



ASSOCIATION BLEB MORPHOLOGY FEATURES AND INTRAOCULAR PRESSURE FOLLOWING TRABECULECTOMY IN PRIMARY GLAUCOMA

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ABSTRACT

Background: Glaucoma is the second leading cause of blindness in the world. Trabeculectomy is indicated for eye with primary glaucoma that have an inadequate IOP with maximum tolerated medical therapy. The success of this surgery depends on the functionality of the filtering bleb, aqueous humor drainage and IOP lowering effect.

Methods: A serial prospective analytic case study, we analysed 21 eyes (19 patients) primary glaucoma patients who underwent trabeculectomy. Bleb morphology grading was scored according to Moorfields Bleb Grading System Scale and intraocular pressure was measured by non contact tonometry. The IOP and bleb morphology was assessed before surgery and on day 1st, 7th, 14th and 30th post operative.

Results : Blebs of 21 eyes were assessed until 1 month. All subjects had IOP < 21 mmHg on the 1st, 7th, 14th, 30th day although 1 subjects reached IOP >21 mmHg on the 30 day. There was tendency of increasing mean IOP but still normal meanwhile all variable of morphology bleb had decreasing gradation in average. There was only significantly associated in the first day after trabeculectomy in central bleb area with IOP (p<0,05) but in other variables there was no significantly differences (p>0,05).

Conclusion: The gradation of each variable bleb morphology had decreased and IOP tended to normal postoperatively according to follow up time but from statistical analysis there was not strongly correlated between each variable bleb morphology with IOP.

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INTRODUCTION

Trabeculectomy is indicated for eye with primary glaucoma that have an inadequate IOP with maximum tolerated medical therapy. The principle of the surgery is to reduce IOP by circumventing the outflow tract and allowing aqueous humor to exit beneath the scleral flap and under the conjunctiva where it forms a filtering bleb.¹ The success of this surgery depends on the functionality of the filtering bleb, aqueous humor drainage and IOP lowering effect.^{2,3} Further, the ability of the bleb to remain functional determines the maintenance of desired intraocular pressures and the long-term success of surgery. Bleb morphology has always been an important clinical parameter as an indicator for bleb function.² The description of bleb morphology and function is usually based on clinician's subjective judgment. Bleb appearance, as assessed by slit lamp biomicroscopy is widely used to predict the possible functionality and the structure of blebs, but it is difficult to see internal structures, which may have an effect on bleb function.^{4,5}

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MATERIALS AND METHODS

Subjects

This serial prospective analysis study was performed in the Eye Clinic of Adam Malik Hospital. Eligible patients with primary open angle glaucoma and primary angle closure glaucoma were recruited from January until April 2017. The study was conducted in accordance with the ethical standards of Declaration of Helsinki and approved by Medical Faculty University of Sumatera Utara ethics committee. Written informed consent was obtained from all patients. All subjects underwent ophthalmologic examination included measured of best corrected visual acuity (BCVA), intraocular pressure by non-contact tonometry (NT 530-Nidek), slitlamp examination, gonioscopic (Carl Zeiss Meditec AG, Jenna Germany), visual field with Octopus 301 and reliable SAP, optic disc with direct funduscopy (Neitz, Germany) The inclusion criteria were primary glaucoma (POAG and PACG) patients over 17 years old with medically uncontrolled IOP and progressing glaucoma, scheduled for surgical treatment. Patients with secondary glaucoma, previous ocular surgery, pregnant or nursing woman, patients with uncontrolled systemic diseases, and patients with history of other eye diseases or trauma were excluded from this study. Non contact tonometry was

performed before and one month after surgery. All participants underwent trabeculectomy. Bleb function was considered to be successful if IOP ≤ 18 mmHg without glaucoma medications. The limited success if IOP ≤ 18 mmHg with glaucoma medications. The failure if IOP > 18 mmHg with glaucoma medication. Conjunctiva/bleb evaluation with slit lamp biomicroscopy was performed at 1st, 7th, 14th and 30th postoperative. Biomicroscopy was used to measure bleb area with Moorfields Bleb Grading System: central bleb area (score 1-4), maximal bleb area (score 1-4), height (score 1-4) and vascularization (score 1-5). Two clinicians independently evaluated the bleb. If the difference in terms of evaluation was within one, a mean was performed, if the difference was higher, the bleb was reevaluated by a third operator and a mean was taken.



Figures 1 Moorfields Bleb Grading System

Statistical Analysis

The collected data write in the research publication and keep in the computer. The collected data kept in the computer analysed by using the statical software. Spearman test was used to employed the correlation bleb morphology with intraocular pressure. Statistical analysis were performe with SPSS 19,0 and the level significance were p<0,05 in all statistical test.

RESULT

Twenty one eyes of 19 patients with primary glaucoma (POAG and PACG) were included in the analysis. The clinical and demographic baseline characteristics are summarized in Table 1.

Table 1 Patients demographics and baseline characteristics

| Patients | 19 |
|------------------|--------------|
| Eyes | 21 |
| Gender (M/F) | 6/13 |
| Age | 56±7,6 |
| Snellen BCVA | 6,38±3,23/10 |
| MD (dB) | -10,6±6,45 |
| Preoperative IOP | 31,8±6,4 |

BCVA : best corrected visual acuity; MD : mean deviation of visual field test

IOP and Medication Use

At one month postoperative, surgery was success for 17/21 eyes (81%), a limited success for 3/21 eyes (14%) and failure for 1 patients (5%)

Table 2 Mean IOP through 1 months postoperatively

| IOP (mmHg) | N | Mean±SD |
|---------------|----|-----------|
| Pre-operation | 21 | 31,8±6,4 |
| IOP-1 | 21 | 9,7±2,3 |
| IOP-7 | 21 | 11,7±1,9 |
| IOP-14 | 21 | 13,9±1,3 |
| IOP-30 | 21 | 16,0 ±3,3 |

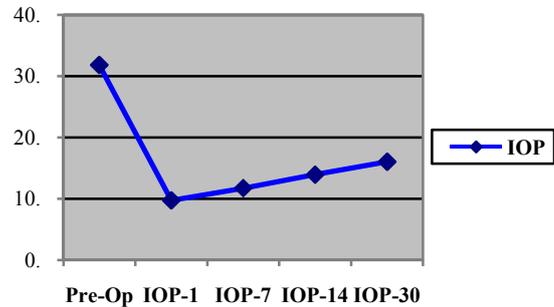


Chart 1 IOP Graph



Pict 1st day.
Abch; score 4, Abmh score 3,
Hh score 3,
Hh score 3.

Pict 7th day.
Abch, Abmh score 3,
Hh score 3,
Vsh, Vph, Vnh score 3

Fig 2 Sample of patients to evaluate bleb morphology features in 1st, 7th, 14th, and 30th days.

Table 3 Correlation bleb morphology and IOP the 1st day post operative

| IOP | N | Range | P |
|------|----|-------|-------|
| Abch | 21 | 0,455 | 0,038 |
| Abmh | 21 | 0,251 | 0,273 |
| Hh | 21 | 0,287 | 0,207 |
| Vsh | 21 | 0,095 | 0,681 |
| Vph | 21 | 0,095 | 0,681 |
| Vnh | 21 | 0,095 | 0,681 |

Abch: Bleb morphology central area; Abmh: Bleb morphology maximal area; Hh; height; Vsh: Central vascularization; Vph: Peripheral vascularization; Vnh: Non-bleb vascularization

From table 3, there was significantly differences between bleb morphology central area and IOP (p<0,05).

Table 4 Correlation bleb morphology and IOP the 7th day post operative

| IOP | N | Range | P |
|------|----|-------|-------|
| Abch | 21 | 0,109 | 0,637 |
| Abmh | 21 | 0,275 | 0,227 |
| Hh | 21 | 0,094 | 0,685 |
| Vsh | 21 | 0,164 | 0,477 |
| Vph | 21 | 0,164 | 0,477 |
| Vnh | 21 | 0,164 | 0,477 |

From table 4, there was no significantly differences between bleb morphology features and IOP ($P>0,05$).

Table 5 Correlation bleb morphology and IOP the 14th day post operative

| IOP | N | Range | P |
|------|----|-------|-------|
| Abch | 21 | 0,190 | 0,410 |
| Abmh | 21 | 0,307 | 0,176 |
| Hh | 21 | 0,193 | 0,402 |
| Vsh | 21 | 0,273 | 0,231 |
| Vph | 21 | 0,273 | 0,231 |
| Vnh | 21 | 0,273 | 0,231 |

From table 5, there was no significantly differences between bleb morphology features and IOP ($P>0,05$)

Table 6 Correlation bleb morphology and IOP through 30th post operative

| IOP | N | Range | P |
|------|----|-------|-------|
| Abch | 21 | 0,194 | 0,398 |
| Abmh | 21 | 0,347 | 0,123 |
| Hh | 21 | 0,058 | 0,802 |
| Vsh | 21 | 0,303 | 0,182 |
| Vph | 21 | 0,095 | 0,682 |
| Vnh | 21 | 0,010 | 0,967 |

From table 6, there was no significantly differences between bleb morphology features and IOP ($p>0,05$).

DISCUSSION

The main aim of filtering surgery is to achieve low levels of IOP in order to prevent further visual field loss. Assessment of trabeculectomy has taken a major turn since the last view decades. Along with this, the conventional method of assessing the bleb on slitlamp also developed step by step and various bleb graing systems were published, such as the Indiana bleb grading system, the Moorfield bleb grading system and the WBCS.⁶ The Moorfield bleb grading and Indiana bleb grading system were mainly based on the pictures that were to be compared with the bleb to be assessed, and the bleb was then graded according to the pictures where it would fit the best.⁷ In our study to evaluate the bleb morphology features, we allowed Moorfields Bleb Grading System. The bleb is assessed either photographically or at the slit lamp biomicroscope and characterized with respect to height and to vascularity in three zones: central bleb, peripheral bleb and non bleb.⁸

Accordingly, a bleb having less vascularity as compared to normal conjunctiva microcysts and is predictive of long term good functioning, and any deviation from these may lead to failure if proper management is not done on time. In our study, we considered Trab as success when IOP was less than 18 post surgery for 17 eyes (81%). Succesful glaucoma filtering surgery is characterized by the passage of aqueous humor from the anterior chamber to subconjunctival space, which results in the formation of a filtering bleb. A trabeculectomy bleb, like any other tissue, undergoes different phases of postoperative wound healing. The first phase is an immediate inflammatory response that occurs in the initial postoperative days. The second phase comprises activation, migration and proliferation of episcleral fibroblast, angiogenesis and the formation of collagen bundles. The third phase involves remodeling and final healing of the wound, when contraction of the collagen fibers and formation scar tissue occurs, ultimately resulting in reduction of aqueous drainage and subconjunctival absorpion.^{9,10}

The Moorfields Bleb Grading System (MBGS) is capable of describing these variant appearance. Vascularity grading in the MBGS is scored for three zones: central bleb, bleb edge, and non-bleb conjunctiva. Capture of information about vascularity and bleb size in this way allow for numerical description of a wide spectrum of bleb morphology.¹¹

In our study, MBGS not strongly connected with IOP. There is a connection only on central area bleb and IOP on 1st day post operative, meanwhile the other variables no statistically significant differences ($P>0,05$). Bleb morphology was change all the time during the wound healing until the maximal area bleb. There was a gradation in central area bleb. The first day central area bleb with score 4 in 80, 9% and decreased with score 2 on the 7th, 14th, and 30th postoperative in 85,71%. Smith reported that was no significantly differences between central bleb area with IOP for two years post operative. The bleb height with score 2 (90,4%) for 1 month postoperative. There is no correlated between the height bleb and IOP for 1 monthpostoperative, but suggested the elevated of IOP caused by decreasing of bleb height. This correlated with Smith reported that the higher of the bleb caused IOP decreased.^{12,13}

Our study also reported central vascularization in 1stday post operative with score 5 (severe) (76,1%), and score 3 (mild) in 14th (95,2%) and score 2 (normal) in 30th (85,7%). The decreasing of the vascularization gradating postoperative also in peripheral bleb and non bleb with the normal IOP. but there was no statistically significant differences between bleb vascularization with IOP in 30th days post operative. Futhermore our study found that there was no statistically differences associated bleb morphologic features and IOP in primary glaucoma.

In conclusion the gradation of each variable bleb morphology had decreased and IOP tended to normal postoperative according to follow up, so further long term studies are needed in order to evaluate stabilization of glaucoma progression based on morphological parameters of filtering blebs with large sample size and long follow up.

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Conflict of Interest

The authors declare that there are no conflicts of interest

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