Can Acetazolamide be used to reduce the intraocular pressure rise from Laparoscopic Colorectal Surgery?

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Introduction

- Background
- Aim and Methods of study
- Results
- Conclusion
Background

- The incidence of perioperative visual loss (POVL) after laparoscopic colorectal surgery is quoted as 1.24 per 10,000 in USA (1996 – 2005) \(^1\)
- Various factors thought to contribute including:
  - Patient positioning
  - IOP

References:
IOP Physiology

- Ocular perfusion pressure (OPP) is defined as:
  \[
  \text{OPP} = \text{MAP} - \text{IOP}
  \]

- Resulting in ischaemic optic neuropathy, compression of nerve in scleral canal which results in POVL
Evidence

• Awad et al (1)
  – IOP measured during Robotic prostatectomy
  – Steep Trendelenburg; ↑PEEP; ↑ duration of surgery → ↑IOP

• Grosso et al (2)
  – Pneumoperitoneum (12-14 mmHg) increased IOP mean 4 mmHg.

• Chauhan et al (3)
  – The degree of IOP rise & length of time IOP is raised has an additional cumulative effect.
  – A change in IOP > 10 mmHg can damage the optic nerve.

Acetazolamide

- Carbonic anhydrase inhibitor
- Reduces aqueous humor production
- Limited effect if IOP low/normal
- Routinely used to treat glaucoma
- Plasma Half life 4 hours
  - 30 tablets cost £16.99

Centofanti, M., et al., Comparative effects on intraocular pressure between systemic and topical carbonic anhydrase inhibitors: a clinical masked, cross-over study. Pharmacological research, 1997.
TaPPs Study

Aim:
• Investigate if acetazolamide reduces the IOP rise that occurs whilst in the Trendelenburg (TB) position.

Methods:
• Randomised cross-over blinded study.
• 9 volunteers randomised to start with placebo or Acetazolamide.
• Baseline IOP measured on both days & medication taken
• After 1.5 hours volunteers lay head-down at 17 degrees’ for 4 hours
• IOP measurements every ½ hour
Results

- 9 healthy volunteers (2M, 7F) included
  - mean age 54 years (range: 21-76).

<table>
<thead>
<tr>
<th></th>
<th>Placebo (mean)</th>
<th>Acetazolamide (mean)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>14.06 mm Hg (SD ± 2.61)</td>
<td>14.89 mm Hg (SD ± 3.0)</td>
<td>P&gt;0.05</td>
</tr>
<tr>
<td>IOP change after 4hrs in TB</td>
<td>3.17 mm Hg (SD ± 4.63)</td>
<td>0.02 mm Hg (SD ± 4.01)</td>
<td>P=0.03</td>
</tr>
</tbody>
</table>
## Results

### Graph: IOP change with 95% CI

#### Table: IOP change with 95% CI

<table>
<thead>
<tr>
<th>Time Point</th>
<th>Event</th>
<th>Placebo - Mean change in IOP</th>
<th>Acetazolamide - mean change in IOP</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>After medication</td>
<td>-0.24 mm Hg</td>
<td>-1.13 mm Hg</td>
<td>P &gt; 0.05</td>
</tr>
<tr>
<td>4</td>
<td>Supine</td>
<td>0.81 mm Hg</td>
<td>0.22 mm Hg</td>
<td>P &gt; 0.05</td>
</tr>
<tr>
<td>5</td>
<td>TB (5mins)</td>
<td>1.96 mm Hg</td>
<td>0.67 mm Hg</td>
<td>P &gt; 0.05</td>
</tr>
<tr>
<td>6</td>
<td>TB (30mins)</td>
<td>3.13 mm Hg</td>
<td>-0.48 mm Hg</td>
<td>P = 0.001</td>
</tr>
<tr>
<td>7</td>
<td>TB (60mins)</td>
<td>2.61 mm Hg</td>
<td>-0.04 mm Hg</td>
<td>P = 0.014</td>
</tr>
<tr>
<td>8</td>
<td>TB (90mins)</td>
<td>1.61 mm Hg</td>
<td>-0.50 mm Hg</td>
<td>P = 0.05</td>
</tr>
<tr>
<td>9</td>
<td>TB (120mins)</td>
<td>1.62 mm Hg</td>
<td>-0.31 mm Hg</td>
<td>P &gt; 0.05</td>
</tr>
<tr>
<td>10</td>
<td>TB (150mins)</td>
<td>2.59 mm Hg</td>
<td>-0.07 mm Hg</td>
<td>P = 0.013</td>
</tr>
<tr>
<td>11</td>
<td>TB (180mins)</td>
<td>1.92 mm Hg</td>
<td>-0.24 mm Hg</td>
<td>P = 0.03</td>
</tr>
<tr>
<td>12</td>
<td>TB (210mins)</td>
<td>2.32 mm Hg</td>
<td>0.82 mm Hg</td>
<td>P &gt; 0.05</td>
</tr>
<tr>
<td>13</td>
<td>TB (240mins)</td>
<td>3.17 mm Hg</td>
<td>0.02 mm Hg</td>
<td>P = 0.003</td>
</tr>
<tr>
<td>14</td>
<td>Supine</td>
<td>1.60 mm Hg</td>
<td>-0.74 mm Hg</td>
<td>P = 0.03</td>
</tr>
<tr>
<td>15</td>
<td>Sitting</td>
<td>-0.12 mm Hg</td>
<td>-2.54 mm Hg</td>
<td>P = 0.024</td>
</tr>
</tbody>
</table>
Summary

Limitations
• Our IOP rise with Trendelenburg position was small compared to elevations noted in live surgical situations.

• It is likely that there is a significant contribution to IOP elevation by the surgically induced pneumoperitoneum.

Conclusion
• IOP does rise whilst in the Trendelenburg position.

• Acetazolamide reduces the IOP rise that occurs whilst in the Trendelenburg position.