The Incidence Of Rhegmatogenous Retinal Detachments And Its Association With Seasonality And Climatic Factors in Greater Manchester

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Null Hypothesis

• There are no association between incidence of rhegmatogenous retinal detachment (RRD) and seasonality or ambient temperatures
Background

- Correlation between weekly average temperatures and incidence of posterior vitreous detachment reported by Rahman et al (2001)

Do climatic variables influence the development of posterior vitreous detachment?

Posterior vitreous detachment (PVD) is a common condition after the fifth decade of life. Synchis of the vitreous progresses in proportion to age, creating holes in the posterior hyaloid membrane and allowing PVD to occur. The incidence of rheumatogenous retinal detachment is generally accepted to be season dependent, with a higher incidence in the summer months. However, there is no evidence that PVD is season dependent. We performed this study to determine whether there is any correlation between ambient temperatures, humidity, or solar radiance on the incidence of PVD.

Case report

Patients were selected for this study from the eye casualty database at Oxford Eye Hospital. All patient records, which have been diagnostically coded as acute PVD over a 2 year period, were reviewed. Cases where there was a precipitating cause for PVD such as blunt trauma, retinal vascular disease, diabetic retinopathy, previous surgery, or laser treatment were excluded. Only cases with spontaneous PVD were included in the study.

Comment

Vitreous liquefaction, which advances with increasing age, is an important event in the pathogenesis of PVD. In our study there was no evidence of a cyclical pattern for the weekly or monthly occurrences, therefore we modelled the number of PVD cases directly as a function of the air temperature. Our data suggest a highly significant correlation between weekly average temperatures and the incidence of PVD.

The lack of any previous literature on this subject makes it difficult to draw any conclusions about the mechanism for an increase in PVD occurrences with increasing temperatures. However, we postulate that increasing physical activity and dehydration associated with increasing temperatures may have a role to play.

Further work is necessary in order to investigate the effect of increasing temperatures and/or dehydration on the biochemical structure of the vitreous.

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The results of previous studies investigating relationship between RD and associated seasonal variations has been inconsistent.

<table>
<thead>
<tr>
<th>Peak incidence in Spring/Summer</th>
<th>No association</th>
<th>Peak incidence in Winter</th>
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<tbody>
<tr>
<td>Mansour et al (2009) Lebanon (n=211)</td>
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<td>Bertelmann et al (2011) Germany (n=1490)</td>
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<td>Lin et al (2011) Taiwan (n=23718)</td>
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Proposed mechanism

- Different mechanisms have been proposed for seasonal variation in RRD

  - Dehydration associated with increased temperature
  - Increased physical activities in warmer months
  - Effects of ultraviolet light increasing incidence of PVD
  - Low temperatures results in increased adhesive forces and protect the vitreous gel from collapsing
Methods

• Retrospective review of RRD cases identified using the theatre database (2004-7) and VR database (2008-9)
• Average daily temperature supplied by the Met Office
• RRD secondary to trauma and tractional retinal detachments were excluded
Results

- 1361 cases identified between Jan 2004-Dec 2009 (Feb 2007-Jun 2008 missing)
Results – RD incidence and seasonality

- Incidence of RD
- Average temperature

\[ p = 0.089 \text{ (Seasonal Mann Kendall test)} \]
Results – RD incidence and seasonality

average weekly temperature
weekly incidence
Results - No correlation between temperature and incidence of RD

Possible negative correlation between temperature and incidence of RD but not statistically significant (p= 0.151 Generalised linear model)
Results – Extreme analysis

• Extreme analysis carried out comparing RD incidence in January and July
• No statistical difference was observed in the incidence of RD between January (mean 25.4 cases) and July (mean 19.8 cases) (p=0.340 paired t-test, df=6)
Discussion

- Our results are consistent with that of Li (2003) and Ivanisevic (2002) but is contrary to other Northern European studies (Bertelmann (2011), Laatikainenet (1985), Paavola (1983))

- No seasonal variation in RD incidence
- No correlation between ambient temperatures and RD incidence
Discussion

- Large number of patients included in our study
- Temperature data specific to Greater Manchester rather than national average
Limitations

- Data could be biased during certain months of the year as we are a tertiary referral centre.
  - In August and December when other vitreoretinal surgeons within the region are on leave leading to spike in referrals.
Conclusions

• No correlation between incidence of RD and seasonality (P=0.089 Seasonal Mann-Kendall test)
• No statistical significant correlation between weekly average temperature and weekly RD incidence (p=0.191 Generalised linear model)
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