# Resident Heart Rate Variability During Cataract Surgery

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## INTRODUCTION

- By their last year of residency, ophthalmology residents have performed a large amount of cataract surgery cases.
- The minimum requirement by the ACGME for number of cataract cases residents must perform prior to graduation is 86.
- These surgeries are performed under supervision of multiple attendings often in different sub-specialties.
- Resident comfort level with each step of cataract surgery varies from resident to resident and is expected to gradually progress.
- The purpose of this study is to evaluate ophthalmology resident anxiousness and cardiovascular response by tracking resident heart rate (HR) when performing cataract surgery during their last year of residency.

## METHODS

- This is a prospective analysis of 31 cataract cases completed by three residents (two females and one male) at the Kresge Eye Institute in August and September 2020.
- Informed consent was obtained from all residents who utilized the MOOFIT tracker to track heart rate (HR) during cataract surgeries.
- Each case was divided into three critical intervals, and the time these steps were performed were recorded.

  1) Start to Pre-Phaco (S-P) which corresponds to the time from the start of the case to Capsulorrhexis.

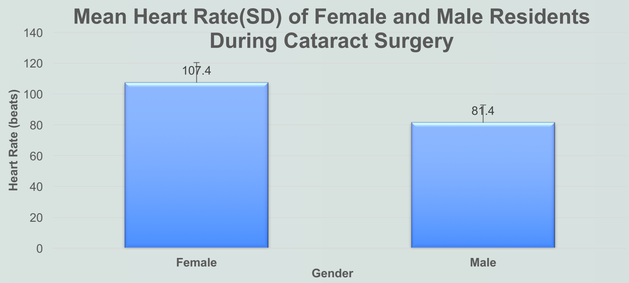
  2) Pre-Phaco to I&A (P-I) which corresponds to the time from Capsulorrrhexis to Nuclear Disassembly.

  3) I&A to End (I-E) which corresponds to the time from cortex removal, subsequent lens insertion, and to the end of the surgery.
- Inclusion criteria include cataract cases performed by PGY-4 residents who employed the use of the iOS Heart Graph app.
- Exclusion criteria include PGY 2-3 Ophthalmology residents, residents on medications that affect cardiovascular response (i.e. Beta Blockers), residents with android devices who could not use the MOOFIT iOS app, and residents who declined participation.

## RESULTS

**Gender HR & Variability**

- Total HR mean(SD) was significantly elevated for female residents with a HR of 107.4(13.0) for females and 81.4(11.5) for males (P<0.0001).
- Females had a significantly higher HR at the beginning and end of each operation with P<0.0003 and P<0.0002, respectively
- Females had significantly higher minimum and maximum HRs when compared to male HRs (P<0.0005)
- Notably, there was no statistical difference in total duration (minutes) of each cataract surgery amongst female and male residents (P=0.8409).




**Start to Pre-Phaco (S-P) Duration**

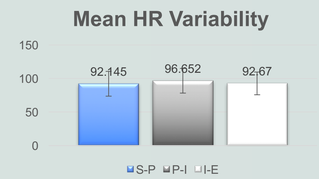
- After case #23, there was a significant decrease in the duration (mins) of procedure start to pre-phaco time. (Mann-Whitney, P-value = 0.01)
  - S-P Duration of Cases #≤23 Mean(SD)=13.75(3.50) mins
  - S-P Duration Cases of #>23 Mean(SD)=9.50(3.01) mins

**Intra-operative HR Variability**

- There was no significant difference in mean or max HR between the 3 subdivisions of the procedure. Thus, the significant tachycardia the female residents experienced, was experienced for the duration of the case.

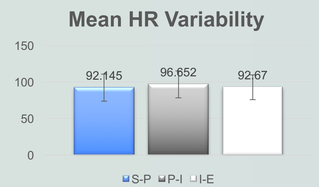
| | Mean Diff. | DF | t-Value | P-Value |
|---|---|---|---|---|
| I-E, P-I | -3.982 | 57 | -.864 | .3914 |
| I-E, S-P | .525 | 58 | .115 | .9092 |
| P-I, S-P | 4.507 | 59 | .954 | .3438 |

Unpaired T-test for **Mean HRs**




| | Mean Diff. | DF | t-Value | P-Value |
|---|---|---|---|---|
| I-E, P-I | .179 | 57 | .044 | .9650 |
| I-E, S-P | 3.960 | 58 | .988 | .3274 |
| P-I, S-P | 3.781 | 59 | .878 | .3834 |

Unpaired T-test for **Max HRs**




## DISCUSSION

- Our study demonstrates a significant difference in peak and sustained HR response between female and male ophthalmology residents while performing cataract surgery (Female HR>Male HR).
- Operating female residents averaged higher heart rates across all categorized time frames.
- Notably, case #23 was the point at which resident comfort level appeared significantly improved in the first defined step of the surgery.
- The quantitative measurement of HR during these surgical subdivisions can be used to tailor resident education more effectively, as evaluating resident comfort and preparedness is typically subjectively gauged by the attending's observation.
- The cumulative effect of high HR on the overall health of residents, training in the surgical specialty of ophthalmology, needs further investigation.

## LIMITATIONS

- Small number of surgical cases (n=31), limiting power.
- Gender analysis performed with 2 female residents and 1 male resident.
- First 15 cases were not analyzed because they may have been performed prior to the start of the study.
- Depending on attending and his/her subspecialty, amount of experience with cataract surgeries varies, affecting the experience of the operating resident

## FUTURE DIRECTIONS

- Increasing sample size by including more PGY-4 residents and including all surgical cases from the start of their fourth year.
- Obtaining base line HR for each participating resident.
- Modifying education curriculum for female residents to see if this will neutralize the observed variability in heart rate.

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