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RESEARCH ARTICLE

QUANTITATIVE ANALYSIS OF ANTERIOR CHAMBER ANGLE WITH ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY (ASOCT) BEFORE AND AFTER LASER PERIPHERAL IRIDOTOMY

Dr. K.V.V. Satyanarayana MD[1], Dr. Ravi Naini MS[2], Dr. V.V.L. Narsimha Rao MS. DO[3], Dr. C. Rajyalakshmi MD[3], Dr. P. Veena MS. DO[3] and Dr. D. Gayatri DNB[4]

1. Associate Professor.
2. Assistant Professor.
3. Professor.
4. Sr. Resident.

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Abstract

To measure the Anterior Chamber depth, Anterior chamber angle with Anterior segment OCT and measuring intra ocular pressure before and after Laser Peripheral Iridotomy in Primary Angle closure Disease.

Methods: In primary angle closure patients both males and females are selected with variable ages. Anterior chamber (AC) angles examined with Gonioscopy and the angle configuration classified with Shaffer System (1960) (1)The Intra Ocular Pressure (IOP) recorded with applanation Tonometer. Laser Peripheral Iridotomy (LPI) performed in indicated cases and AC angle and IOP recorded after 3 days, 6 weeks and 6 months.

Conclusions: In Angle closure Glaucoma AC depth and AC Angle are remarkably increased after LPI. IOP also is decreased in Primary Angle closure Glaucoma with Ocular Hyper Tension. LPI proved to be effective in almost all the Primary Angle Closure Suspect, Primary Angle Closure, Primary Angle Closure with OHT, Primary Angle Closure Glaucoma.

Introduction:-

Glaucoma is a sight threatening disease if neglected and it may lead to permanent blindness. The prevalence of PAOG and PACG varies ethnically. Increased age is a definite risk factor for both POAG and PAACD.(2)

The incidence of PACG is more in Asia where 60% of population of the world resides. 54% of Primary Glaucomas are PACG in China.(3) The ratio of PACG with POAG 1:1.

PACG carries 3 folds increased risk of blindness than POAG. Prevalence of blindness among the subjects of more than 40 years of age in the rural Tamil Nadu is 3.36%.(4).The risk of blindness in PACG is decreased by performing Laser Peripheral Iridotomy.

Corresponding Author:- Dr. K.V.V. Satyanarayana MD
Address:- Associate Professor.

Laser Iridotomy is strongly recommended in Primary Angle Closure (PAC) / Primary Angle-Closure Glaucoma (PACG)(5). Prophylactic LPI prevents 95% of progression of PACD (6). The depth of anterior chamber is not constant. Studies have noticed the depth of Anterior chamber has diurnal variations.(7)

Gonioscopy is the gold standard to evaluate the Anterior chamber angle. PACD classified as per International Society of Geographic and Epidemiologic Ophthalmology (ISGEO) in to:
1. Primary angle closure Suspect (PACS),
2. A. Primary angle closure with occludableangle (PAC),
2 B. Primary angle closure with ocular hyper tension (PAC OHT)
3. Primary angle closure glaucoma (PACG).(8).

There is no proper quantitative measurement for AC angle and depth configuration. AS OCT is a promising tool to fill this deficiency, and a proper way of documentation of all parameters including Corneal thickness, AC depth, Angle opening distance lens vault etc., can be done.

The AS-OCT is a noncontact, rapid imaging device that uses low-coherence interferometry to obtain cross-sectional images of the anterior segment. (9). The diurnal variation of anterior chamber depth can be measured by Ant. Seg. OCT.(10). Anterior chamber angle measurements obtained from anterior segment OCT. The mean anterior chamber angle of healthy normal eyes was 35.9 ± 5.7°. AS-OCT allows for better diagnosis of angle-closure glaucoma.(11).

Peripheral iridotomy is the treatment for PACG. Peripheral Iridotomy was first time performed by von Graefe.(12). Later it was modified and replaced by Laser Iridotomy which have several advantages over surgical PI .(13). Laser peripheral iridotomy(LPI) is the first line treatment in cases of Primary Angle Closure Glaucoma (PACG) .(14). LPI results in a significant increase in the angle width in Chinese papulation with narrow angles. (15). LPI widens the anterior chamber angle in the PACS and can be documented with OCT(16).

Material &Methods:-

A retrospective study of case series is conducted at Gitam Institute of Medical Sciences, Visakhapatnam, Andhra Pradesh, South India, over a period of 11-months ie. September 2021 to August 2022. 78 eyes of 39 individuals of PACD between the ages of 40 - 60 years of age are included in this study. This number consists of primary angle closure suspect (PACS) n 62 (80%), Primary angle closure with occludable angle (PAC)n 8 (10%), PAC with ocular hypertension (PAC OHT)n 4 (5%) and primary angle closure glaucoma (PACG)n 4 (5%). Out of 39 individuals 34(87%) were Female and 5(12%) were Male. All the individuals selected for this study are treated with Laser Peripheral iridotomy (LPI) as indicated in the treatment for PACD.

Anterior segment examined for all cases with slit lamp bio microscope, to evaluate the peripheral and central anterior chamber depth. Intra ocular pressure recorded with Goldman applanation Tonometer before and post laser procedure. Anterior chamber angle assessment done with Sussman 4 mirror Gonio scope before and after laser iridotomy. AC angle documentation done with Topcon 3D OCT-1 Maestro2 before and after LPI at nasal and temporal cuts in static mode. All the cases are followed up for 3 days, 6weeks and 6 months to assess AC depth, Angle width, IOP.

LPI was performed usingNd:YAG (neodymium–yttrium–aluminium–garnet) laser. After instilling pilocarpine 2% eye drops one hour before the LPI procedure. 1-3 shots were applied on a crypt of the temporal iris margin, with a power between 200 and 350 mW, a 0.1 seconds and a 500 µm spot size, by using laserirodotomy lens. Steroid eye drops prescribed three times a day for 3 days to control the post laser iritis.

On the 3rd day follow-up visit, IOP is recorded, AC angle examined with Gonioscope and anterior chamber parameters are documented with ASOCT (Topcon 3D OCT-1 Maestro2), and steroid eye drops are withdrawn.

Results:-

39 individuals between 35 – 50 years of age are selected, n 34 (87%) are females and n 5 (12.8%) are males. After clinical evaluation as described above, they are sub classified as PACS 62 eyes (79.5%) PAC 8 eyes (10.3%) PAC OHT 4 eyes (5.1%), and PACG 4 eyes (5.1%).

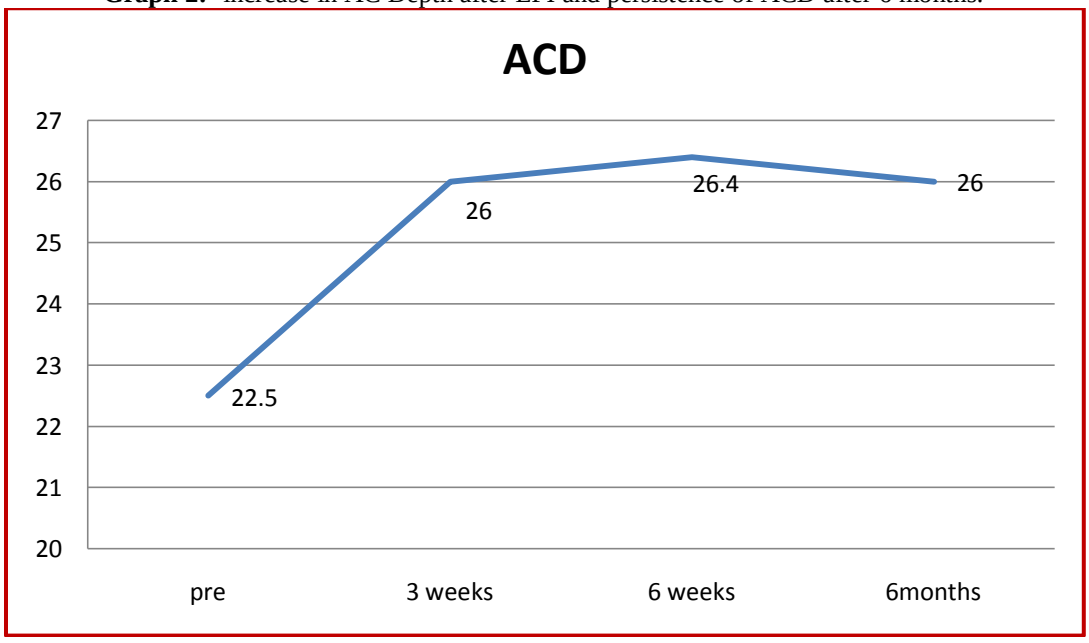
IOP, Anterior chamber depth, Anterior chamber angle are the parameters recorded after doing LPI.
The mean IOP reduced from 18.95 +/- 1.05 to 13.05 +/- 1.89 mm of Hg. There is drop 6 mm of Hg of IOP. (Table.1)

Graph 1:- Showing the reduction of IOP after LPI during the follow-up visits.

The mean IOP reduction from 18.95 mm of Hg is reduced to 13.05 mm of Hg, 12.05 mm of Hg, 14.2 mm of Hg after LPI in the follow-up visits of 3 days, 6 weeks and 6 months respectively.

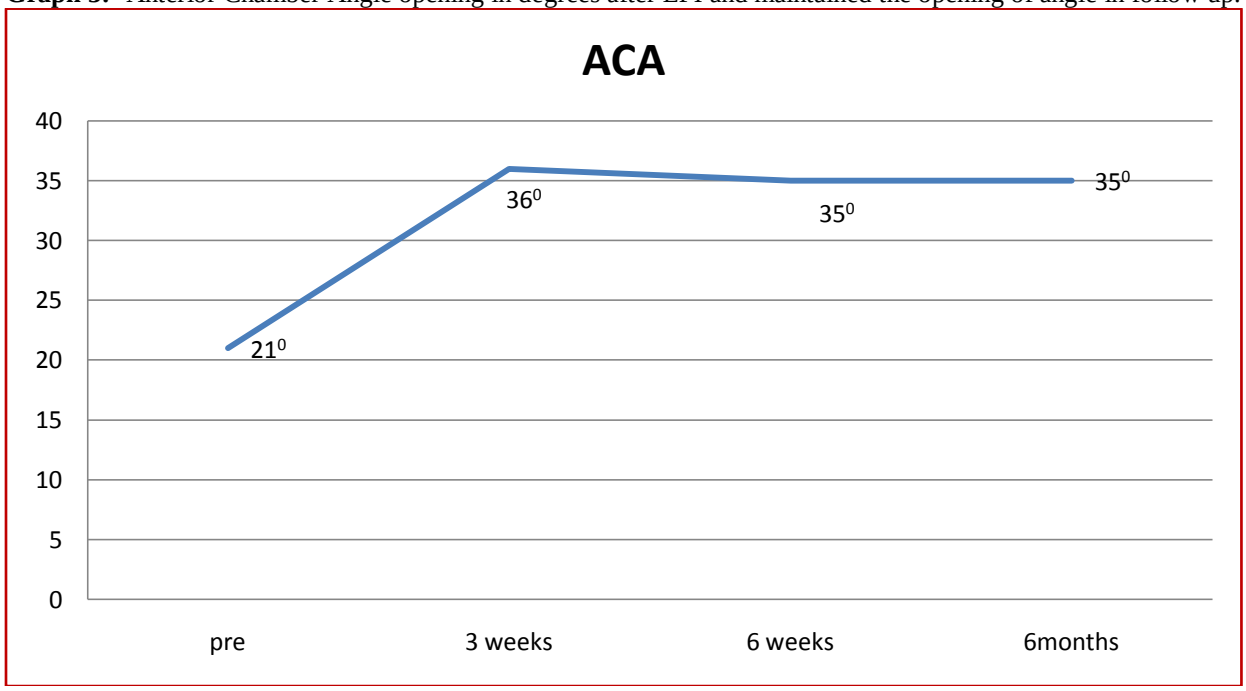
The mean Anterior chamber depth for all 78 eyes of all categories of glaucoma pre laser is 22.5 mm and after laser the ACD is significantly increased to 26mm, 26.4mm and 26 mm after 3 weeks, 6 weeks, 6 months respectively. ACD was not improved much in 1 case of PAC and 2 cases of PACG. (Table.2)

Graph 2:- increase in AC Depth after LPI and persistence of ACD after 6 months.



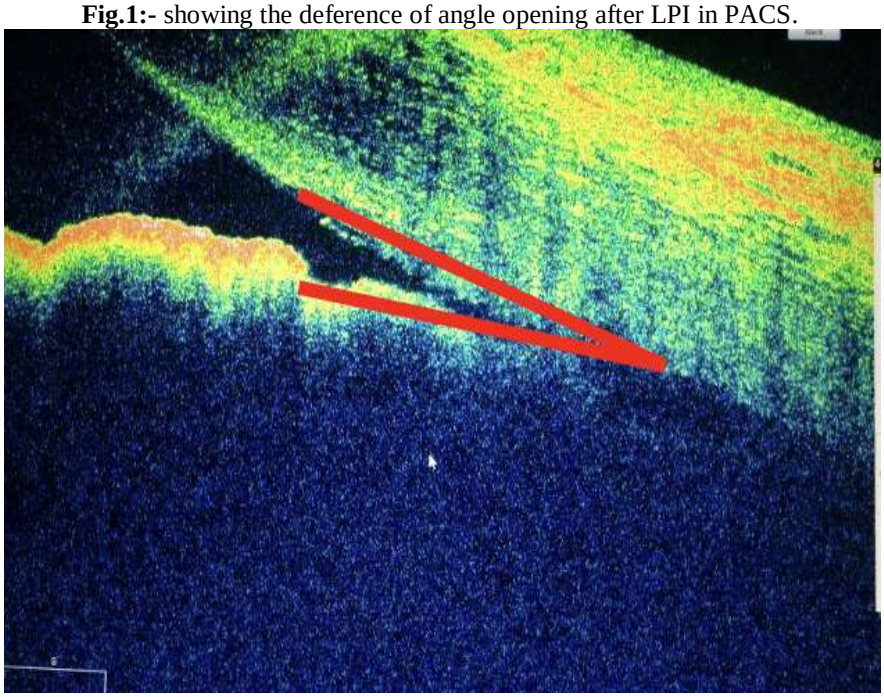
The anterior chamber angle is remarkably opened from 21° degrees to 36°, 35° and 35° respectively. No significant improvement of opening of the angle in 3 cases of PACG, because of PAS.(Table.3)

Graph 3:- Anterior Chamber Angle opening in degrees after LPI and maintained the opening of angle in follow up.



OCT measurements of the ACA after LPI I PACS (Fig.1). there is significant improvement of Angle opening from less than 20 degrees to 35 degrees.

Fig.1:- showing the deference of angle opening after LPI in PACS.



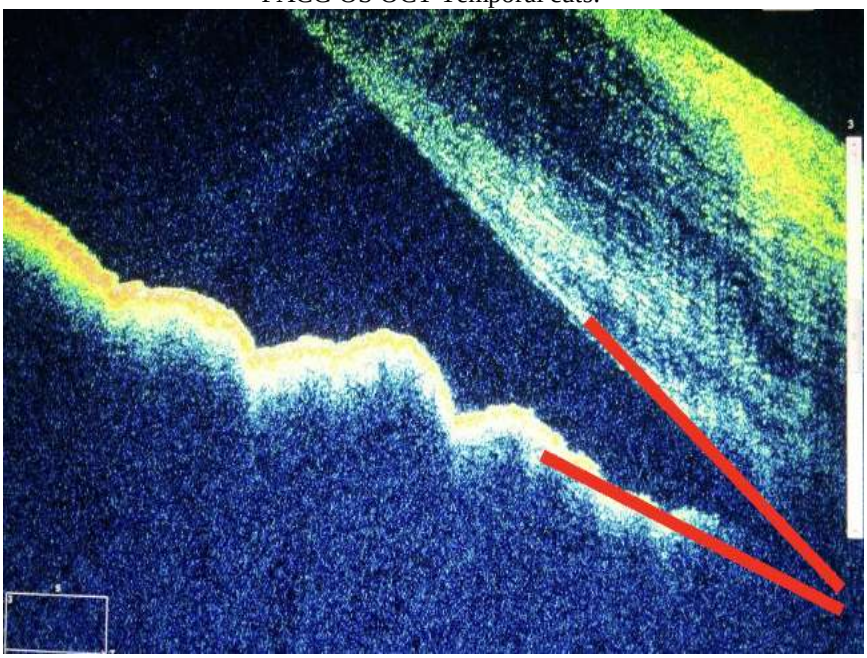
PACS OD OCT Temporal cuts : Pre LPI

Post LPI

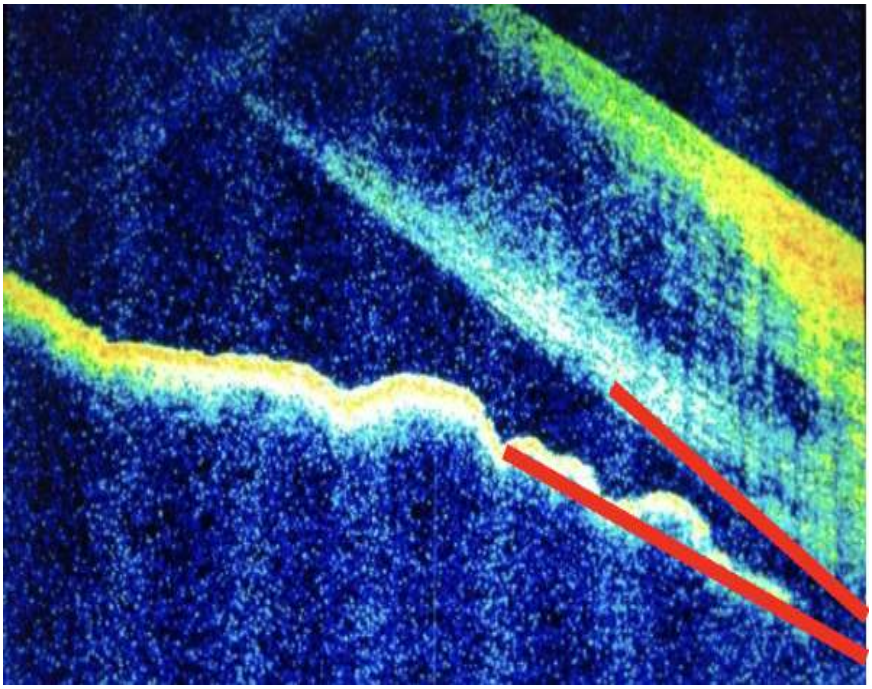
The AC angle opening is also remarkable even in PACG. (Fig.2).

Fig.2:- Showing the improvement in angle opening distance in PACG.

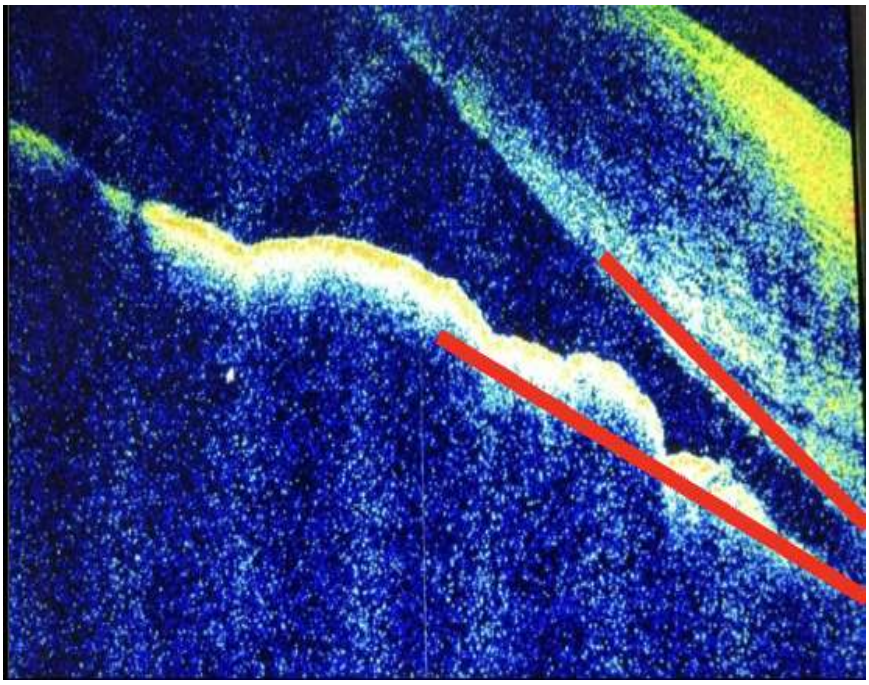
PACG OS OCT Temporal cuts:



Pre LPI



Post LPI



Discussion:-

Anterior chamber depth increased significantly after LPI. The anterior chamber depth (ACD) is proportionate to anterior chamber angle (ACA) in degrees. LPI is the treatment for PACD irrespective of the stage. This fact is once again proved by our study. OCT measurements of the anterior chamber parameters are ideal for documentation and can be compared with previous readings. In our study chamber depth reduced by 0.4mm in the subsequent follow up after 6 months in PACS cases.

Summary:

AS OCT is a important tool to measure the changes in Anterior Chamber parameters and for documentation. It is useful for both diagnostic and prognostic aspects for PACD.

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