

Original Article

MACULAR EPIRETINAL MEMBRANES AND THEIR ASSOCIATION WITH SIGHTING DOMINANCE LATERALITY AND VISUAL PERFORMANCE

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Objective: The purpose of this study was to investigate for associations between sighting dominance, laterality and handicap in visual performance in patients presenting with unilateral Macular Epiretinal membranes (ERM).

Material and Methods: Consecutive patients with unilateral macular Epiretinal membranes and no other ocular pathology were included in this study. A questionnaire and case note review were performed to determine the patient's mode of presentation, presence of symptomatic binocular interference, historically dominant eye and whether they choose to undergo surgery.

Results: 44 eyes of 44 patients fulfilled the inclusion criteria. 21 (48%) of affected eyes were right sided and (52%) of the were in the historically dominant eye. 76% of ERM's in historically dominant eyes presented symptomatically compared to 36% in non-dominant eyes. 72% of patients with ERM affecting their historically dominant eye were aware that the diseased eye interfered with its fellow during day to day binocular viewing; this contrasts with 21% where the ERM was in the historically non dominant eye. 23 (52%) patients elected to undergo surgery of whom 18/23(78%) had ERM in their historically dominant eye.

Conclusions: This study suggests that sighting dominance may be an important determinant of the visual handicap suffered by patients with unilateral Epiretinal membranes.

Keywords: Epiretinal membranes (ERM), Ocular dominance, laterality, binocular interference

Introduction

The clinical impression was gained that patients with macular Epiretinal membranes (ERM) affecting their dominant eye suffer greater visual handicap and elect to undergo surgery more frequently than patients with disease in their historically non-dominant eye. The aim of this study was therefore to investigate for associations between laterality, sighting dominance and visual handicap in patients with unilateral ERM.

Material and Methods

Inclusion criteria:

Consecutive patients with unilateral ERM and no other significant ocular pathology (including abnormalities of binocular vision or amblyopia) presenting to the department of Ophthalmology between March 2009 and Nov 2010, over a 18-month period were included. Patients were offered surgery on the basis of the severity of their day-to-day binocular visual handicap.

Data were derived from a case note review and patient questionnaire (figure 1) to determine:

- 1) Demographics
- 2) The patient's historically dominant eye.
- 3) Whether the initial presentation was symptomatic on the part of the patient or resulted from

an asymptomatic screening finding (Figure 1, Q2).

- 4) Whether the patient was aware of binocular interference (that is that the eye with the ERM interfered with the vision of the fellow eye during day-to-day binocular viewing)1,2,3.
- 5) Whether the patient elected to undergo surgery.

All data were collected prior to surgery. Proportions were compared using chi-squared tests.

Results

44 Eyes of 44 patients were included in this study. 33 (75%) were female. The age of the patients ranged from 52 years to 74 years (mean 63 years). 21 affected eyes were right sided and 25 eyes (56%) were considered historically dominant. None of the included patients considered themselves as historically co-dominant. 25 (56%) patients had initially presented symptomatically. In 19 patients the macular Epiretinal membrane was detected as an asymptomatic finding during a routine ocular examination. 22 patients (50%) were aware of binocular interference (that is that the affected eye interfered with its normal fellow in day to day binocular viewing). 23 (52%) patients elected to undergo surgery.

These data were analysed separately on the basis of laterality and ocular dominance. The results of this

analysis are presented in **Table 1**.

It can be seen from table 2 that 85% (9/13) of right eyes and 70% (7/10) of left eyes scheduled for surgery were historically dominant.

Table-1: To compare the prevalence of symptomatic presentation, interference and listing for surgery on the basis of both Sighting dominance and disease laterality in patients with unilateral Epiretinal membranes.

	Refereals	Listed	Dominant eyes listed
Right	21	13 (62%)	11 (85%)
Left	23	10 (40%)	7 (70%)

Table-2: To illustrate the association between disease laterality, ocular dominance and listing for surgery in patients presenting with unilateral Epiretinal membranes.

	Dominant	Non-dominant	Right	Left
Symptomatic Presentation	19/25(76%)	6/19(36%)	14/21(67%)	11/23(47%)
Interference	18/25(72%)	4/19(21%)	12/21(57%)	9/23(40%)
Listing	16/25(76%)	4/19(21%)	13/21(61%)	10/23(43%)

anfusion. The observer experiences alternating dominance and suppression of each unocular image. Harrad et al have shown that symptoms of binocular rivalry like transient blanking out of vision, intermittent fuzziness and blurring were much more common when the dominant eye is patched in comparison to the non dominant eye¹. We hypothesise that the impaired and distorted image presented by an eye with a Epiretinal membrane might results in rivalry. An alternative possible explanation for our finding is binocular inhibition⁹. This binocular phenomenon occurs when there is slightly dissimilar acuity or contrast sensitivity in each eye and results in the binocular acuity or contrast sensitivity being up to 20% worse than that in the better eye alone. Other binocular interactions may be equally or more important in the causation of the observed phenomenon and further investigation is warranted¹⁰.

Several functional tests to determine ocular dominance have been described^{11,12,13}. Unilateral eye disease as encountered in this study might however bias the results of such tests. We therefore elected to determine dominance on the basis of the patients⁵ recollection of their pre morbid ocular preference when performing a one eyed task. We are not aware of any data regarding the reliability of this method

Discussion

Ocular dominance is defined as "the eye controlling binocular function" and represents the tendency to prefer visual input from one eye to the other.

Ocular dominance has been quite extensively studied in sportsmen⁴ but its role or associations in disease states are relatively poorly understood. Dominance is thought to be important in the development and control of reading⁶ and abnormalities of dominance may have a role in the deviating eye in strabismus.⁸

An association between ocular dominance and binocular rivalry has been demonstrated. Binocular rivalry occurs when corresponding points in each eye view images that are sufficiently dissimilar to prevent

or of its concordance with functional tests.

Patients were asked whether the macular ERM had presented symptomatically or had been discovered as a previously asymptomatic finding during a routine ocular examination. 76% of patients with an ERM in their historically dominant eye presented symptomatically. Symptomatic presentation was half as frequent (36%) when the ERM was in the historically non-dominant eye (p = 0.003).

Awareness of binocular interference, that is awareness of the diseased eye interfering with the vision of its normal fellow during day-to-day binocular viewing, is a clinically prevalent ophthalmic symptom^{14,15}. It is not unusual for patients with unilateral or asymmetric eye disease to either cover or close an affected eye in order to relieve this symptom¹⁶. The routine clinical consultation included enquiry into symptoms consistent with binocular interference. These included the patient being aware of the affected eye interfering with its fellow, and or of having to shut or cover the affected eye in order to improve their vision. Binocular interference was perceived by 72% of patients with a ERM in their dominant eye and only 21% of those with a diseased non-dominant eye (p= 0.001).

All patients were offered surgery and advised to make a decision on the basis of the severity of their visual handicap. We therefore used the decision to under or

forego surgery as a surrogate measure for the symptomatic severity of the disease. 76% of those with a ERM in their dominant eye elected to undergo surgery as opposed to only 21% of those where the disease was on the non-dominant side ($p = 0.0003$). The numbers in this study are relatively small but the observed effect size was sufficiently great for statistically significant results with the same polarity to be found for each of the outcome measures employed. The questionnaire and tests employed were however not validated. While this is a recognized flaw we feel that these caveats would have added to measurement noise (and therefore reduced the power of the study) rather than biasing the results in any particular direction. An important potential bias is that the patient's decision to undergo surgery and data regarding binocular

interference may have been unconsciously influenced by the interviewing surgeon.

Repeating this study in a naive surgeon/patient group would validate these results and determine the importance of observer bias.

Conclusion

The results of this study suggest that the visual handicap perceived by patients suffering from unocular ERM may be strongly influenced by disease laterality and Sighting dominance. The importance of sighting dominance in the aetiology of visual handicap may be under recognised.

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