RESIDENT PHYSICIAN PERFORMED
PHACOEMULSIFICATION:
INTRAOPERATIVE COMPLICATION RATES
AND THE SURGICAL LEARNING CURVE
**Introduction**

- Cataract surgery is one of the most commonly performed surgeries in the world, with over 1 million performed per year in the United States alone.

- Resident education designed accordingly.
In 2002 a resident survey revealed that:

- the number of phacoemulsification procedures performed by a single resident ranged from 50 to 300
- the majority perform between 80 and 140 (avg. 120)
- 25% performed less than 80
In 2007, the Residency Review Committee of the ACGME increased the minimum number of resident performed phacoemulsification procedures from 45 to 86.

Few studies to date attempt to identify time point/case number for significant improvement in resident performed surgery.
The aim of this study is to identify a time point/case number for which a significant decline in complication rates occurs.

Also as a measure of internal “quality” of Vanderbilt’s residency program.

Are patients being subjected to an acceptable level of complications in the early parts of training?
Materials and Methods

- Retrospective chart review

- VA Hospitals, Nashville, TN, charts from patients who had undergone resident performed phacoemulsification during a 6 year period from July 8, 1999, through June 28, 2005 were reviewed.
The surgical cases were categorized based on the resident surgeon performing the cataract surgery, and then sorted chronologically and given a sequential case number.

The total number of intraoperative complications including posterior capsular tear, vitreous loss, and retained lens fragments were recorded, as well as the case numbers for which they occurred.
The study was powered at 80% with statistical significance set at $p = 0.05$ to detect a 50% change in complication frequency (estimated to be 15%) 

Sample size = 304
The cases were divided into groups spanning every 20 procedures

Statistical analysis was performed
- using chi square analysis
- calculating 95% confidence intervals
Results

- 19 resident surgeons
- Under guidance 23 different attending surgeons
- 99.4% cases performed on males
- 51.6% Right eyes, 48.4% Left eyes
Number of Cases Sorted by Resident Surgeon

N = 1442
Mean: 76
Range: 58 - 115
Overall Complication Rate

- Posterior Capsular Tear: 11.17%
- Vitreous Loss: 8.25%
- Retained Lens Fragment: 0.89%
Rate of Posterior Capsular Tear vs. Surgical Case Number

p = 0.0710

p = 0.0244
Rate of Vitreous Loss vs. Surgical Case Number

The graph shows the rate of vitreous loss in relation to the number of surgical cases. The rate decreases as the number of cases increases, with the following percentages:

- 9.74% in the first 20 cases
- 10.53% in the next 20 cases
- 6.35% in the following 40 cases
- 5.88% in the subsequent 20 cases
- 6.67% in the last 20 cases

The data suggests that with more experience, the rate of vitreous loss decreases.
Rate of Vitreous Loss vs. Surgical Case Number

p = 0.0386
Conclusions

- There is a statistically significant decrease in intraoperative complications in resident performed phacoemulsification cataract surgery once the surgeon has performed 80 procedures.
  - 61-80 for Posterior Capsular Tears
  - 41-60 for Vitreous Loss
The results of this study are in line with the ACGME recommendation to increase minimum amount of phacoemulsification procedures from 45 to 86.

There was also a trend of continued reduction in intraoperative complication rates with increasing surgical experience.
<table>
<thead>
<tr>
<th>Resident Teaching Institution</th>
<th>Number of Cases</th>
<th>Posterior Capsular Tear</th>
<th>Vitreous Loss</th>
<th>Retained Lens Fragment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanderbilt University</td>
<td>1442</td>
<td>11.2%</td>
<td>8.2%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Emory University</td>
<td>680</td>
<td>4.9%</td>
<td>3.4%</td>
<td>0.4%</td>
</tr>
<tr>
<td>New Jersey Medical School</td>
<td>719</td>
<td>6.7%</td>
<td>5.4%</td>
<td>1.0%</td>
</tr>
<tr>
<td>University of California – San Francisco</td>
<td>218</td>
<td>-</td>
<td>8.7%</td>
<td>-</td>
</tr>
<tr>
<td>Penn State College of Medicine</td>
<td>332</td>
<td>-</td>
<td>4.8%</td>
<td>-</td>
</tr>
<tr>
<td>Baylor College of Medicine</td>
<td>181</td>
<td>9.9%</td>
<td>5.5%</td>
<td>-</td>
</tr>
<tr>
<td>University of Chicago</td>
<td>343</td>
<td>-</td>
<td>4.7%</td>
<td>-</td>
</tr>
<tr>
<td>University of Arizona</td>
<td>136</td>
<td>-</td>
<td>14.7%</td>
<td>-</td>
</tr>
<tr>
<td>University of Utah</td>
<td>396</td>
<td>-</td>
<td>1.8%</td>
<td>-</td>
</tr>
<tr>
<td>Royal Eye Infirmary, England</td>
<td>102</td>
<td>5.8%</td>
<td>2.9%</td>
<td>-</td>
</tr>
<tr>
<td>Istanbul/Akdeniz University, Turkey</td>
<td>296</td>
<td>10.5%</td>
<td>6.4%</td>
<td>2.4%</td>
</tr>
</tbody>
</table>
Overall, phacoemulsification complication rate 3-4%  

Resident performed cataract surgery complication rate has been deemed “acceptably low”  

What about the early cases?  

Roll of adjunctive surgical learning tools
Limitations

- Case series subject to limitations of retrospective study.
- Accuracy of medical record?
- The data included only those procedures performed at the VA Hospital.
Acknowledgements

- Dr. Amy Chomsky
- VA Staff
- Vanderbilt Eye Institute Residents and Teaching Faculty
References


