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Implantation In Pediatric Cataract Surgery: A Preliminary Comparative Study Between Flexible and Rigid Implants

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Summary

Introduction: Childhood cataract is a progressive opacification of the lens that occurs from birth or in the first years of life. This is a diagnostic and surgical emergency. The primary aim of this study was to compare postoperative outcomes in children who received soft implants versus those who received rigid implants. The specific objectives were to highlight the epidemiological characteristics, and to study the clinical, therapeutic and prognostic aspects of childhood cataracts.

Methodology: This was a single-center, descriptive, comparative and analytical retrospective study over a period of 02 years from June 2017 to June 2019 at the ophthalmology center of Abass Ndao hospital. It included all the files of children aged 0 to 15 years followed and treated for a congenital cataract operated on with implantation in the posterior chamber. We analyzed sociodemographic and clinical data, surgical treatment and postoperative follow-up data.

Results: we included 53 files (96 eyes) of children during the study period. The average age was 4.5 years and the sex ratio was 1.9. The involvement was bilateral in 43 cases (81.1%). The cataract was total in 56.6% of cases and nuclear in 35.8% of cases. Phacoexeresis was performed in 69.8% of cases. It was associated with a posterior capsulotomy and an anterior vitrectomy in 30.2% of cases. Of the 96 eyes operated on, 24 eyes (25%) received flexible implants and 72 eyes (75%) received rigid implants. Among the 24 eyes (25%) that received a flexible implant, we observed 7 secondary cataracts (29.2%), 2 anterior subluxations of the implant (8.3%) and 1 posterior synechia (3.33%). In 72 eyes where we used a rigid implant, we noted 46 secondary cataracts (63.8%), 10 anterior subluxations of the implant (13.8%), 12 posterior synechiae (16.7%).

Conclusion: our results show that flexible implants cause fewer complications than rigid implants.

Keywords: congenital cataract, flexible implants, rigid implants, postoperative results

Abbreviations: GA: General Anesthesia; VA: Visual Acuity

Introduction

Childhood cataract is a progressive opacification of the lens that occurs from birth or in the first years of life [1]. It is the leading cause of curable blindness in children worldwide. It affects 1 to 15 children out of 10,000 births worldwide according to Foster [2] and its incidence is 15.5% in West Africa [3]. Visual deprivation secondary to congenital cataract, occurring during the sensitive period of visual development, is responsible for an alteration of this process in children and consequently the onset of amblyopia which can be irreversible and profound [4]. The latter remains a diagnostic and surgical emergency. Advances in surgical techniques and primary implantation facilitate early rehabilitation and provide better functional results [1]. The primary aim of this study was to compare postoperative outcomes in children who received soft implants versus those who received rigid implants. The specific objectives were to highlight the epidemiological characteristics, and to study the clinical, therapeutic and prognostic aspects of childhood cataracts.

Material and Methods

This was a single-center, descriptive, comparative and analytical retrospective study over a period of 02 years from June 2017 to June 2019 at the ophthalmology center of Abass Ndao hospital. It included all the files of children aged 0 to 15 years followed and treated for a congenital cataract operated on with implantation in the posterior chamber. Records of children with traumatic cataract were not included. We analyzed sociodemographic and clinical data, surgical treatment and postoperative data. The clinical ophthalmological examination was complete and bilateral. It was performed under the same conditions in the awake child and, if necessary, under general anesthesia (GA). Biometry was carried out by a mode A ultrasound probe 10 according to the Holladay formula. We applied a corrective factor by reducing the calculated theoretical power (Table 1).

Table 1: IOL power correction chart according to age.

Age	<3 Months	3 – 6 Months	6/12/2025 Months	1/2/2025 Years	2 – 4 Years	4– 5 Years	5- 7 Years	>7 Years
Reduction of bio-metrics result	30%	20%	15%	10%	5%	2D	1D	0

D = diopter

All our patients were operated on under general anesthesia, according to two protocols. Phakoexeresis without posterior capsulotomy: it included a corneal pre-incision with tunneling using a pre-calibrated 2.75 mm knife followed by an injection of a high viscosity viscoelastic substance into the anterior chamber. The creation of an anterior capsulorhexis of approximately 5 mm in diameter or an anterior postage stamp capsulotomy preceded the careful aspiration of the masses using the Bonnet dual-current cannula. The intervention continued with the placement of a foldable or rigid implant. At the end of the operation, a 10/0 monofilament suture with three to five safety stitches was performed; these stitches will be removed 1 month post-operatively.

Phakoexeresis with posterior capsulotomy and anterior vitrectomy: it was carried out according to the same protocol in every respect, to which two steps were added after aspiration of the lens masses. This is a posterior capsulorhexis with a diameter smaller than the anterior capsulorhexis, enlarged if necessary, during vitrectomy; and dry anterior vitrectomy with a vitreotome. We used two types of implants. Or rigid PMMA implants, which had good biocompatibility. However, they required widening the corneal incision by 6 mm. Or 1-piece hydrophobic acrylic flexible implants with open loops, which had better biocompatibility and only required a mini-incision. Post-operative treatment systematically included anti-inflammatory treatment by subconjunctival injection of corticosteroid at the end of the operation, with immediate post-operative instillation of eye drops and ointments combining a mydriatic (atropine), an antibiotic and a steroidal and non-steroidal anti-inflammatory. Orally, an antibiotic and a steroidal anti-inflammatory drug in doses adapted to the child's weight were administered for 10 days. All children were seen and examined systematically on day 1 (D1), D3, D7, on 1 month (M1), M3, M6, M12 postoperatively.

Data analysis was done with Excel 2013 and SPSS 2.0.

Results

Table 2: Distribution of patients according to age of discovery.

Age of Discovery	Number of Cases	Percentage
0 - 1 year	23	43.4%
2 - 3 years	11	20.8%
4 - 5 years	4	7.5%
6 - 7 years	12	22.6%
> 7 years	3	5.7%
Total	53	100%

During our study period, 903 children aged under 15 were consulted, including 60 (6.6%) with a congenital cataract. Fifty-three (53) files (96 eyes) of operated and implanted patients were included in the study. The average age of the children was 4.5 years with extremes of 2 months and 13 years. The average age of discovery was 2.8 years with extremes of 1 month and 11 years (Table 2). The sex ratio was 1.9 (35 boys and 18 girls). We noted parental consanguinity in 37.7% of cases. The involvement was bilateral in 43 cases (81.1%). The cataract was total in 56.6% of cases and nuclear in 35.8% of cases (Table 3). The associated ocular signs were nystagmus in 4% of cases and strabismus in 8% of cases. There was also a case of persistence of the primary vitreous. The time between cataract diagnosis and surgical intervention was on average 6 months with extremes of 1 month and 20 months. In the case of bilateral cataracts, the average time between the two eyes was 6 months with extremes of 1 month and 13 months.

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Table 3: Distribution according to type of cataract.

Type of Cataract	Number of Cases	Percentage
Total	30	56.6%
Nuclear	19	35.8%
Cortico-nuclear	2	3.8%
Subcapsular	1	1.9%
Polar	1	1.9%

Phacoexeresis was performed in 69.8% of cases. It was associated with a posterior capsulotomy and an anterior vitrectomy in 30.2% of cases. Of the 96 eyes operated on, 24 eyes (25%) received flexible implants and 72 eyes (75%) received rigid implants. Post-operative complications such as secondary cataract, implant subluxation and posterior synechiae were noted (Table 4). A posterior needle capsulotomy via an anterior approach was performed in 15 cases of secondary obturating cataract (28.3%). Three of them had benefited from a synechotomy and repositioning of the implant during the same operating time. Visual acuity (VA) was quantified in 20.8% of cases (11 patients). Among the children who presented with a unilateral cataract, the results were satisfactory for 2 children (28.6%) with visual acuity which was greater than or equal to 3/10th. Amblyopia was recorded in 5 children (71.4%) in whom visual acuity did not change and did not exceed 1/10th. The 4 patients who presented a bilateral cataract and quantifiable visual acuity had satisfactory results with a VA greater than or equal to 3/10th.

Table 4: Post-operative complications observed depending on the type of IOL.

Complications/Type of IOL	Soft IOL n (%) 24 (25)	Rigid PMMA IOL n (%) 72 (75)	Total n (%) 96 (100)
Secondary cataracts	7 (29,2)	46 (63,8)	53 (55,2)
Anterior subluxations	2 (8,33)	10 (13,8)	12 (12,5)
Posterior synechia	1 (4,16)	12 (16,7)	13 (13,54)
Suture loosening	0 (0)	10 (13,8)	10 (10,41)
Iris hernia	0 (0)	3 (4,16)	3 (3,12)
Corneal edema	2 (8,33)	7 (9,72)	9 (9,37)

IOL = Intraocular Lens

Discussion

Congenital cataract is a common condition, easy to diagnose but difficult to manage. It represents the leading cause of curable blindness in children worldwide. It affects 1 to 15 children out of 10,000 births worldwide [2] and its incidence is 15.5% in West Africa [3]. A hospital frequency of 6.6% was found during our study period, which is similar to that of Takou in Yaoundé, where the hospital frequency was 4.7% [5]. The average age of discovery of congenital cataract was 2 years 8 months in our series, which was very high compared to the French study by Lefèvre Hansen [6] where it was 3.66 months. This demonstrates a diagnostic delay which could be due to a lack of screening, parental ignorance, a lack of suitable structures but also to an absence of information and awareness. Unlike developed countries, where screening is systematic from maternity and especially in families with hereditary cataracts by examining the pupil reflection. A male predominance (66%) was observed with a sex ratio of 1.9. These results are comparable to those found in the Ghemri series [7]. On the other hand, the Lundvall study [8] shows a female predominance of 64.2%. However, gender appears to have no impact on the occurrence of congenital cataracts. Parental consanguinity was present in our study in 37% of cases and is similar to the study of Latif [9], in Tunisia which reported 32.7% cases of consanguinity. This promotes the expression of autosomal recessive genes. Leukocoria is the main symptom of congenital cataract. It represented 43% of the circumstances of discovery in our study. It was 60% for Ammar [10] in his study. However, any leukocoria in children requires rigorous examination to rule out a serious pathology such as retinoblastoma. Decreased visual acuity, strabismus and nystagmus are other circumstances in which congenital cataracts are discovered.

Regarding laterality, congenital cataract is very often bilateral with 81.1% of cases in our series. This observation is classic in the literature [11,12]. This form is known to be less amblyogenic than unilateral cataract. Total bilateral cataracts are surgical emergencies that must be operated on before the end of the second month of life, the date at which irreversible nystagmus sets in. Unilateral total cataracts should preferably be operated on as early as possible so that amblyotherapy can be effective [13]. Once the indication has been made, the intervention must be carried out urgently. The majority of authors prefer to intervene from the 5th week [14,15]; while knowing that the visual system has a latency period of 6 weeks before it becomes sensitive to visual deprivation. In our series, the average intervention time was 6 months, which

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is quite long and this could be linked to insufficient anesthetic personnel or negligence on the part of the parents. The reference surgical technique currently used is phacoemulsification without ultrasound in children, via the anterior approach with posterior capsulorhexis and anterior vitrectomy [16].

In our series, 30.2% of operated eyes had a posterior capsulotomy and an anterior vitrectomy with primary implantation. Studies by Lundvall and Lesueur noted better results with this protocol [8,17]. On the other hand, posterior capsulorhexis and anterior vitrectomy may not be performed in children over 7 years old, an age from which these children are cooperative enough to be able to perform a YAG laser capsulotomy [16]. Posterior capsulorhexis has now become essential, given the constant risk of secondary opacification after any extraction of a congenital cataract [18]. The principle is to remove the posterior capsule to prevent the migration of epithelial cells responsible for secondary opacification [19]. Primary implantation before the age of 3 years is a subject of contention among surgeons [20].

Primary implantation was the rule in our study in children aged at least 6 months; 25% of eyes received a flexible implant and 75% a rigid implant. We noted in our series that eyes having received a flexible implant developed fewer secondary cataracts (29.2% compared to 63.8% for rigid implants), less implant dislocation (8.3% compared to 13.8% for rigid implants) and less inflammation. Our results are consistent with those in the literature. Indeed, Hollick and Khotar found in their studies that the flexible implant offers better post-operative tolerance than PMMA HSM implants in congenital cataract because the implantation is done through a small incision thus minimizing inflammatory complications [21,22]. It also seems that PMMA implantation would be at greater risk of developing a secondary cataract than with the hydrophobic flexible implant [23].

Conclusion

Congenital cataract is the main cause of blindness in African children. This is reversible blindness if detected early. Surgical decisions must take into account the risk of postoperative complications, particularly secondary cataract, which is an important factor of amblyopia. Our results show that flexible implants cause fewer complications than rigid implants.

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