Journal of Medicine and Medical Sciences Vol. 2(1) pp. 632-637 January 2011
Available online@ http://www.interesjournals.org/JMMS


*Full Length Research Paper*

# Prevalence of Astigmatism in Post Operative Cataract in University of Port Harcourt Teaching Hospital, Nigeria

**[+]Aruotu N and *UzoDike EB**

[+]University Of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria
*Department Of Optometry, Abia State University, Uturu, Nigeria

Accepted 13 January, 2011

**Clinical cards of all cataract patients operated on in the eye centre of the University of Port Harcourt Teaching Hospital (UPTH) between 2002 and 2006 were studied. The study comprised 114 eyes of 100 patients who had cataract surgeries done within the 5-year period of this study. The age of the patients ranged from 6 months to 94 years with mean age of 58.84±19.57years. Data obtained from the clinical files include patient's age, sex, type of surgery carried out with or without intraocular lens implant (IOL), the eye concerned, and post-operative refraction (objectively and subjectively) at 12 weeks among others. Of 114 eyes, 83 eyes (72.8%) had refraction postoperatively. The total number with astigmatism was 59 giving 71.08%. Against the rule, astigmatism (ATR) was found in 69.49%, with the rule astigmatism (WTR) in 20.73% while 10.16% had oblique astigmatism. The mean post-operative astigmatism was 1.85 Dioptric Cylinder (DC). Astigmatism was highest with extra capsular cataract extraction with posterior chamber IOL (ECCE+PCIOL; 44.07%). Astigmatism less than 2D was highest in those with ECCE+IOL (33.89%) followed by ECCE only (23.73%). Least astigmatism of any type and degree was found in those that had intra capsular cataract extraction with anterior chamber IOL (ICCE+ACIOL). ECCE+PCIOL (33.89%) surgeries were carried out mostly on patients 60 years and below while ECCE (23.73%) surgeries only were carried out mostly on those above 60 years. Post operative astigmatism can be reduced with better operating skills using small incision sutureless techniques. Existing postoperative astigmatism can be reduced by suture cutting at specific periods particularly if there is follow-up at the critical periods.**

**Keywords:** Astigmatism, Post cataract extraction, Suturing, Intraocular lens, Refraction.

## INTRODUCTION

The visual acuity of patients following cataract extraction has been shown to be significantly better than preoperative vision in every age group (Raiyawa et al, 2008a; Raiyawa et al, 2008b). However, even with modern techniques, particularly with those with incisions larger than 3mm, poor vision can result from astigmatism (Raiyawa et al, 2008a; Zheng et al, 1997). This is largely because of wound closure which for these large incisions still requires to be closed with sutures which can inadvertently create tension in certain meridia of the cornea. The location of the incision is also important as certain loci can induce astigmatism more than others (Merriam et al, 2003; Marek et al, 2006; Matsumoto et al, 2001). Suture placement and whether sutures are removed postoperatively are also important in the development of astigmatism (Krishnamachary and Basti, 1997; Kronish and Forster, 1987).

All these can lead to astigmatism which is difficult to correct and this has been the bane of these types of surgeries. In the process of the postoperative management of these patients, an over refraction is often needed to enable the patient have the satisfaction of clear vision at different distances (Raiyawa et al, 2008b; Wilkins et al, 2009). Clear vision may however still elude some patients in some cases. Thus there may be need for high corrective cylindrical lens in many of the patients which may possibly result in some instances, to poor tolerability of the optical prescription by the patient

*Corresponding author's email: ebeluzo@yahoo.com

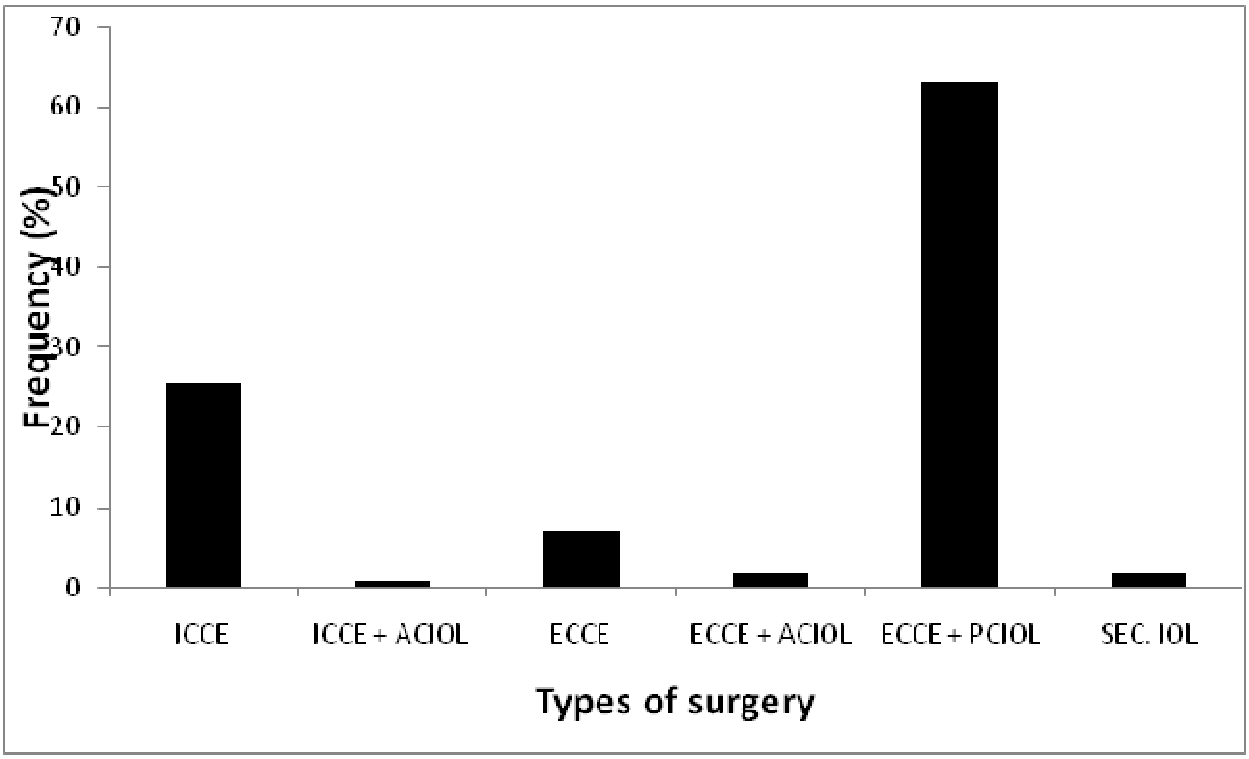


**Figure 1.** Distribution of patients according to types of surgery performed

(Kronish and Forster, 1987). It may be almost like exchanging one problem for another one. Quite a few factors may be responsible for these and some clinical studies have highlighted this (Raiyawa et al, 2008b). The advent of sutureless small incision surgery (Zheng et al, 1997; Marek et al, 2006; Masket et al, 2009) has doubtlessly made these conditions a thing of the past. However in Nigeria, a lot of centers are still performing extra capsular cataract extraction with the implantation of intraocular lens (ECCE+PCIOL; Zheng et al, 1997; Adio and Awoyesuku, 2007; Burgansky et al, 2002; Axt et al, 1987) and some even perform intra capsular cataract extraction (ICCE; Nag et al, 2001). UPTH, Nigeria at the period of this study was still carrying out ICCE for some patients, with incisions of up to 6-8mm sometimes.

This study reviews the prevalence of post operative astigmatism in relation to type of surgery with a view towards advocating for improved techniques for the ultimate benefit of the patients.

## MATERIALS AND METHODS

This is a retrospective study. Clinical records of all patients who attended the University of Port Harcourt Teaching Hospital (UPTH) eye clinic, diagnosed to have cataract and had cataract extraction carried out between 2002 and 2006 (5 year period) were studied. Data extracted from the records were age, sex, the past medical history, the type of cataract surgery, the power of the intraocular lens (IOL) that was inserted, the position of the IOL(whether in the anterior or posterior chamber i.e. AC or PC). Other information retrieved include the pre and postoperative visual acuity at 12 weeks, whether or not intraoperative or postoperative complications occurred and what type, and the refraction in those who were still on follow up after the end of 12 weeks with emphasis on the astigmatic errors.

Data obtained were tabulated and analyzed using bar-charts, graphs and simple percentage. The patients were group into age groups of 20 years interval for better analysis.

## RESULTS

The clinical files of 114 eyes of 100 patients who underwent cataract extraction at the UPTH between 2002 to 2006 were studied and data collected were analyzed in this study. The patient ages ranged from 10 years to 94 years with mean age of 58.84±19.57years.The sex distribution was 45% males and 55% females.

The preoperative acuity ranged from counting fingers (CF) to light perception (LP). ICCE was carried out in 29 (25.44%) eyes. ICCE+ACIOL was carried out on 1 (0.88%) eye, ECCE only was carried out in 8 (7.02%) eyes, ECCE+ACIOL was carried out on 2 (1.75%) eyes, ECCE+PCIOL was performed on 72 (63.16%) eyes. Two (1.75%) eyes had secondary IOL inserted into the anterior chamber (figure 1).

The power of IOL used was generally between 17 and 22D with 21D used in about 60% of cases. Of those with lenses inserted, over 90% had it inserted in the posterior

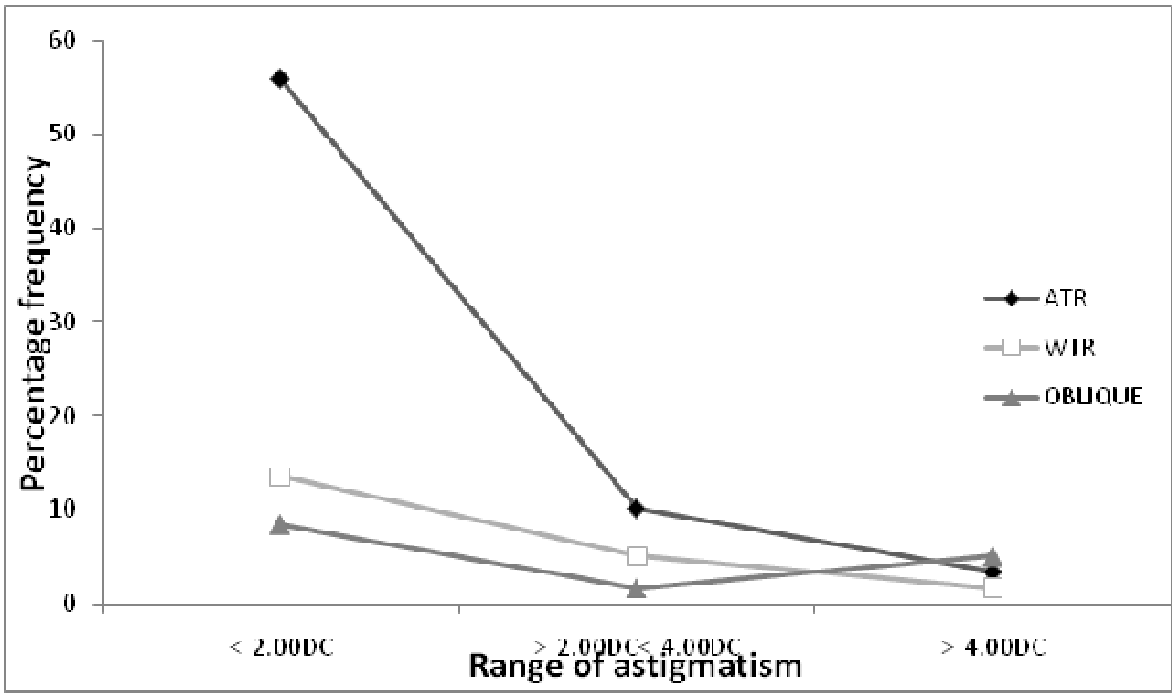


**Figure 2.** Classification of astigmatism with respect to degree and axis meridian.

**Table 1.** Distribution of astigmatism according to age group and surgery type

| Age Group | ICCE | ICCE + ACIOL | ECCE | ECCE + PCIOL | ECCE + ACIOL |
|---|---|---|---|---|---|
| 0 - 20 | 0 | 0 | 0 | 1 (1.69%) | 0 |
| 21- 40 | 0 | 0 | 0 | 0 | 0 |
| 41-60 | 8(13.56%) | 2 (3.38%) | 0 | 21(35.59%) | 1 (1.69%) |
| 61-80 | 7(11.86%) | 0 | 7(11.86%) | 4 (36.78%) | 0 |
| 81-100 | 1(1.69%) | 0 | 7(11.86%) | 0 | 0 |
| Total | 16(27.12%) | 2 (3.38%) | 14(23.73%) | 26(44.07%) | 1 (1.69%) |

chamber. Intraoperative complications were mainly vitreous loss in 7 cases (6.1%).

Of the 114 eyes seen, refraction was not done on 31 eyes (27.2%). Of these, four of the eyes had no useful reflex and had no improvement with lenses likely due to the post operative complications. The refraction done 12 weeks postoperatively gave corrected visual acuity ranging between 6/6 and 6/60. Of the 83 eyes refracted, 59 (71.08%) had astigmatism. The astigmatism found was classified according to its axis and 69.49% were found to be ATR, 20.33% WTR while 10.16% were oblique (figure 2).

The degree of astigmatism ranged from -0.5D to -5.00D with 76.27% of the errors <-2.00D, 16.95% were >-2.00D<-4.00D and 5.08% were >-4.00D (figure 2). In table 1, ECCE with PCIOL gave the highest number of subjects with astigmatism (26, 44.07%), followed by ICCE (16, 27.12%) and ECCE (14, 23.73%). ECCE+PCIOL was carried out mainly on the younger age groups (below 60years; 37.28%) while ECCE was carried mostly on those older than 60 years of age (23.73%). The number of ICCE carried out was the same for those within 60years of age or older (13.56% respectively).

Figure 3 shows that out of the 59 cases of astigmatism found 20 (33.89%) whose power was <-2.00DC underwent ECCE+PCIOL surgery followed by 14 (23.73%) that went through ECCE surgery only and 10 (16.95%) that had ICCE surgery only. Other cases of astigmatism whose degree of error were >-2.00DC went through ICCE or ECCE+PCIOL almost in equal proportion.

## DISCUSSION

Astigmatism means unequal curvature of the refractive surfaces of the eye. Thus a point source of light cannot be brought to a focus on the retina but is spread over a

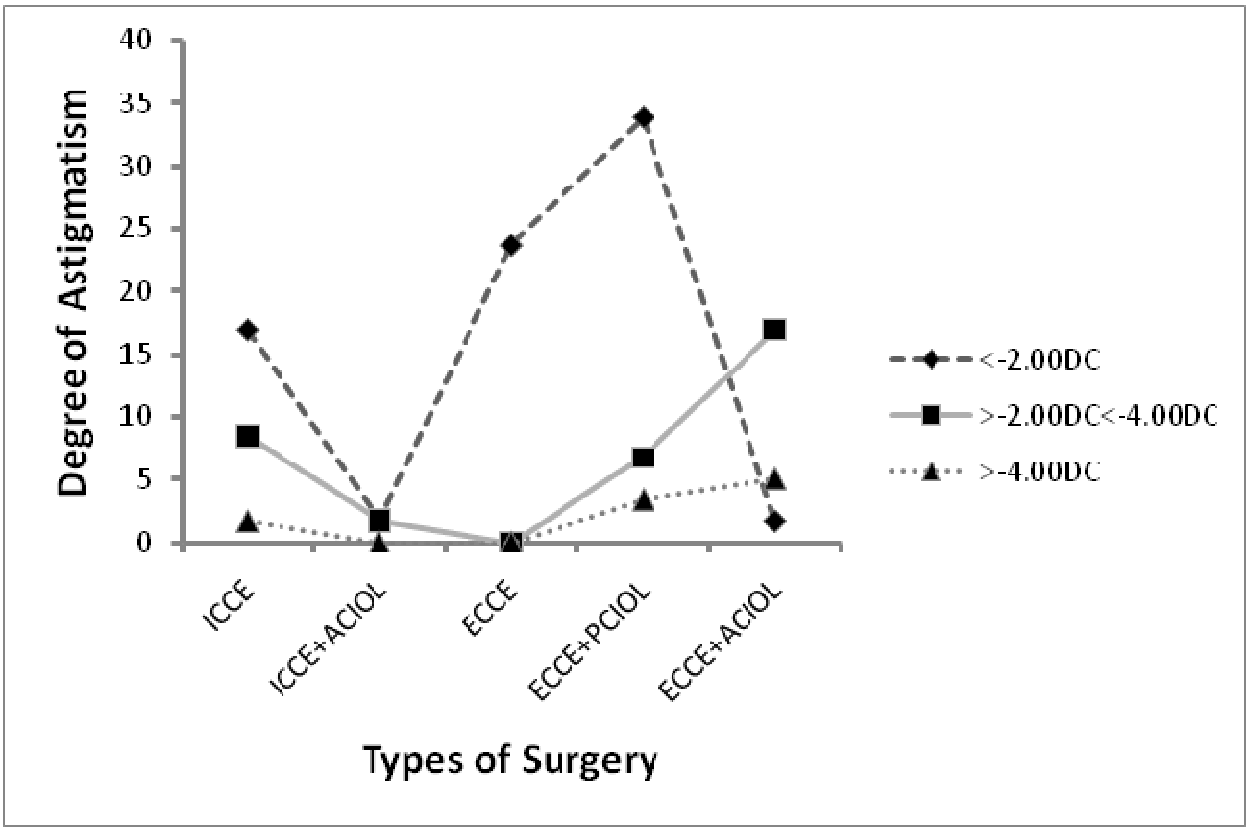


**Figure 3.** Distribution of astigmatism according to degree of error and type of surgery performed

more or less diffuse area. This results from the radius of curvature in one plane being longer or shorter than the radius at right angles to it (Dorland's, 2010).

Corneal astigmatism after cataract surgery is a well documented finding in adults (Storr-Paulsen et al, 1994; Church and Hillman, 1996; Atanassov et al, 1998). The degree of astigmatism present depends on various factors, such as the type and location of the surgical incision, the amount of scleral cauterization performed, the suture material and the placement of the sutures. The immediate post operative astigmatism and its subsequent changes are affected by the surgical technique and the experience of the surgeon (Zheng et al, 1997; Marek et al, 2006; Skubiszewska et al, 1996; Jurowski, 2003). Majority of patients (69.49%) studied in the period under review had ECCE carried out on them which has been the gold standard for many years (unpublished lecture note) particularly in the developing world. Prior to this, the situation has been different.

Cataract surgery has evolved over the years from being carried out through a large incision to give adequate access to the entire lens so as to enable it to be delivered safely and easily. Though the methods then were a bit crude with the instruments in use rather large and needing a larger incision (Guzowski,et al, 2002). Now with the advent of smaller incision surgeries for cataract like small incision cataract surgery (SICS) and phacoemusification, and microsurgical equipment, it is expected that the incidence of surgically induced astigmatism will be reduced to the barest minimum (Matsumoto et al, 2001; Guzowski et al, 2002).

It is most likely from the postoperative refractions carried out that some level of astigmatism had been induced, 71.08% of the 83 eyes that were refracted had astigmatism. This value represents 51.75% of the eyes that had cataract extraction within the period under review. It should be noted that some studies have not shown any significant level of astigmatism with similar types of cataract surgeries (Zhend et al, 1997; Burgansky et al, 2002).

A study of post ICCE surgery patients showed even higher figures with ranges of up to 8DC (Nag et al, 2001). In our study, the type of cataract extraction that caused the greatest amount of astigmatism was ECCE+PCIOL (3.39%). This could be because of sheer numbers as it was the most commonly performed surgery. Astigmatism less than 2D was highest in this group (ECCE+PCIOL; 33.89%) also while ICCE had the highest number with astigmatism in the range between 2D and 4D (8.47%; figure 3).

The level of astigmatism of up to 4D in this study is also plainly shown in Nepal (Nag et al, 2001). Against the rule

astigmatism was also observed in a high number of our patients (69.49%) this is corroborated by other workers (Axt et al, 1987; Cho and Kim, 2009). Surgically induced astigmatism is a dynamic feature showing changes in size and axis even up to 3 years postoperative. Releasing the sutures early by the 6th week (Giansanti et al, 2006) has however been found helpful particularly if done in conjunction with careful retinoscopy and keratometry in decreasing induced astigmatism and accelerating the shift in astigmatic axis, turning astigmatism ATR when compared with eyes with intact sutures (Storr-Paulsen et al, 1994; Church and Hillman, 1996) . Astigmatism decay was steeper in eyes that had their sutures cut (Standford et al, 1993). Eyes with preexisting astigmatism however have higher chances of being or remaining astigmatic after the surgery (Matsumoto et al, 2001). A study has shown that preoperative astigmatism did not affect astigmatic change in their own series of ECCE surgeries (Zheng et al, 1997). The size of the incision and the location has been shown to affect postoperative astigmatism (Zheng et al, 1997; Masket et al, 2009). Incisions larger than 3.2mm are more likely to induce astigmatism (Zheng et al, 1997; Merriam et al, 2003; Burgansky et al, 2002) no matter the location.

Locating the incision temporally can also ameliorate the surgically induced astigmatism (Zheng et al, 1997, Marek et al, 2006). In the cases studied, most of the surgeries were carried out with the superior approach. The location temporally is also important and causes minimum astigmatism (Junejo et al, 2009). If clear corneal, it is more advantageous, particularly if it is 2.8mm long (Marek et al, 2006; Masket et al, 2009). This has greater effect, no matter the location; if there was low preoperative corneal cylinder (Amesbury and Miller, 2009). Most of the temporal incisions carried out in this series were 6-7mm long. If the suture is less, also it is more advantageous (Matsumoto et al, 2001; Burgansky et al, 2002). However in this series, about one third of the patients were lost to follow-up. It could be that they were satisfied with their vision. This may have favorably altered the outcome of these results, particularly if they had low levels of induced astigmatism. Follow-up has been a great challenge in this part of the world. This is also made worse by the various bureaucratic bottlenecks in hospitals. Therefore, immediately a patient begins to feel better, he may stop coming. This may also adversely affect early detection of the induced astigmatism for which suture cutting can be used at the appropriate meridian to allow remodeling and thereby prevent intractable astigmatism (Krishnamchary and Basti, 1997; Kronish and Forster, 1987) which in this series has been observed to be as high as 5DC. Mean of 1.85±1.26DC found in this study is however lower than a study that reported up to +3.47DC as the mean induced cylinder (Zheng et al, 1997).

Astigmatism however changes over time with the eye still remodeling months to years after the surgery (Zheng et al, 1997; Kronish and Forster, 1987; Axt et al, 1987; Cho and Kim, 2009). Preexisting astigmatism can be treated during surgery as shown by some workers (Matsumoto et al, 2001; Gills 2002). However carrying out sutureless small incision surgery, may reduce astigmatism almost completely as the amount of induced astigmatism is almost negligible when carried out carefully (Matsumoto et al, 2001). This will mean better and more satisfied patients as the quality of vision they have will be superior (Wilkins et al, 2009). This type of surgery is what is advocated for now in developing countries as follow-up, for which there is a local challenge may not matter. The morbidity is much less also and the patient will be able to return to work a much happier person than before.

It is advocated that a complete change in surgical technique (unless otherwise indicated) should be made in UPTH and other centers to sutureless small incision surgery as the level of astigmatism induced from the traditional extracapsular could affect some patients adversely (Zheng et al, 1997). SICS should be taught to all ophthalmology residents. Intracapsular techniques should be relegated completely as even inserting an IOL can increase the risk of developing astigmatism postoperatively (Nag et al, 2001).

The best surgery to avoid astigmatism, however, is to use incisions that are less than 3mm located on the cornea and temporal. This can only be used with phacoemulsification techniques, the use, however, is still not as widespread in the developing world due to the cost of the equipment (Merriam et al, 2003). As most patients find it difficult to come for follow-up, this may be a better option as surgically induced astigmatism can be treated only if the patients present themselves for periodic refraction so that it can be picked up early and suture cutting carried out early (Kronish and Forster, 1987).

This change is in keeping with international recommendations for the developing world and it is desirable for it to be adopted in UPTH and Nigeria as a whole.

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