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Comparative Study of Extracapsular Extraction with Manual Sutureless Phaco Alternative in Cataract Surgery at the Reference Health Center in Ouelessebougou

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Abstract **Original Research Article**

Cataract is a significant public health issue in developing countries, necessitating surgical treatment. The aim of this study was to compare extracapsular extraction with manual sutureless phaco alternative in terms of outcomes and functionality. It was a prospective study conducted from June 2023 to December 2023, involving 200 eyes followed up to Day 30 at the secondary ophthalmology center in Ouelessebougou. Data were analyzed using IBM SPSS and Excel 2016 software. Almost all of our patients, 92% in Phaco-A and 89% in EECC+ICP, underwent biometry. At Day 30 postoperative with spectacle correction, phaco alternative yielded 82% good results compared to 60% for extracapsular extraction. At Day 30 with spectacle correction in Phaco-A, 91% of patients had good visual acuity compared to 75% in EECC+ICP. This result is comparable to those of Konaté M [17] and Windinmanegdé Djiguimdé *et al*., [18], who achieved 83.49% and 79.6% good visual acuities. Phaco alternative provides better postoperative results in cataract surgery at the secondary ophthalmology center in Ouelessebougou.

Keywords: Cataract surgery, adult; EEC technique, phacoA, visual acuity.

INTRODUCTION

Cataract is the total or partial opacity of the lens, typically bilateral and responsible for varying degrees of visual impairment [1]. It is a highly prevalent condition worldwide and constitutes the primary (leading) cause of treatable blindness globally [2]. According to the World Health Organization (WHO), at least 2.2 billion people have visual impairments, with at least 1 billion experiencing preventable or untreated impairments, of which cataracts account for 65.2 million cases [3].

In Mali, the prevalence of blindness exceeds 1.2%, with 180,000 blind individuals, of whom 90,000 are affected by cataracts [6]. The treatment for cataracts is purely surgical, involving the removal of the opaque crystalline nucleus (phacoexeresis) and correction of residual aphakia [6]. Several techniques are employed, including:

Extracapsular extraction (EEC),
Ultrasonic phacoemulsification (PKE),
Sutureless manual phaco alternative (PKA).

All these techniques involve intraocular lens implantation in the anterior or posterior chamber [7, 8]. At the secondary ophthalmology center in Ouelessebougou, sutureless manual phaco alternative and extracapsular extraction are the two techniques used for cataract surgery. Given these observations, we decided to conduct this study.

PATIENTS AND METHODS

This prospective study was conducted in a second-level ophthalmological center located in the health district of Ouelessebougou in the Republic of Mali, covering the period from June 1st to December 31st, 2023.

Our study included cases of age-related cataracts (≥40 years) without associated apparent ocular pathologies, operated on using the EEC and PKA (sutureless manual phaco alternative) techniques, with intraocular lens implantation in the posterior or anterior chamber (in the sulcus or the bag). The surgeries were performed by an ophthalmic surgeon practicing both

surgical techniques, and the patients received a postoperative follow-up of at least 30 days.

Patients were recruited during consultations, and pre-anesthetic consultations and preoperative assessments (PT, PTT, blood glucose) were systematically conducted. The patients underwent a preoperative consultation. Biometry was then performed on most patients selected for surgery using an A-mode ultrasound device (Sonomed Escalon).

Data collection was facilitated using consultation registers, patient files, operating room registers, and study information sheets. Data processing and analysis were conducted using IBM SPSS and Excel 2016 software, while document writing was accomplished using Word 2016.

RESULTS

SOCIO-DEMOGRAPHIC ASPECTS:

A total of two hundred (200) eyes, evenly distributed between the two surgical techniques, were included and followed up to day 30. The age group of 61-70 was the most represented, constituting 42% (Table 1). The male-to-female sex ratio was 1 (Table 2). Housewives dominated the sample, accounting for 23% (Table 3). The majority of patients came from rural areas, comprising 56% (Table 4).

Table 1: Sample age distribution

Age group	Number	Percentage
40-50	16	8
51-60	50	25
61-70	**84**	**42**
71-80	41	20.5
81 and over	9	4.5
Total	200	100,0

The 61-70 age group was the most represented at 42%.

Table 2: Sample distribution by gender

Gender	Number	Percentage
Male	100	50,0
Female	**100**	**50,0**
Total	200	100,0

The F/H sex ratio was 1.

Table 3: Sample distribution by profession

Profession	Number	Percentage
Farmer	40	20
Civil servant	12	6
Shopkeeper	19	9.5
Housewife	**46**	**23**
Retired	40	20
Liberal	43	21.5
Total	200	100,0

Housewives dominated our sample with 23%.

Table 4: Sample distribution by residence

Residence	Number	Percentage
Rural	**112**	**56**
Semi-rural	65	32.5
Urban	23	11,5
Total	200	100,0

The majority of our patients came from rural areas (56%).

ANATOMO-CLINICAL ASPECTS:

Patients were equally distributed between the two techniques, with 50% for EEC and 50% for Phaco-A (Table 5). Preoperative visual acuity in EEC+IOL was < 1/10 in 86% of patients (Table 6). Preoperative visual acuity in Phaco-A+IOL was < 1/10 in 88% of patients (Table 6). During the intervention, 5% of patients experienced incidents in the Phaco-A group and 6% in the EEC group (Table 7).

In the EEC group, six (06) patients experienced incidents during the intervention, including four (04) cases of capsular rupture with vitreous loss (4%), and two (02) cases of posterior capsular rupture without vitreous loss (2%). Among the four patients with vitreous loss, two received an IOL and the other two received an ACI (Table 8).

In the Phaco-A group, five (05) patients experienced incidents during the intervention, all being capsular ruptures with vitreous loss. Despite the incidents, all five patients were implanted: (04) IOL, (01) ACI (Table 8).

IOL was planned or calculated by biometry in 92% of patients in Phaco-A and 89% in EEC+IOL (Table 9). IOL was placed in 98% of patients in the EEC group and 99% in the Phaco-A group (Table 10).

At day 1 postoperatively, 15% of patients had complications in the EEC group and 9% in the Phaco-A group (Table 11). At day 1, postoperative complications included corneal edema and hyphema in both groups (Table 12).

At day 15 postoperatively, 9% of patients had complications in the EEC group and 3% in the Phaco-A group (Table 13). At day 15, postoperative complications included corneal edema, hyphema, and endophthalmitis, favoring the EEC group (Table 14).

At day 30, 7% of patients had complications in the EEC group and 2% in the Phaco-A group (Table 15). At day 30, complications were mainly dominated by posterior capsule opacification, with 5% in the EEC group and 1% in the Phaco-A group (Table 16).

At day 30 postoperatively without correction, 50% had visual acuity ≥ 3/10 in the EEC group and 72% in the Phaco-A group (Table 17). At day 30 postoperatively, visual acuity with the best correction

worn was ≥ 3/10 in 91% in the Phaco-A group and 75% in the EEC group (Table 18).

Table 5: Breakdown of sample by surgical technique

Operating techniques	Number	Percentage
EECC	**100**	**50**
Phaco A	100	50
Total	200	100,0

Patients were divided equally between the two techniques.

Table 6: Distribution of preoperative visual acuity (VA) using the two techniques

AV Preoperative	EECC+ICP		Phaco-A	
	Number	%	Number	%
<1/10	86	86	88	88
1/10 et <3/10	14	14	12	12
Total	100	100	100	100

Preoperative visual acuity in EEC+ICP was < 1/10 in 86% of patients; and 88% of patients in phaco A

Table 7: Breakdown of patients by course of treatment

Incident	EECC+ICP		Phaco-A	
	Number	%	Number	%
With incident	6	6	5	5
Without incident	94	94	95	95
Total	100	100	80	100

During the intervention, 5% of patients in the phaco A group and 6% in the EEC group experienced incidents.

Table 8: Sample distribution by incident type

Type of incident	EECC+ICP		Phaco-A	
	Number	%	Number	%
CPR with vitreous exit	4	4	5	5
Without glass exit	2	2	-	-
Total	**6**	**6**	**5**	**5**

Six (06) patients had incidents in EEC during the procedure, compared with five (05) in Phaco-A

Table 9: Distribution of patients according to predicted or calculated IOL

IOL	EECC+ICP		Phaco-A	
	Number	%	Number	%
Planned or calculated	89	89	92	92
Not planned	11	11	8	8
Total	**100**	**100,0**	**100**	**100,0**

IOL was predicted or calculated by biometry in 92% of patients in Phaco-A and 89% in EEC+ICP.

Table 10: Patient distribution by IOL type

Type of IOL installed	EECC+ICP		Phaco-A	
	Number	%	Number	%
ICP	98	98	99	99
ICA	2	2	1	1
Total	**100**	**100,0**	**100**	**100,0**

PCI was placed in 98% of patients in the EEC group 99% in the phaco A group.

Table 11: Distribution of patients according to postoperative complications at D1

Post-op complications on Day 1	EECC+ICP		Phaco-A	
	Number	%	Number	%
Yes	15	15	9	9
No	85	85	91	91
Total	**100**	**100,0**	**80**	**100,0**

At D1 post-op, 15% of patients in the EEC group had a complication, and 9% in the Phaco-A group.

Table 12: Distribution of patients by type of postoperative complication at D1

Types of post-operative complications at D1	**EECC+ICP**		**Phaco-A**	
	Number	%	Number	%
Palpebral edema	1	1	-	-
Corneal edema	6	6	3	3
Residual mass	1	1	2	2
Hyphema	4	4	3	3
Uveitis	1	1	-	-
CA glass	2	2	1	1
No comlication	85	85	91	91
Total	**100**	**100**	**100**	**100**

At D1, post-operative complications were marked by corneal edema and hyphaema in both groups.

Table 13: Distribution of patients according to postoperative complications at D15

Post-op complications at D15	**EECC+ICP**		**Phaco-A**	
	Number	%	Number	%
Yes	9	9	3	3
No	91	91	97	97
Total	**100**	**100,0**	**100**	**100,0**

At 15 days post-op, 9% of patients in the EEC group and 3% in the Phaco-A group had complications.

Table 14: Distribution of patients by type of postoperative complication at D15

Types of post-operative complications at D15	**EECC+ICP**		**Phaco-A**	
	Number	%	Number	%
Corneal edema	3	3	1	1
Keratitis	2	2	-	-
Hyphema	2	2	1	1
Off-center pupil	1	1	-	-
Endophthalmitis	1	1	1	1
No complication	91	91	97	97
Total	**100**	**100**	**100**	**100**

At D15 post-op, the complications were corneal edema; hyphaema; endophthalmitis in favour of the EEC group.

Table 15: Distribution of patients according to postoperative complications at D30

Post-op complications at D30	**EECC+ICP**		**Phaco-A**	
	Number	%	Number	%
Yes	7	7	2	2
No	93	93	98	98
Total	**100**	**100**	**80**	**100**

At D30, 7% of our patients had complications in the EEC group and 2% in the Phaco-A group.

Table 16: Distribution by type of postoperative complication at D30

Types of post-operative complications at D30	**EECC+ICP**		**Phaco-A**	
	Number	%	Number	%
Opacification of the posterior capsule	5	5	1	1
Corneal edema	1	1	-	-
Irien pigment/ICP	1	1	1	1
No complications	93	93	98	98
Total	**100**	**100**	**100**	**100**

At D30, complications were dominated by opacification of the posterior capsule: 5% in the EEC group and 1% in the Phaco-A group.

Table 17: Distribution of patients according to uncorrected visual acuity at D30

AVSC D30	**EECC+ICP**		**Phaco-A**	
	Number	%	Number	%
< 1/10	23	23	9	9
1/10 et 2/10	27	27	19	19
≥ 3/10	50	50	72	72
Total	**100**	**100**	**100**	**100**

At 30 days post-op without correction, 50% had visual acuity ≥ 3/10 in the EEC group and 72% in the phacoA group.

Table 18: Distribution of patients according to corrected visual acuity at D30

AVAC D30	EECC+ICP		Phaco-A	
	Number	%	Number	%
< 1/10	12	12	5	5
1/10 et 2/10	13	13	4	4
≥ 3/10	75	75	91	91
Total	**100**	**100**	**100**	**100**

At 30 days post-op, visual acuity with the best correction worn was ≥ 3/10 in 91% of the Phaco-A group and 75% of the EEC group.

DISCUSSIONS

1. Sociodemographic characteristics of patients:

- The 61-70 age group was the most represented (42%). This result is comparable with those of Konaté M; P. Widenmanegdé *et al*., Nadio T *et al*., and N. Maneh *et al*., who found 63.77, 62.47, 64.2 and 61.63 years respectively [17, 18, 6, 19]. This could be explained by the fact that cataract is a physiological modification of the crystalline lens that is age-dependent in the majority of cases.
- Sex: The sex ratio F/H was 1, which is explained by our type of study (comparative study) in which both sexes must be equally represented.
- Origin: The majority of our patients came from rural areas (56%). This result differs from that obtained by Nadio T [6], who found 58.0% of patients from urban areas. This could be explained by our study's rural setting.
- Occupation: Housewives dominated our sample with 23%. The empowerment of women in housework in Africa may explain these results. Konaté M [17] also found in his study a strong predominance of housewives with 52.96%.

2. Preoperative visual acuity

In our study, preoperative visual acuity in phaco-A was <1/10 in 88% versus 86% in EECC. In the study by Nadio T [6], VA in EECC+ICP was <1/10 in 97.8% of patients versus 86.5% in Phaco-A.

This preoperative visual acuity is characteristic of developing countries, where cataract surgery is generally delayed for a variety of reasons (poverty, geographical inaccessibility, fear of surgery, lack of surgeon, lack of technical facilities, ignorance) [20].

3. Surgery

- **Technique used**

In our study, patients were equally distributed between the two techniques, i.e. EEC and phaco A.
This is explained by our type of study.

- **Biometry**

IOL was predicted or calculated by biometry in 92% of Phaco-A patients versus 89% in EECC+ICP.

This result is similar to that of Nadio T [6], in whom IOL was predicted or calculated by biometry in 89.8% of patients operated on in EECC+ICP versus 87.1% in Phaco-A; but superior to the results observed by Kanza [21], Baaré [22] and Ganone [23], who found 34.9%, 54% and 76% respectively.

IOL placement was predominantly in the posterior chamber, with similar proportions in both series (99% in EECC+ICP and 98% in phaco-A). This result corroborates those obtained by Kanza [21] (98.8%), Baaré [22] (97.6%) and Ganone [23] (98.7%).

- **Intraoperative incidents**

In our study, six (06) patients presented with EECC+ICP incidents during the operation, including:
- Four (04) cases of capsular rupture with exit of the vitreous 4%
- Two (02) cases of posterior capsular rupture without vitreous exit 2%.
Of the four patients concerned, 2 underwent PCI and the other two ICA.
Five (05) patients had Phaco-A incidents during the procedure
- all five cases were capsular ruptures with glass exit.
Although there were incidents, all 5 patients were implanted: (04) ICP, (01) ICA.

Many studies have found posterior capsular rupture to be the most common intraoperative complication: Guirou N *et al*., [24] (2.93%); Diallo JW *et al*., [25] (2.33%); Konaré CO [20] (6.47%) and Baaré [22] (3.2%).

These results may be explained by the fragility of Zinn's zonule and capsule on the one hand, and surgical manipulation on the other.

- **Early postoperative complications**

Corneal edema and hyphaema dominated the picture of early postoperative complications from day 1 in both groups, gradually regressing by day 15.

At D1, post-operative complications were marked by corneal edema (6%) and hyphaema (4%), in favour of EECC.

At D1 post-op, corneal edema and hyphaema accounted for 6% and 4% respectively in EECC+ICP and 3% each in phaco-A.

In the study by Konaré CO [20], the main early post-operative complications were conjunctival hyperemia, corneal edema and hyphaema, which accounted for 77.94%; 15.59%; 1.92% respectively.

Diallo JW *et al*., [25] in Burkina Faso obtained 26.33% corneal edema and 4.33% hyphaema. At D4 and D15, corneal edema and hyphaea had progressively regressed, and at D15 were respectively only 3% and 2% in EECC+ICP and 1% each in phaco-A.

We noted 2 cases of endophthalmitis on D15 (1 case in EECC+ICP and 1 case in phaco-A). This result is similar to that of Konaré CO [20], who found 1 case (0.10%) of endophthalmitis.

These complications can be explained mainly by the non-use of cautery for hyphaema, surgical manipulations in the anterior chamber and pre-existing corneal disease for corneal oedema, and poor hygiene for endophthalmitis.

- **Late postoperative complications**

At D30, complications were dominated by posterior capsule opacification, i.e. 5% in favour of EECC and 1% in favour of Phaco-A.

Late postoperative complications were dominated by posterior capsule opacification in both cases, i.e. 5% in EECC and 1% in Phaco-A. Our results are similar to those of Ganone [23], in whom posterior capsule opacification accounted for 7.9% in EECC and 9.2% in phaco-A.

4. Post-operative visual acuity

In the study, 72% of patients had good uncorrected visual acuity at D30 in phaco-A versus 50% in EECC+ICP. This result is comparable to that of Diallo JW *et al*., who obtained 67.83% [25].

The majority of patients had good visual acuity with correction at D30 in phaco-A, i.e. 91% versus 75% in EECC+ICP. This result is comparable to those of Konaté M [17] and Windinmanegdé Djiguimdé *et al*., [18], who respectively obtained 83.49% and 79.6%. These results may be explained by the surgeons' experience and the techniques used.

CONCLUSIONS

Cataract, the leading cause of blindness worldwide, remains a major public health challenge, particularly in developing countries where its prevalence increases with age.

At the end of our 6-month prospective study, we can conclude that cataract is the prerogative of the elderly.

It is a surgically curable pathology, and the surgical techniques used in our study were EECC+ICP and phaco A+ICP.

Capsular ruptures with vitreous exit were the most common intraoperative incidents. Corneal edema and hyphaema dominated the picture of early postoperative complications, while late complications were dominated by posterior capsule opacity.

At 30 days post-op, with the best correction worn, phaco A gave better results (91%) than EECC (75%).

APPENDICES

INVESTIGATION FORM

N° Dossier:/_____/

SURNAME AND FIRST NAME:

I- SOCIO-DEMOGRAPHIC DATA

1 Age: / ___/ (40-50= 1, 51-60=2, 61-70=3, 71-80=4 , 81 and over=5)

2 Sex: / / (Male= 1, Female= 2)

3 Profession: / / (Farmer= 1; Civil servant= 2; Shopkeeper= 3; Housewife= 4; Retired= 5; Liberal= 6: Child= 7)

4 Residence: / / (Rural= 1; Semi-rural= 2 ; Urban= 3)

II- CLINICAL DATA

5 Preoperative visual acuity: / / (<1/10=1, 1/10 and < 3/10=2, ≥ 3/10=3,)

6 Comorbidity: / / (Strabismus= 1, Diabetes= 2, HTA=3, Ocular trauma= 4, None=5)

7 Corneal appearance: / / (Transparent= 1, Stained= 2, Leukoma=3, Dystrophy=4)

8 Etiology of cataract: / / (Congenital= 1, Traumatic= 2, Senile=3, Pathological=4)

III- THERAPEUTIC DATA

9 Surgical technique: / / (EEC+ICP=1, Phaco A+ ICP=2)

10 Eye operated on: / / (OD=1, OG=2)

11 Intraoperative complications: / / (Iridodialysis=1, Posterior capsule rupture without vitreous outlet=2, Capsular rupture with vitreous outlet=3, none=4)

12 IOL position: /____/ (planned=1 ,unplanned=2)

13 Type IOL/____/ (ICP =1, ICA=2)

IV- ANATOMICAL AND FUNCTIONAL RESULTS

14 Postoperative complications at D1: / / (Corneal edema=1, Iris hernia=2, Hyphaema or hematic tyndall=3, Off-center implant=4, Crystalline mass remnant=5, Iris pigment=6, CA vitreous=7 Posterior capsular opacification=8, Iris pigment=9, Hypopyon=10 Endophthalmitis=11, None =12

15 Postoperative complications at D4: / / (Corneal edema=1, Iris hernia=2, Hyphaema or hematic tyndall=3, Off-center implant=4, Crystalline mass remnant=5, Uveitis=6, CA vitreous=7, Posterior capsular opacification=8, Iris pigment=9, Hypopion=10 Endophthalmitis=11, Keratitis =12 ,none=13

16 Uncorrected visual acuity at D15: / / (<1/10=1, 1/10 and <3/10=2, ≥3/10=3)
17 Postoperative complications at D15: / / (Corneal edema=1, Iris hernia=2, Hyphaema or hematic tyndall=3, Off-center implant=4, Crystalline mass remnant=5, Uveitis=6, CA vitreous=7 Posterior capsular opacification=8, Iris pigment=9, Hypopyon=10 Endophthalmitis=11, Keratitis=12, None =13
18 Postoperative complications at D30: / / (Corneal edema=1, Iris hernia=2, Hyphaema or hematic tyndall=3, Off-center implant=4, Crystalline mass remnant=5, Uveitis=6, CA vitreous=7 Posterior capsular opacification=8, Iris pigment=9, Hypopion=10 Endophthalmitis=11, Keratitis=12, None =13
19 Uncorrected visual acuity at D30: / / (<1/10=1, 1/10 and <3/10=2, ≥3/10=3)
20 Visual acuity with TS at D30: / / (<1/10=1, 1/10 and <3/10=2, ≥3/10=3)
21 Corrected visual acuity at D30 with best correction worn:/___/ (<1/10=1 ,1/10 and < 3/10=2, ≥ 3/10=3)

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