

# Measuring the Predictive Capability of Surgical Outcome of Different Factors using Optical Coherence Tomography

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## ABSTRACT

**Objective:** The present study intended to measure the predictive capability of surgical outcome of various factors by OCT (optical coherence tomography).

**Methods:** This case series study was conducted in the Department of Ophthalmology, Al-Ibrahim Hospital and Al-Tibri Medical College Hospital from April to October 2013. 21 diagnosed cases of primary macular hole (PMH) of grade =2 were selected through non probability consecutive sampling. Exclusion criteria were secondary macular hole (SMH), retinal detachment and cataract. Visual acuity was checked by Snellen's chart before proceeding to the funduscopy. OCT macular scan was conducted preoperatively. Willing volunteers were asked to sign an informed written consent. Pars plana vitrectomy along with internal-limiting membrane (ILM) peeling was performed. Gas tamponade was used. Patients were asked for follow ups on day 1, week 1 and finally at one month postoperatively. Data was analyzed on SPSS 21.0 version at 95% CI ( $p = 0.05$ ).

**Results:** Gender distribution showed male predominance. Male and female were noted as 12 (57.14%) and 9 (42.85%) respectively. Mean age was noted as  $55.4 \pm SD 8.56$  years. Right and left eye procedure were performed in 14 (66.6%) and 7 (33.3%) of patients respectively. Mean Macular Hole Base Diameter (MHBD) was noted as  $1358 \pm 745.34 \mu$  (Range  $358 \mu - 3987 \mu$ ). Mean Macular Hole Height (MHH), was  $417.90 \pm 113.99 \mu$  (Range  $208 - 687 \mu$ ). Mean MHMD was measured as  $603 \pm 153.19 \mu$  (Range  $334 - 978 \mu$ ). Mean macular hole index (MHI) was found  $0.36 \pm 0.19$  (Range  $0.14 - 1.11$ ). Mean diameter hole index (MDHI) was noted as  $0.51 \pm 0.21$  (Range  $0.17 - 1.22$ ). Mean Tractional hole index (MTHI) was noted as  $0.72 \pm 0.2144$  (Range  $0.37 - 1.26$ ). Successful surgery was noted in 17 (81%) of macular hole in present study. While 4 (19%) subjects proved macular hole surgery as unsuccessful.

**Conclusion:** It is concluded that the preoperative evaluation by OCT may be used for better outcome for macular hole surgery. Pre operative evaluation by OCT may help in positive prediction of surgical outcomes.

**Key words:** Macular hole, Surgical outcome, Optical coherence tomography

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## INTRODUCTION:

Macular hole (MH) is a serious visual problem of significant visual loss. MH may

be age related idiopathic problem or may be due to trauma.<sup>1</sup> Prevalence of MH is reported in approximately 3.3/1000 adults.<sup>2</sup> Similar to prevalence, the etiology shows high variations as regards different factors. However, most of types are idiopathic in nature. A previous reported macular holes etiology as; 83% of idiopathic origin and 15% had history of blunt trauma.<sup>3</sup> Full thickness macular holes are reportedly associated with visual disturbances such as; vitelliform retinal degeneration, arterio-venous shunting of

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retina, choroid neovascularization, Best's disease, proliferative diabetic retinopathy, myopia, optic disc coloboma, etc.<sup>4,5</sup> Optical coherence tomography (OCT) is valuable tool for detecting the senile macular hole formation, such as attachment of vitreous humor to the retina posteriorly.<sup>6</sup> Peeling of internal-limiting membrane (ILM) resulted in the better surgical outcomes, has been reported.<sup>7</sup> However, the success rate is different in various studies,<sup>8,9</sup> this makes it essential to evaluate factors which might affect the surgical outcomes. Various studies have advised use of OCT for evaluation of multiple factors in predicting the surgical outcomes of MH.<sup>10-12</sup> The present prospective study was designed to measure the predictive capability of surgical outcome of various factors using OCT (optical coherence tomography) at our tertiary care eye hospital.

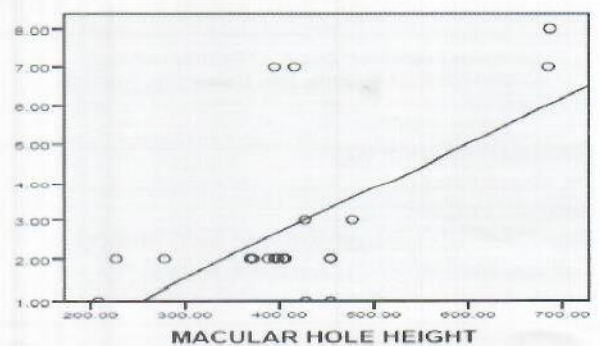
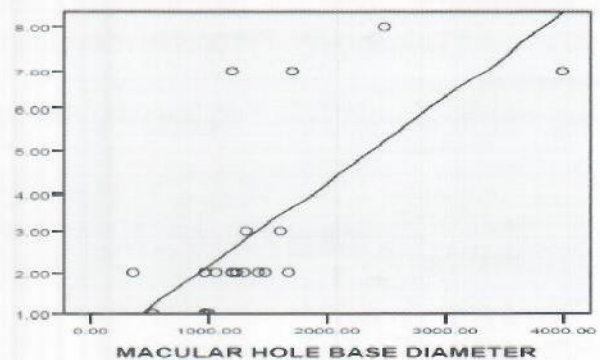
#### METHODS:

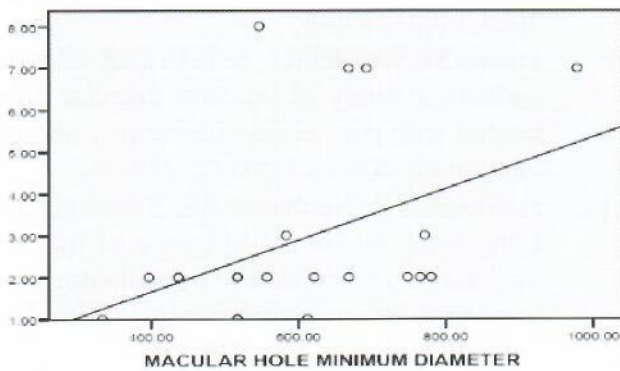
The present case series prospective study was designed and conducted at the "Retina clinic" of Al-Ibrahim eye hospital, Karachi. A sample of 21 diagnosed cases of primary macular hole (PMH) of grade=2 were selected. Cases were selected through non probability consecutive sampling. Exclusion criteria were secondary macular hole (SMH), retinal detachment and cataract. Patient's history was taken of the disease problem. Visual acuity was checked by Snellen's chart before proceeding to the fundoscopy. OCT macular scan was conducted preoperatively. Volunteers were asked to sign an informed written consent if willing to participate. Standard surgical technique was applied after local anesthesia. Necessary clinical examination was performed. Pars plana vitrectomy along with ILM peeling was performed. OCT evaluation was employed for anatomical success of surgical procedure. Gas tamponade was used. Patients were asked for follow ups on day 1, week 1 and finally at one month postoperatively. VA was checked during the follow ups. Ethical approval was taken from institutional authority. Data was recorded on a pre structured proforma. Student's t-test and

chi-square test were used for the analysis of continuous and categorical data variables. Data was analyzed on SPSS 21.0 version at 95% CI ( $p = 0.05$ ).

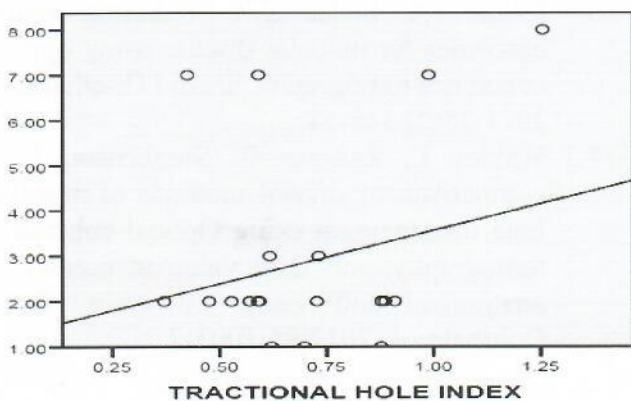
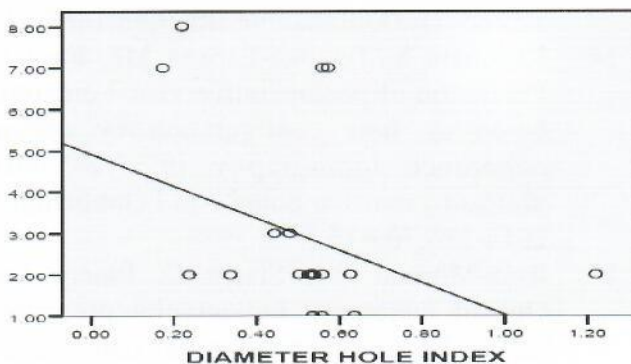
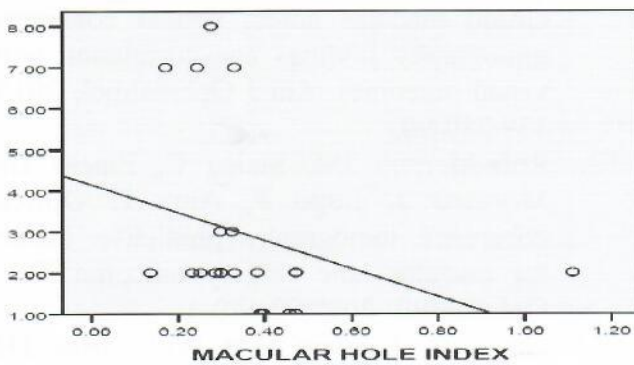
#### RESULTS:

Mean  $\pm$  SD age was noted as  $55.4 \pm 8.56$  years. Gender distribution showed male predominance. Of 21 sample size, male and female were noted as 12 (57.14%) and 9 (42.85%) respectively. Right and left eye procedure were performed in 14 (66.6%) and 7 (33.3%) of patients respectively. Mean MHBBD was noted as  $1358 \pm 745.34 \mu$  (Range  $358 \mu - 3987 \mu$ ). Mean MHH was noted as  $417.90 \pm 113.99 \mu$  (Range  $208 - 687 \mu$ ). Mean MHMD was measured as  $603 \pm 153.19 \mu$  (Range  $334 - 978 \mu$ ). Mean macular hole index (MHI) was found  $0.36 \pm 0.19$  (Range  $0.14 - 1.11$ ). Mean diameter hole index (MDHI) was noted as  $0.51 \pm 0.21$  (Range  $0.17 - 1.22$ ). Mean Tractional hole index (MTHI) was noted as  $0.72 \pm 0.2144$  (Range  $0.37 - 1.26$ ). Successful surgery was noted in 17 (81%) of macular hole in present study. While 4 (19%) subjects proved macular hole surgery as unsuccessful. Scatter graphs of parameters and indices are shown in graph 1 and 2 respectively.





Graph-1: Scatter Graph of Parameters and Indices



Graph-2: Scatter Graph of Parameters and Indices

## DISCUSSION:

The present is the first study being from a tertiary care hospital of Sindh, the Al-Ibrahim Eye Hospital, Al Tibri Medical College, Karachi. It is a common experience that the large macular holes (MH) show poor visual outcome even after best surgical procedures compared to smaller MH. A previous research specifically analyzed whether the MHBD can be used as a predictive factor for MH surgery outcomes.<sup>13</sup> It was reported that the MHBD is a good guide for prediction of visual outcome and showed positive correlation with the surgical procedures.<sup>13</sup> The findings of above study are consistent to the present study. Another previous study reported on the correlation of height of MH and success of anatomical and visual parameters. That study reported a positive association of good visual outcomes.<sup>14</sup>

The study concluded that the height of MH is more predictive than the MHBD for the visual outcomes. Another previous study reported on the macular hole diameter index (MHDI) and proved of better criterion of surgical outcome in MH surgery.<sup>15</sup> Also, they reported MHDI was a good predictor of anatomical success. The findings are in keeping with our present study. However, another previous study reported controversial results of MHDI and visual outcome.<sup>16</sup> The previous study analyzed the predictive value of MH tractional hole index (MTHI) was correlated with the visual and anatomical outcome.<sup>16</sup>

Thus it is evident that most of studies are in parallel comparison to the present study. But some studies had reported MHBD being the strong predictor of surgical outcome, and this is followed by macular hole height<sup>15,16</sup>. A previous study showed failure of MHDI and reported no significant correlation with visual and anatomical success.<sup>17</sup>

A search of medical literature showed the present is the first research being reported from Al-Ibrahim Eye Hospital from Pakistan. The findings of present study will help treating ophthalmologist for successful surgical treatment of retinal macular hole. The limitations of present study include small sample size, however, its strength lies in its prospective study design and regular follow ups. Follow up failures were not observed in the present study.

**CONCLUSION:**

The present study concludes that the preoperative evaluation by OCT may be used for better outcome for macular hole surgery. Pre operative evaluation by OCT may help in positive prediction of surgical outcomes. Pre operative analysis of Macular Hole Base Diameter (MHBD), Macular Hole Height (MHH), Macular Hole Minimum Diameter (MHMD) and Macule Diameter Hole Index (MHDI) should be conducted by optical coherence topography for successful visual surgical outcome. Macular hole tractional index failed to show any predictive value in the present study.

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