-op	Va Post-op
1	14	M	PL	6/24
2	8	M	HM(RE), HM(LE)	6/24 (RE), 6/18 (LE)*
3	14	M	CF(RE), HM(LE)	6/24 (RE), 6/12(LE)*
4	8	F	CF(RE), CF(LE)	6/24 (RE)
5	7	M	5/60(RE), PL(LE)	6/24 (LE)
6	8	F	CF (RE), CF(LE)	6/60 (RE)
7	8	M	PL(RE), PL(LE)	6/24 (RE)
8	15	M	HM(RE), NPL(LE)	HM (RE)
9	6	M	PL(RE), CF(LE)	6/36 (RE)

CF, Counting Fingers; **HM,** Hard Movement; **PL,** Perceiving Light; **LE,** Left Eye; **RE,** Right Eye.
** Two eyes operated*

Table 4: Visual acuity in Eight Children with Trauma

S/N (Sex)	Age (Years)	Visual Acuity Pre-op	Visual Acuity Post-op
1(F)	8	HM	6/18
2(M)	14	HM	6/60
3(M)	6	PL	6/60
4(M)	10	HM	1/60
5(F)	8	HM	6/60
6(M)	13	NPL	NPL
7(F)	13	PL	6/24
8(M)	12	HM	6/9

HM, Hard Movement; **NPL,** Not Perceiving Light; **PL,** Perceiving Light.

congenital cataracts so as not to disrupt the development of the visual pathways hence surgery is advocated before six weeks of age.[8] In this study only one child presented early while others presented late, similar to findings from other developing countries in Africa.[9] One of the consequences of late presentation is nystagmus which was found in three (12%) children in this study. Ignorance and financial constraints are some of the causes for late presentation.[10] In some countries parents pay for surgery unlike in The Gambia where eye surgery for Gambian children is free. However cost of transportation to Banjul and provision of escorts were financial burdens to parents. This could also explain default in follow up so that only 25 (62.5%) children out of 40 operated came at least three times confirming the observation of Yorston and coworkers.[7]

The pattern of complications following surgery in this study was similar to previous reports.[11] Vitreous loss in this series occurred in young children who had dense posterior capsules that were incised with scissors. It had been documented that eyes with vitreous loss were more likely to have post operative vision less than 6/12 as was the finding in our series where one of them had hand movement vision in his only eye.[12] Eyes with vitreous loss are also more predisposed to secondary glaucoma although our study period was too short to find this complication.[13]

Minor complications such as gaping wound and cortical lens remnants necessitate surgical intervention to prevent serious sequelae of endolphthalmitis, chronic inflammation and poor vision.[7] Retinal detachment is not common in extracapsular cataract extraction partly because maintenance of the posterior capsule and the anterior hyaloid phase reduces the risk. In our study one child had a detachment of the retina predisposed to by couching. Our limited experience with partially couched cataract is that their firm adherence to the anterior retina could result in a tear in an attempt to extract the lens by expression. A vitrector could serve better in these cases.

Posterior capsular opacity (PCO) is common after extracapsular cataract extraction with incidence ranging between 14 and 100% depending on length of follow up.[10] A primary posterior capsulectomy is expected to reduce the incidence in children.[14] It has been shown that primary posterior capsulectomy alone without anterior vitrectomy doess not prevent secondary membrane formation and that it is associated with longer post operative period and younger age at surgery.[14–16] We were only able to do capsulotomy. Two children developed a dense posterior capsule (PCO) within the study period. From previous reports there is a possibility that more children might develop PCO later. There is a need for availability of neody: yttrium-aluminium-garnet (yag) laser if surgical membranectomy is not done for these cases.[16]

Previous reports noted some degree of refractive error especially astigmatism after cataract surgery and improvement of vision after refraction.[11]Although the children were refracted the responses were poor and procurement of glasses was difficult. However, one eight-year-old child with developmental cataract had a significant improvement in vision such that he went back to normal school. We believe that auto refractometers could have given a more accurate guide to their errors. Correction of optical error was therefore not optimal. Despite this

Table 5: Cataract Surgery and IOL Implant in Children in the Developing Countries

Characteristic	Yorston *et al* Kenya[7]	Olusanya *et al* Ibadan (Nig)[10]	Bowman *et al* Tanzania[11]	Current Report Gambia
Study type and duration	Retrospective Jan, 1993 – Oct, 1997	Retrospective 1996 – 2005	Retrospective 2001 – 2004	Prospective Dec, 2005 – Nov, 2006
No of eyes	118	151	232	32
ECCE with no IOL	0	98(64.9%)	0	3(9.37%)
ECCE with PCIOL	118(100%)	50(33.1%)	232	27(84.38%)
Needling/Vectis	0	3	0	2
Pcav	61(51.7%)	34(22.5%)	209(86%)	26(81.25%)
Post op Va	91	90	94 eyes	18 eyes
6/18 or >	40(44%)	35(38.9%)	58(62%)	4(22.2%)
6/24–6/60	–	29(32.2%)		11(61.1%)
3/60 or <	3 (3.3%)	26(28.9%)	13(13.83%)	3(16.7%)

IOL, Intraocular Lens; **PCAV,** Posterior Capsulotomy and Anterior Vitrectomy.

difficulty it was gratifying that all but one of the congenital and developmental cataract children had subjective improvement in their vision.

Prognosis for good visual acuity was found to be better in patients with developmental cataracts supporting the finding of Olusanya and Baiyeroju.[10] Consanguinity could explain the possibility of congenital and developmental cataracts being hereditary in this community although no laboratory tests were done to rule out rubella cataracts. The poor visual acuity in five children in traumatic cataracts might be connected with concurrent lesions in the posterior pole.

More of the bilateral cataracts could have had both eyes operated but for unavoidable irregular availability of general anaesthesia which is necessary for childhood cataracts. Wilson *et al* [6] and Bowman[11] advocate operating the two eyes at a sitting to reduce cost of anaesthesia and also to facilitate the operation of both eyes as the child might not be brought back for the second eye. The possibility of post operative infection could not be ruled out entirely; therefore, it was safer to operate one eye at a time. Although there had been reports on the use of ketamine for childhood cataract surgery, it still had to be administered by another personnel which in our study was the anaesthetist.[17]

The visual outcome in this study when compared with other reports from Africa, it was found to be encouraging. Results of studies from the West African sub region appeared similar to ours. (Table 5). The dedicated centre for paediatric cataracts had better visual results.[11] The follow up period was too short to make an reliable conclusion on the vision of 7 (28%) out of 25 children although their visions were subjectively better. As reported in previous studies proficiency in the surgery and better modern equipment will contribute to a better visual outcome.[10] Early presentation, and good follow up are also essential.

In conclusion visual rehabilitation after cataract extraction with intra ocular lens implant and primary posterior capsulotomy is encouraging. Militating factors against good visual outcome are late presentation, suboptimal optical correction and inadequate technology.

REFERENCES

1. Ajibode HA, Onabolu OO, Oluyadi FO. Causes of blindness among blind children in Ogun state. *Nigeria Journal of Clinical Practice.* 2003, **6:** 17–19.
2. Ezepue IR,Umeh RE, Ezepue UF. Causes of childhood blindness:Results from schools for the blind in Eastern Nigeria. *Br J Ophthalmol* 2003; **87:** 20–23.
3. Faal H. Minassian S, Forster A. National survey of blindness in The Gambia. *Br J Ophthalmol* 1989; **73:** 82–87.
4. Faal H, Minassian S, Forster A. Survey of blindness in The Gambia 1996. Royal Victoria Teaching Hospital Department of Ophthalmology, The Gambia.
5. Forster A, Gilbert C, Rahi J. Epidemiology of cataract in childhood a global prespective. *J Cataract Refract Surg* 1997; **23:** 601–4.
6. Wilson ME Jr., Pandey SK, Thakur J. Paediatric cataract blindness in the developing world: Surgical technique and intraocular lenses in the new millennium. *Br J Ophthalmol* 2003; **87:** 14–19.
7. Yorston D, Wood M, Forster A. Results of cataract surgery in young children in East Africa. *Br J Ophthalmol,* 2001; **85:** 267–271.
8. Lesueur LC, Arne JL, Chapotol EC, Thouvenim D, Melacaze F. Visual outcome after paediatric cataract surgery: is age a factor. *Br J Ophthalmol* 1998; **82:** 1022–1025.
9. Mwende J, Bronsard A, Geneau R Coutright P. Delay in presentation to hospital for surgery for congenital and developmental cataract in Tanzania. *Br J Ophthalmol* 2005; **85:** 1478–1482.
10. Olusanya BA, Baiyeroju AM, Fajola AO. Visual recovery after cataract surgery in children. *Nigerian Journal of Ophthalmology* 2006; **14:** 46–51.
11. Bowman RJC, Kabiru J, Negretti G, Wood ML. Outcomes of Bilateral Cataract Surgery in Tanzanian Children. *Ophthalmol.* 2007; **114:** 2287–2292.
12. Ionides A, Minassian D, Tuft S. Visual outcome following posterior capsular rupture during cataract extraction. *Br J Ophtalmol* 2001; **85:** 222–224.
13. Vishwanath M, Cheong-Leen R,Taylor D, Russell-Eggitt I, Rahi J. Is early surgery for congenital cataract a risk factor for glaucoma? *Br J Ophthalmol* 2004; **88:** 905–10.
14. Jensen AA, Basti S, Greenwald M.J, Mets M.B. When may the posterior capsule be preserved in paediatric intraocular lens surgery? *Ophthalmol.* 2002; **2:** 324–7.
15. Pavlovic S. Cataract surgeries in children. *Med Pregl.* 2000; **53:** 257–61.
16. Hosal B.M, Biglan A.W. Risk factors for secondary membrane formation after removal of paediaric cataract. *Cataract Refract Surg.* 2002; **28:** 302–9.
17. Pun M.S, Thakur J, Poudyal G, Gurung G, Rana S, *et al.* Ketamine anesthesia for paediatric ophthalmology. *Br J Ophthalmol.* 2003; **87:** 535–37.