The association between the frequency of rhegmatogenous retinal detachment (RRD) and the atmospheric temperature

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• Risk factors of RRD are myopia, long axial length, a history of trauma, congenital anomalies, age, cataract extraction and RRD in fellow eye.

• Regarding temperature, there were controversies about the relationship between temperature and RRD incidence. Some authors reported that there was no apparent seasonal variation in the occurrence of new RRD cases. However, other authors reported that there was convincing evidence for a seasonal variation of RRD incidence.

• Chorioretinal adhesion was important for the normal retinal adhesion. Chorioretinal adhesion also could be changed by temperature change. At 4 °C, chorioretinal adhesion was increased, compared with at 37 4 °C. And, retinal adhesiveness decreased rapidly postmortem at 37°C, but remained near control levels for hours at 4 °C.
From this point of view, several reports published about RRD incidence was increased at the summer. However, there was still controversies about seasonal variation of RRD incidence.

We speculated that the **diurnal temperature range**, rather than the rise of the temperature, may further affect the occurrence of RRD. We thought that dynamic changes in temperature during the day cause dynamic changes in chorioretinal adhesion and vitreous status, which eventually resulted in retinal detachment.

Therefore, we evaluated the association between the frequency of rhegmatogenous retinal detachment (RRD) and the daily temperature range.
Study Objectives

✓ The primary objective
  Investigate the relationship between the daily temperature range and the frequency of RRD surgery.

✓ The secondary objectives
  The association between various temperature data and the frequency of RRD surgery.
## Methods

### Retrospective review

- **Periods:** 1996-2016

Consecutive eyes which undergone primary RRD surgery at Chungbuk National University Hospital, South Korea.

Scleral buckle or PPV

**Exclusion Criteria**

- Chronic RD (more than 1 month) that cannot expect the onset time of RD
- RD d/t secondary cause. (ex. uveitis associated RD, DMTRD)

### Temperature data

- Temperature data of South Korea

From Korean meteorological administration data base during 1yr

- Daily temperature range
- Highest temperature
- Lowest temperature
- Mean daily temperature
From 1996 to 2016, 990 eyes with RRD were included in this study.

Figure 1 shows the numbers of RRD operation and daily temperature range. There is a graph of temperature and RRD frequency. (A) The monthly average number of RRD operations showed a bimodal peak (April and October) throughout the year. (B) With the same tendency as frequency of RRD, the monthly average of daily temperature range during 1 year also showed bimodal peak in April (daily temperature range, 12.3 °C) and October (daily temperature range, 11.2 °C).
Figure 2 shows RRD frequency and absolute temperature change than last month. There was similar tendency between RRD frequency and absolute temperature change than last month.

Figure 3 shows the relationship between RRD frequency and temperature change from last month. There was no positive correlation between RRD frequency and Temperature change. (Highest, lowest, and mean temperature change.)
Figure 4 shows the correlation between RRD frequency and daily temperature range. There was a significant positive correlation between the monthly average of daily temperature range and the number of RRD surgery. (Pearson correlation coefficient: 0.297, P<0.001)

Figure 5 shows relationship between RRD frequency and highest, mean, lowest temperature. There was no correlation between RRD frequency and highest, mean, lowest temperature.
Conclusion

• Chorioretinal adhesion is affected by temperature.
• At lower temperature, chorioretinal adhesion was increased.
• Increased temperature is associated with vitreous dehydration.

Dynamic changes in temperature during the day cause dynamic changes in chorioretinal adhesion and vitreous status (dehydration?), which eventually resulted in retinal detachment.

• The higher the daily temperature range, the more RRD frequency was observed. Significant positive correlation was found between RRD frequency and daily temperature range.
• The temperature changes compared to the previous month was similar pattern to the frequency of retinal detachment.
• There was no significant correlation between RRD frequency and highest, lowest, mean temperature.
References

