The effect of macular hole duration on post-operative outcomes:

An individual participant data meta-analysis of randomised controlled trials

Declan C Murphy, Mo Al-Zubaidy, Noemi Lois, Neil Scott, David HW Steel

Background

An Idiopathic full thickness macular hole (MH) is a common and visually disabling vitreoretinal disorder[1]
Incidence is highest in females aged 60-70 years: 200/100,000 per year[2]
Treatment is with vitrectomy surgery. Ninety percent of MHs close following a single surgical intervention but the extent of visual improvement is variable[3]
Two post-operative outcomes indicate success following MH surgery: primary MH closure and post-operative vision
Several factors appear to affect post-operative MH closure and vision. Most notably, hole size
The length of time a hole has been present for before surgery (estimated by patient-reported symptom duration) is thought to affect both post-operative MH closure and vision
The current evidence of the link between duration and MH closure and post-operative vision is variable[1-3]

Aim

In this study, we aimed to investigate the effect of duration on surgical outcomes following MH surgery

Methods

Study Design

Individual participant data (IPD) analysis of patients from randomised controlled trials (RCT) who underwent vitrectomy and gas or air tamponade surgery for treatment of their MH. All studies must have had post-operative best corrected visual acuity (BCVA) recorded.

Participants

Participants in RCTs of adults with MHs undergoing vitrectomy with gas tamponade where symptom duration had been documented, and primary MH closure and post-operative best corrected visual acuity (BCVA) recorded.

Outcomes

Primary MH closure and 6-month post-operative BCVA

Methods

Search Strategy

Systematic review study protocol was prospectively registered on PROSPERO database (CRD42020200664).

We reviewed all peer-reviewed literature published in the English language

Dates: January 2000 to August 2020

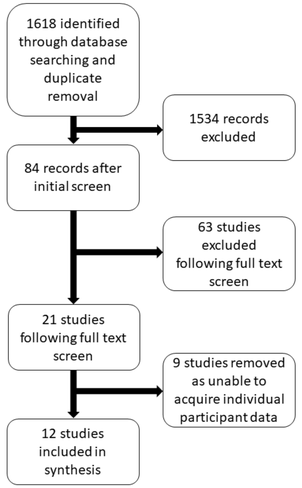


Figure 1: *Search strategy*

Of the 1618 studies identified, 12 studies were included in the final synthesis (figure 1).

Inclusion Criteria	Exclusion Criteria
Randomised controlled trials (RCT) Adults (≥18 years) Confirmed MH who underwent vitrectomy surgery with gas or air tamponade Studies recording duration of symptoms from onset to the time of surgery	Secondary macular holes (e.g. secondary to trauma) MHs treated with silicone oil tamponade MHs previously failed previous interventions Co-existing pathology affecting their visual function (e.g. age-related macular degeneration)

Statistical analysis

Descriptive statistical analysis
Multilevel regression to examine the effect of duration on post-operative MH closure and BCVA
Sensitivity analysis

Results

Descriptive data

Median (interquartile range (IQR)) age was 68 (IQR: 63-72) years
Median symptom duration was 6 (IQR: 3-10) months.
Median minimum linear diameter (MLD) was 492µm (400-624)
Median pre-operative BCVA was 0.84 logMAR (Snellen equivalent: 20/138)

Hole size, baseline vision and duration

Positive correlation between MH size (MLD) and symptom duration (figure 2) and MH size and pre-operative vision

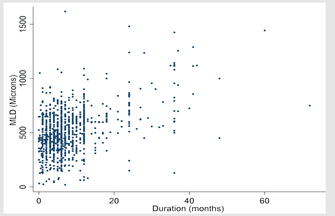


Figure 2*: MLD and symptom duration*

Duration and hole closure

Primary MH closure occurred in 81.5% cases
Median symptom duration for those with primary closure was 6 months (IQR: 3-9)
Relationship between predicted probability of closure and symptom duration was linear
Multilevel logistic regression suggested that each additional month of duration was associated with an odds of iFTMH closure that was 0.965 times lower (95% CI: 0.935 to 0.996, p=0.026)

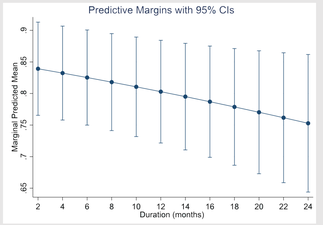


Figure 3*: Probability of hole closure according to duration*

Duration and BCVA

Median post-operative BCVA for eyes following primary hole closure (n=747) was 0.48 logMAR (Snellen equivalent: 20/60) (IQR: 0.3-0.7)

Results

Duration and post-operative vision

Multilevel linear regression showed each additional month of duration was associated with an increase in 0.008 logMAR units (95% CI: 0.005 to 0.011, p<0.001) for six-months post-operative BCVA (i.e., visual acuity deteriorates). (Figure 4)

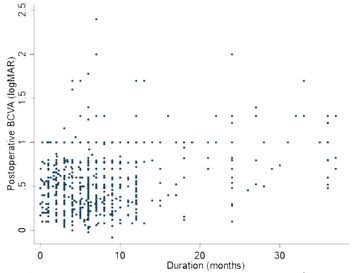


Figure 4*: Post-operative BCVA and symptom duration*

Symptom duration had a similar effect on post-operative BCVA when the analysis included both patients who achieved iFTMH closure and those who did not

When examining the change in BCVA from baseline, a longer duration was associated with worse vision

Duration could predict whether patients achieved a post-operative BCVA of 0.3 or better (odds ratio: 0.065, p=0.006), as were pre-operative visual acuity (odds ratio: 2.848, p=<0.001) and MLD (odds ratio: 0.003, p=0.001)

Conclusions

- Symptom duration was independently associated with anatomical and vision outcomes following MH surgery
- Time to surgery for MHs should be minimised and care pathways designed to enable this.

References

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