# Results

(Table 1) shows the patients' preoperative data. Twenty five eyes (23 patients), all were implanted with Crystalens®AT-45 (Eyeonics, Inc, Aliso Viejo, CA) for management of age related cataract.

| Preoperative Data | (Range) Mean ± SD |
|---|---|
| **Total procedures** | 25 |
| **Age (years)** | (45-65y) 52.23 ± 5.3 |
| **Sex (M/F)** | 13/12 |
| **Laterality** | 2 bilateral, 21 unilateral |
| **Keratometry (K)** | (42.2-45.6) 43.2±0.35 |
| **Difference Keratometry (dK)** | ( 0.25 – 1.00) 0.55 ± 0.25 |
| **Axial lengths (mm)** | (21.9 – 25) 23.5 ± 0.86 |
| **Crystalens Powers (D)** | (19-24) 21.8 ± 1.45 |

*Table (1) preoperative data of the study.*

❖ **Keratometric astigmatism:** the difference between the preoperative and 6 month postoperative difference K (dK) was statistically insignificant (*P* =0.065; paired sample *t* test). See table (2) and (3)

| | | PREdK | dK6MO |
|---|---|---|---|
| N | Valid | 25 | 25 |
| | Missing | 0 | 0 |
| Mean | | .5500 | .3600 |
| Std. Error of Mean | | .05000 | .05965 |
| Median | | .5000 | .2500 |
| Std. Deviation | | .25000 | .29826 |
| Variance | | .06250 | .08896 |
| Skewness | | .380 | .634 |
| Std. Error of Skewness | | .464 | .464 |
| Kurtosis | | -.820 | -.125 |
| Std. Error of Kurtosis | | .902 | .902 |
| Range | | .75 | 1.00 |
| Minimum | | .25 | .00 |
| Maximum | | 1.00 | 1.00 |
| Percentiles | 25 | .2500 | .1250 |
| | 50 | .5000 | .2500 |
| | 75 | .7500 | .5000 |

dK: difference between the steepest and flattest corneal meridian.
PREdK: Preoperative dK
dK6MO: Postoperative 6 months dK

Table (2): Difference keratometric Cylinder in pre and 6mo postoperative follow up.

| | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| PREDK - DK6MO | .1900 | .49096 | .09819 | -.0127 | .3927 | 1.935 | 24 | .065 |

*Table (3): Paired samples test comparing Pre and 6 month Postoperative Keratometric Cylinder*

- **Intraocular Pressure (IOP):** Figure (4) shows the stability of IOP along the different follow up visits. The difference between the preoperative IOP and 6 month postoperative IOP was statistically insignificant ($P$ =0.073) .

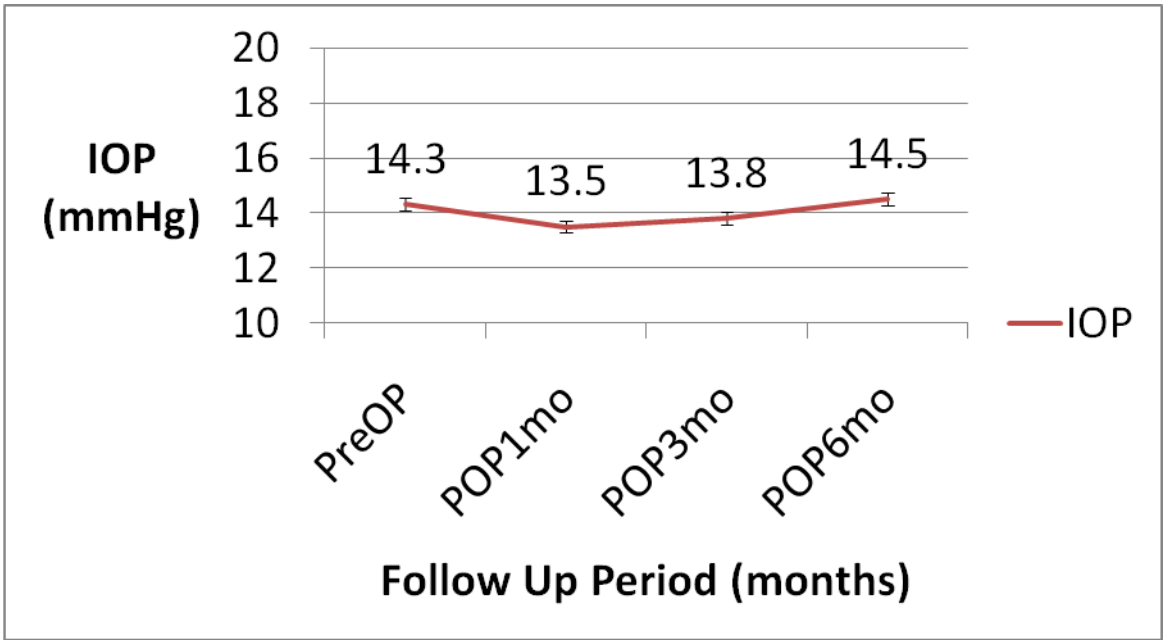



Figure (4): Scatter graph showing the mean of intraocular pressure measurements with standard error of mean in preoperative versus postoperative visits

- **Distant Uncorrected Visual Acuity (DUVA):** the pre and postoperative DUCVA data are described in table (4) .

1-month examination, 22 eyes (88%) had DUVA of 6/12 or better. The remaining three eyes (12%) had DUVA of 6/18 (0.32).

On the other hand, at six month visit, 23 eyes (92%) had DUVA of 6/12 or better and the remaining two eyes (8%) had uncorrected distance acuity of 6/18 (0.32).

A statistically significant different values were obtained on comparing a preoperative and 6 month postoperative DUVA ($P = 0.042$) but insignificant between the one and 6 month visits ($P$=0.062)

| | | PREDUVA | P1MDUVA | P3MDUVA | P6MDUVA |
|---|---|---|---|---|---|
| N | Valid | 25 | 25 | 25 | 25 |
| | Missing | 0 | 0 | 0 | 0 |
| Mean | | .0980 | .828800 | .851600 | .822000 |
| Std. Error of Mean | | .01020 | .0249955 | .0251706 | .0262170 |
| Median | | .1000 | .800000 | .800000 | .800000 |
| Std. Deviation | | .05099 | .1249773 | .1258531 | .1310852 |
| Variance | | .00260 | .0156193 | .0158390 | .0171833 |
| Skewness | | 1.110 | .078 | -.114 | .079 |
| Std. Error of Skewness | | .464 | .464 | .464 | .464 |
| Kurtosis | | .391 | -.723 | -.921 | -.909 |
| Std. Error of Kurtosis | | .902 | .902 | .902 | .902 |
| Range | | .15 | .3700 | .3700 | .3700 |
| Minimum | | .05 | .6300 | .6300 | .6300 |
| Maximum | | .20 | 1.0000 | 1.0000 | 1.0000 |
| Percentiles | 25 | .0500 | .800000 | .800000 | .800000 |
| | 50 | .1000 | .800000 | .800000 | .800000 |
| | 75 | .1000 | 1.000000 | 1.000000 | 1.000000 |

PREDUCVA: preoperative distant uncorrected VA
P1MDUCVA: postoperative 1 month distant uncorrected VA
P3 MDUCVA: postoperative 3 month distant uncorrected VA
P6 MDUCVA: postoperative 6 month distant uncorrected VA

Table (4): Distant uncorrected visual acuity (DUVA)

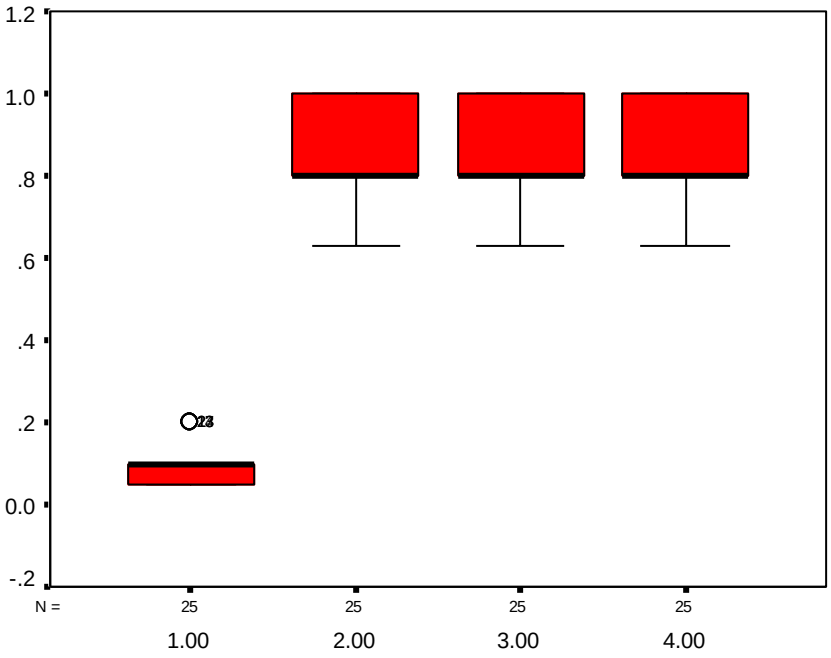
❖ **Distant Corrected Visual Acuity (DCVA):** The pre and postoperative DCVA are described in the following Tables (5) and Figures (5,6) .

In the 6 month follow up period, 25 eyes (100%) had DCVA of 6/12 or more.

The preoperative and 6 month DCVA values showed statistically significant difference (*P*=0.000). A statistically insignificant (*P*=0.065) values were obtained when comparing the DCVA in the first and six month follow up visits.

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| PREDCVA | 25 | .05 | .32 | .2008 | .09115 |
| P1MDCVA | 25 | .6300 | 1.0000 | .925200 | .0972591 |
| P3MDCVA | 25 | .80 | 1.00 | .9520 | .07703 |
| P6MDCVA | 25 | .80 | 1.00 | .9680 | .06272 |
| Valid N (list wise) | 25 | | | | |

Table (5): Distant corrected visual acuity




1.00= Preoperative.
2.00= 1 month Postoperative.
3.00= 3 month Postoperative.
4.00= 6 month Postoperative.

Figure (5): Graph describing the distant corrected visual acuity (DCVA) along the different visits

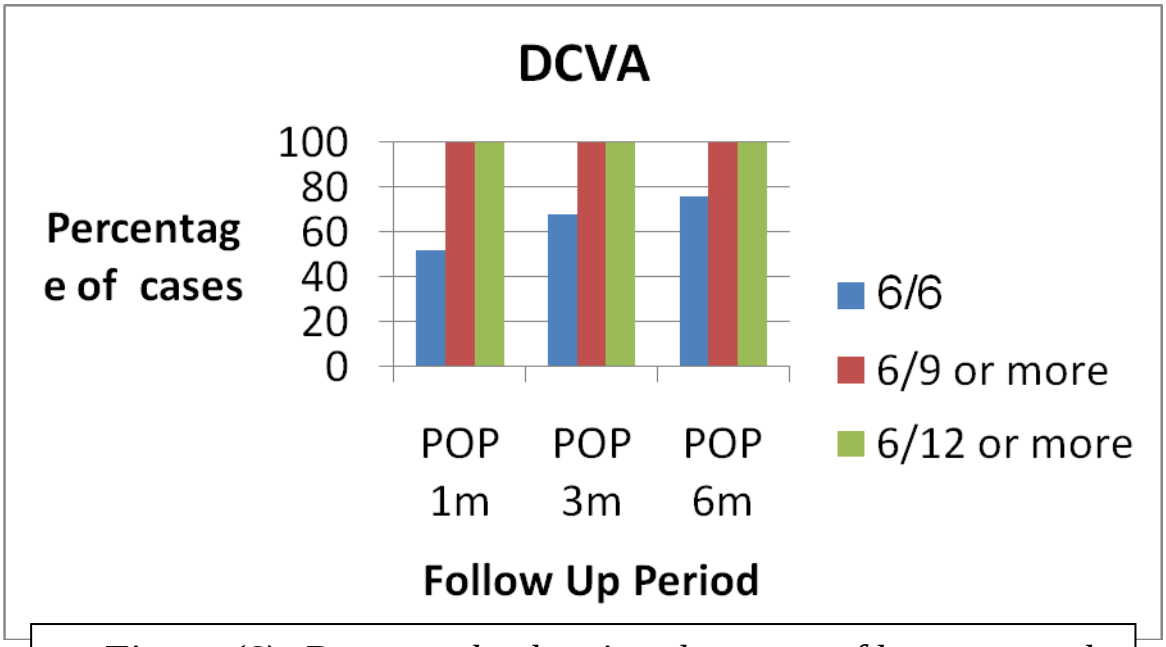



*Figure (6): Barograph showing the mean of best spectacle corrected distant visual acuity (Snellen)*

- **Near Uncorrected Visual Acuity (NUVA):** the pre and postoperative data are described in the following table (6) and figure (7).

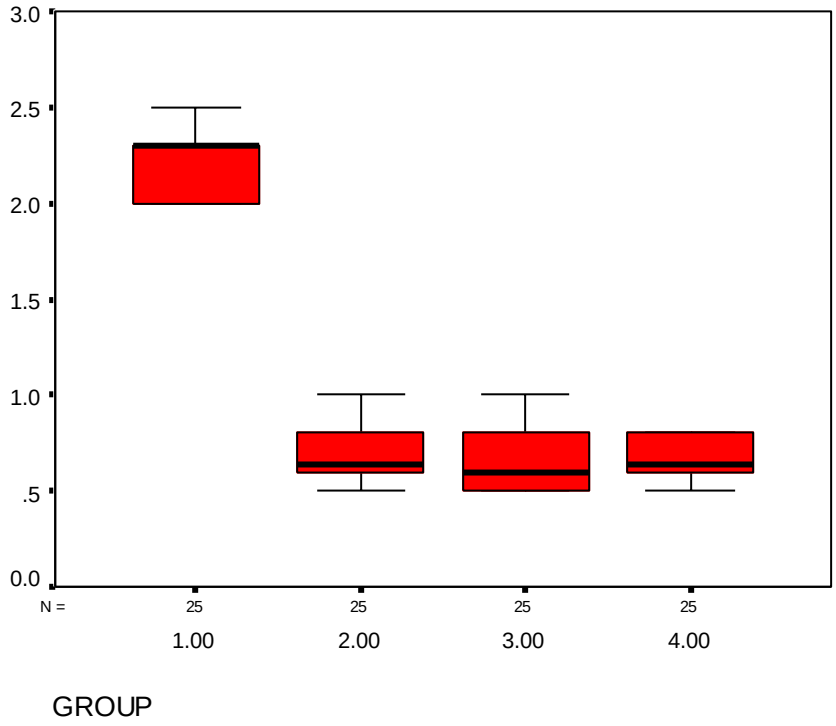
  In all follow up visits (up to six month) – the mean of uncorrected near visual acuity was J4 (0.64).

  At one month follow up visit, 19 eyes (76%) of cases were J3 (0.60) or better while at six month 18 eyes (72%) of cases were J3 (0.60) or better

The difference between the preoperative and 6 month postoperative values in NUVA was statistically significant (*P*=0.000) while on doing a comparison between 1 month and 6 month postoperative follow up visits a statistically insignificant values were obtained (*P*= 0.071).

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Preop | 25 | 2.2560 | .18046 | .03609 | 2.1815 | 2.3305 | 2.00 | 2.50 |
| POP1m | 25 | .7144 | .16192 | .03238 | .6476 | .7812 | .50 | 1.00 |
| POP3m | 25 | .6488 | .13773 | .02755 | .5919 | .7057 | .50 | 1.00 |
| POP6m | 25 | .6824 | .11304 | .02261 | .6357 | .7291 | .50 | .80 |

Table (6):near uncorrected visual acuity




1.00= Preoperative.
2.00= 1 month Postoperative.
3.00= 3 month Postoperative.
4.00= 6 month Postoperative.

Figure (7): Barograph for near uncorrected visual acuity

❖ **Near visual acuity with distant correction :**

The mean near visual acuity with distant correction was J5 (0.8) at one month and 6 month follow up - More than 60% of the patients reached J3 or better (see figure 8).

In comparison between the preoperative near visual acuity with distant correction and six month

postoperative follow up, a statistically significant values were obtained ($P$ =0.021) while insignificant in comparing the first and six month postoperative follow up ($P$=0.076) .

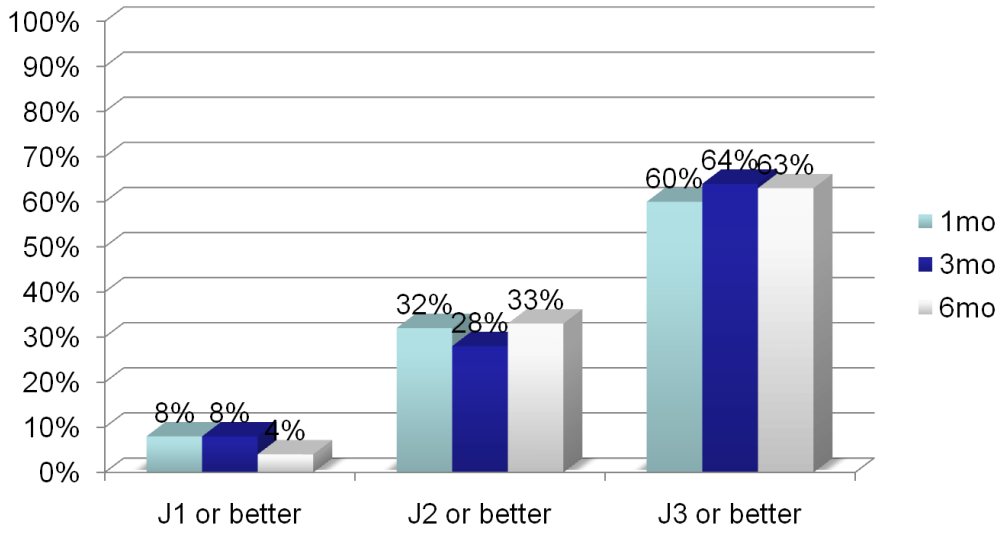



*Figure (8): Columns showing the percentage of corrected near visual acuity with distant correction (Jaeger)*

❖ **Refraction:**

The spherical equivalent from preoperative till the six month postoperative follow up visit are described in the following table (7).

In comparison between different visits starting from preoperative to six month postoperative, a statistically significant values were obtained (P=0.958; using ANOVA statistics)

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Preop | 25 | -.140 | 1.19041 | .23808 | -.6314 | .3514 | -2.00 | 2.00 |
| POP1m | 25 | -.240 | .50249 | .10050 | -.4474 | -.0326 | -1.00 | .50 |
| POP3m | 25 | -.210 | .42500 | .08500 | -.3854 | -.0346 | -1.00 | .50 |
| POP6m | 25 | -.160 | .40104 | .08021 | -.3255 | .0055 | -1.00 | .50 |

Preop = Preoperative. POP1m= postoperative 1 month,
POP3m=postoperative 3 month, POP6m=postoperative 6 month

Table (7):Spherical equivalent

- **Amount of Near correction (Add) and the Near visual acuity with Add:** The pre and postoperative near Add and the corrected near visual acuity were described in table (8) and figure (9)**.**

On analysis of the near visual acuity corrected with near Add at one month was:

- 12% had plano near correction and can read J1 (0.4)

- 24% had +1.00 D or less and can read J1(0.4)
- 100% of eyes can read J1 (0.4) or better with near correction.

After six months follow up, the mean near correction was +1.58 ± 0.21 (Ranged from Plano to +2.00).

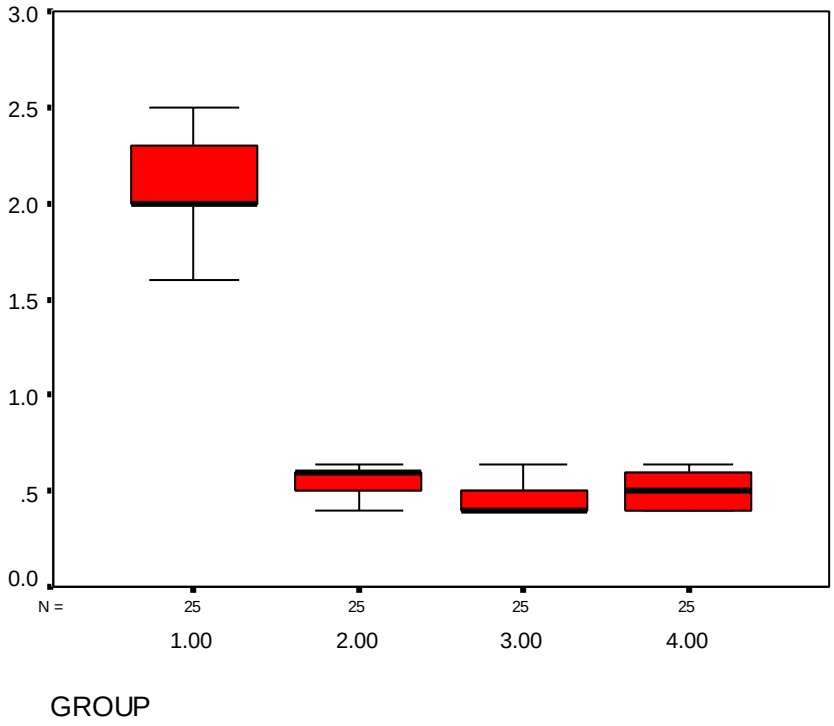
- 12% had plano near correction and can read J1(0.4)
- 30% had +1.00 or less near correction
- 100% had J1 (0.4) with near correction.

The preoperative and 6 month postoperative near visual acuity corrected with near add were statistically significant different (*P*=0.001)

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Preop | 25 | 2.072 | .26851 | .05370 | 1.9612 | 2.1828 | 1.60 | 2.50 |
| POP1m | 25 | .5424 | .08743 | .01749 | .5063 | .5785 | .40 | .64 |
| POP3m | 25 | .4728 | .09361 | .01872 | .4342 | .5114 | .40 | .64 |
| POP6m | 25 | .4856 | .09229 | .01846 | .4475 | .5237 | .40 | .64 |

Preop = Preoperative,
POP1m= postoperative 1 month,
POP3m=postoperative 3 month,
POP6m=postoperative 6 month

Table (8): Descriptive statistics for near add




1.00= Preoperative.
2.00= 1 month Postoperative.
3.00= 3 month Postoperative .
4.00= 6 month Postoperative.

Figure ( 9 ): Amount of near Add in different follow up visits

❖ **Anterior Chamber Depth measurements before and after Pilocarpine 2% Eyedrops:** see figure (10)

After 1 month follow up, the mean postoperative anterior chamber depth (before Pilocarpine 2%) was 3.80 ± 0.34 (Range 3.46 to 4.02mm), which become shallower after Pilocarpine 2% installation with a mean of 3.02 ± 0.26 (Range 2.80 to 3.25mm).

After 6 months follow up, the mean postoperative anterior chamber depth was 4.00 mm ± 0.55 (Range 3.34 – 5.11mm) measured with A scan, on the other hand, after pharmacological stimulation with 2% Pilocarpine, the mean anterior chamber depth was 3.5 ± 0.35 (Ranged 2.63 – 4.3 mm).

The difference between the first and sixth month in AC depth (post-Pilocarpine instillation) is statistically significant (*P*=0.01)

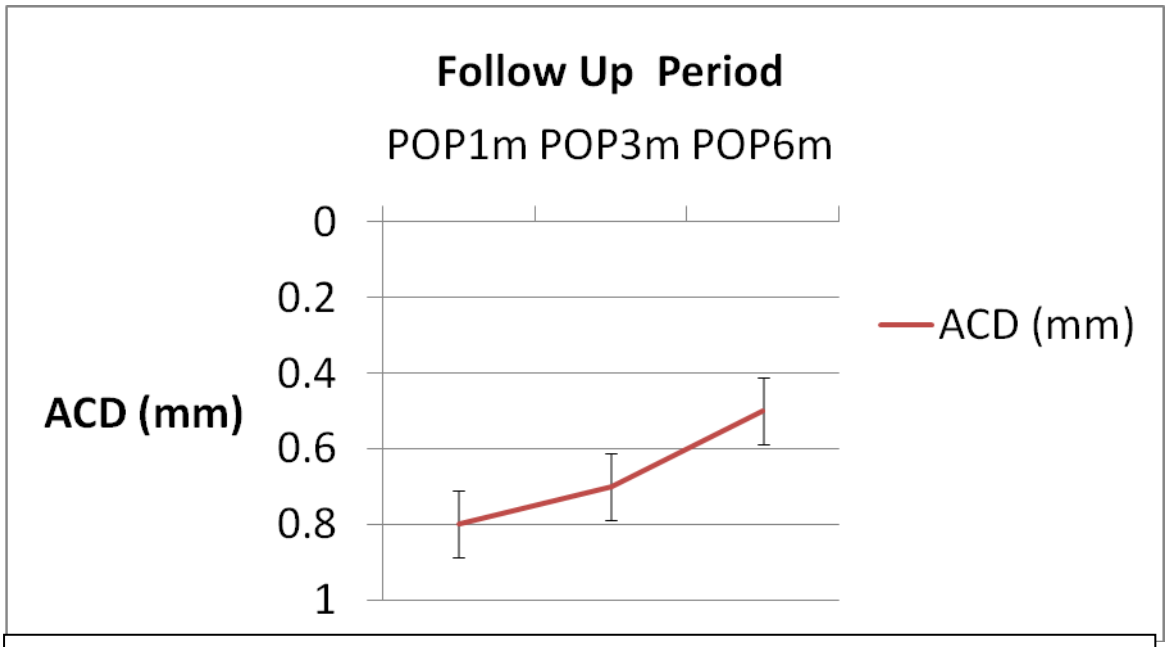



*Figure (10): Scatter gram showing the mean difference in AC depth after Pilocarpine 2% installation.*

❖ **Amplitude of Accommodation:**

- Objective Method: see Figure (11)

  we calculated the amplitude of accommodation by using Gullstrand eye model which demonstrate that every 1 mm forward movement of the IOL is able to acquire a refractive change of the eye approximately 1.8D.

  After pharmacological stimulation by Pilocarpine 2%, the mean postoperative amplitude of accommodation at 6 months follow up visit was 0.91 ± 0.27 (Range 0.18 to 1.26 D)

- Subjective Method: see Figure (11)

  The mean postoperative amplitude of accommodation at six months follow up by defocusing method was 1.32 ± 0.59 (Range 0.5 to 2.5).

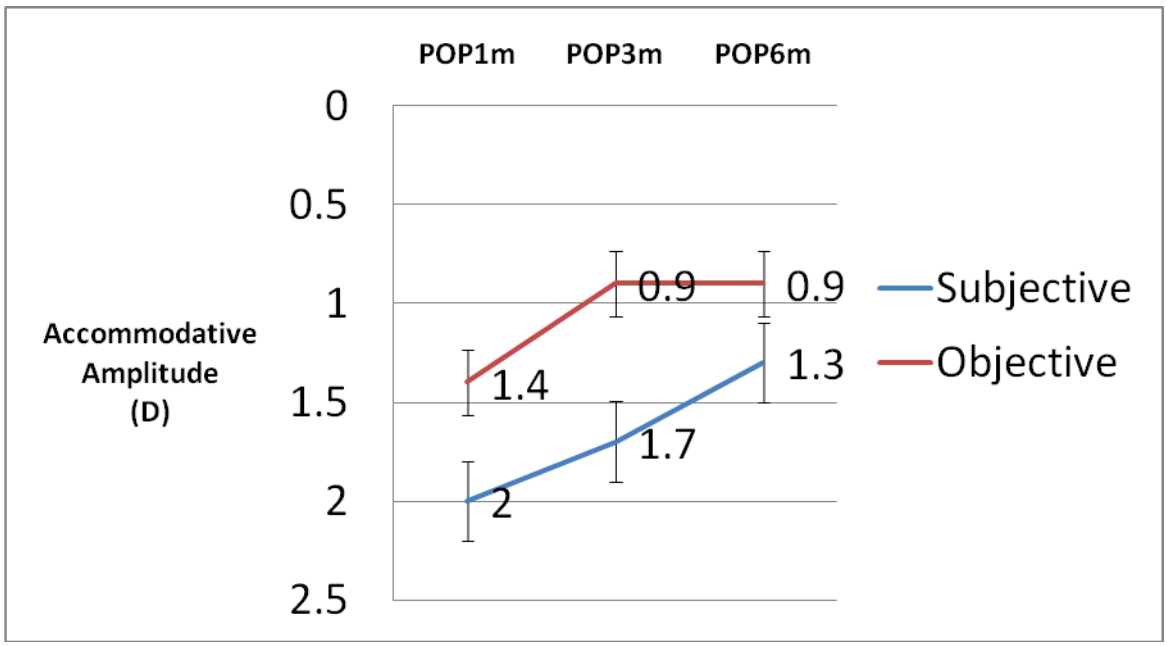



*Figure (11): Scatter gram showing the difference in the mean amplitude of accommodation measured by subjective versus objective methods.*

**Capsular Opacification:** Mild posterior capsule opacification was observed in three eyes (12%) at one month follow up visit. At six month follow up visit, 8 eyes (24 %) were having mild to moderate opacification in both anterior and posterior capsules. YAG Capsulotomy was deferred for more than 6 months after Crystalens AT-45 IOL implantation – according to the study protocol.

**IOL Tolerability:** No corneal edema or iritis was reported past 1 week postoperatively with the exception of one patient whose mild iritis resolved after 2 weeks under frequent topical Prednisolone Acetate 1% eye drops (Pred Forte, Allergan Co.). No IOL decentration or dislocation was reported.

❖ **Results of questionnaire:** see table (9)

| Activity | Yes or Able / number patients |
|---|---|
| Read small font of the news paper without readers *(Near vision)* | 9/25 (36%) |
| Read prices during shopping *(Intermediate vision)* | 25/25 (100%) |
| Participate in sports mainly football *(both distant and intermediate vision)* | 7/9 (77%) |
| Discrimination of people's faces clearly at > 30 meter *(Distant vision)* | 20/25 (80%) |
| Night Driving *(Distant and intermediate vision)* | 4/10 (40%) |
| Sew or do needlework *(Near vision)* | 7/20 (35%) |
| Watch T.V@ 2 meters *(Intermediate vision)* | 25/25 (100%) |

*Table (9) demonstrating the percentage of patients answer yes/able in the questionnaire.*