MINIMIZING INTRA-OP BLEEDING DURING ESS

João Flávio Nogueira, MD
Otolaryngologist
Taís Nogueira, MD
Anesthesiologist
Sinus Centro
Fortaleza, Brazil

DISCLOSURE

NONE

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WHERE I AM FROM

Fortaleza, 3 million
SURGERY

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BLEEDING DURING ESS
October, 16, 1846. William Morton demonstrates anesthesia
Anatomical landmarks identification
Complications
Postoperative
Trauma of the nasal mucosa may lead to formation of adhesions

BLEEDING DURING ESS

• Bleeding could obscure the view of the endoscope.
• Repeated cleaning intraoperatively is time consuming.

Endoscrub – Medtronic, Jacksonville, USA, 2008

Courtesy of Prof. Navarro

Courtesy of Prof. Navarro
BLEEDING DURING ESS

Patient

Surgery ↔ Anesthesia
PATIENT

• Inflammatory mucosa
• Clinical conditions
  – HBP
  – Chronic diseases
  – Fever
• Smoking
• Pre-operative assessment

PATIENT - SMOKING
• Surgeon techniques
  – Instruments
  – Patient positioning
  – Room temperature
• Local vasoconstriction
• Infiltrations?
INSTRUMENTS

PATIENT POSITIONING
Increases venous return 30%

30° 30°

Bleeding

1 °C

Reduces coagulation capability 30%

ROOM TEMPERATURE

- Ideal patient temperature: 36°C
  - Saline heat
- Lower temperatures
  - Drug metabolism

LOCAL VASOCONSTRICTION

- Epinephrine
- Cocaine
- Oxymetazoline
  - 5 minutes
  - 10 minutes

ORIGINAL RESEARCH

Propofol versus sevoflurane: Bleeding in endoscopic sinus surgery

Achim G. Beule, MD, Frank Wilhelmi, MD, Thomas S. Kühnel, MD, Ernil Hansen, MD, PhD, Karl J. Lackner, MD, PhD, and Werner Hosemann, MD, PhD, Greifswald, Mainz, Regensburg, Germany

CONCLUSION: Under conditions of balanced circulatory parameter, equal blood loss and endoscopic vision can be achieved with both tested anesthetic regimens. During extended operations demonstrated thrombocyte impairment by propofol may become clinically relevant.

• BACKGROUND: Bleeding during endoscopic sinus surgery (ESS) may increase complications and negatively effect the surgery and its outcome.
• The aim of this study was to compare TIVA (propofol+remifentanil) vs. inhalation anesthesia (sevoflurane).
• RESULTS: The two groups were matched for surgical procedure and computed tomography scores.
• Mean arterial pressure and pulse were found to influence the surgical field.
• CONCLUSION: In patients undergoing ESS, TIVA results in a better surgical field than inhalational anesthesia.

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**Comparison of propofol and sevoflurane anesthesia by means of blood loss during endoscopic sinus surgery**

Remziye Sivaci, MD, Mustafa D. Yilmaz, MD, Canan Balcı, MD, Tuna Erenler, MD, Halis Unlu, MD

**Conclusion:** General anesthesia based on propofol infusion may have the advantage of decreased bleeding compared with conventional inhalation agents. Therefore, making endoscopic surgery technically easier and safer by improving endoscopic visualization of the surgical field.

In summary, IVA results in less bleeding and a better surgical condition for patients undergoing ESS than conventional balanced anaesthesia, particularly in patients with a high-LM score who anticipate more blood loss.
ANESTHESIA

• Ideal parameters:

• Controlled hypotension
  – BP: mean 60 – 70
  – HR < 60 bpm
  – CO₂ < 35
  – SPO₂ > 97%
LOCAL VASOCONSTRICTION

History of dentistry. Sinus Centro Museu
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LOCAL VASOCONSTRICTION

1 : 2,000
20 amps of epinefrine + 20 mL 0,9% saline solution
Photosensitive (60 minutes)
Topical use of adrenaline in different concentrations for endoscopic sinus surgery

Krishnamurti Matos de Araujo Sarmento Junior, Shiro Tomita, Arthur Octavio de Avila Kós

Keywords: paranasal sinus diseases, epinephrine, hemostasis surgical, norepinephrine, nasal polyps.

![Graph showing changes in average adrenaline levels with different dosages and time points.](image)
**LOCAL VASOCONSTRICTION**

Table 4. Distribution of the measured hemodynamic parameters as normal and abnormal values for each group.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
<th>Adrenalin 1:2.000</th>
<th>Adrenalin 1:10.000</th>
<th>Adrenalin 1:50.000</th>
<th>Control</th>
<th>p value</th>
<th>Significant differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR</td>
<td>&lt; 100 bpm</td>
<td>912 (99.2%)</td>
<td>915 (99.9%)</td>
<td>1013 (96.8%)</td>
<td>236 (90.6%)</td>
<td>None</td>
<td>140 - 159 mmHg at 1:2 000 and 1:1 000 = 1:50 000 and Control</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>7 (0.8%)</td>
<td>1 (0.1%)</td>
<td>4 (0.4%)</td>
<td>1 (0.4%)</td>
<td>0.45</td>
<td>150 - 179 mmHg at 1:2 000 and 1:1 000 = 1:50 000 and Control</td>
</tr>
<tr>
<td></td>
<td>&lt; 140 mmHg</td>
<td>866 (94.2%)</td>
<td>857 (93.6%)</td>
<td>1012 (96.5%)</td>
<td>239 (96.8%)</td>
<td>0.0001</td>
<td>90 - 99 mmHg at 1:2 000 and 1:1 000 = 1:50 000 and Control</td>
</tr>
<tr>
<td>SAP</td>
<td>&lt; 90 mmHg</td>
<td>49 (4.3%)</td>
<td>48 (5.2%)</td>
<td>5 (0.5%)</td>
<td>8 (3.4%)</td>
<td>0.001</td>
<td>100 - 109 mmHg at 1:2 000 and 1:1 000 = 1:50 000 and Control</td>
</tr>
<tr>
<td></td>
<td>90 - 99 mmHg</td>
<td>11 (1.3%)</td>
<td>10 (1.1%)</td>
<td>0</td>
<td>0</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>DAP</td>
<td>&lt; 50 mmHg</td>
<td>557 (93.3%)</td>
<td>866 (94.8%)</td>
<td>597 (99%)</td>
<td>235 (99.5%)</td>
<td>0.0001</td>
<td>90 - 99 mmHg at 1:2 000 and 1:1 000 = 1:50 000 and Control</td>
</tr>
<tr>
<td></td>
<td>50 - 74 mmHg</td>
<td>45 (4.9%)</td>
<td>19 (1.8%)</td>
<td>1 (0.4%)</td>
<td>0</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; or equal to 75 mmHg</td>
<td>8 (0.9%)</td>
<td>3 (0.3%)</td>
<td>2 (0.2%)</td>
<td>1 (0.4%)</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 (0.1%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0001</td>
<td></td>
</tr>
</tbody>
</table>

HR = Heart rate  SAP = Systolic arterial pressure  DAP = Diastolic arterial pressure  MAP = Mean Arterial Pressure  p value: repeated measures ANOVA  Sig. diff.: Bonferroni multiple comparisons

**LOCAL VASOCONSTRICTION**

**Blood loss (mL)**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>D.P.</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>p value</th>
<th>Significant differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenalin 1:2.000</td>
<td>17</td>
<td>140.3</td>
<td>56.7</td>
<td>155</td>
<td>40</td>
<td>270</td>
<td>0.0001</td>
<td>1:2.000 = 1:10.000 1:2.000 = 1:50.000 1:10.000 = 1:50.000</td>
</tr>
<tr>
<td>Adrenalin 1:10.000</td>
<td>16</td>
<td>336.9</td>
<td>20.4</td>
<td>315</td>
<td>85</td>
<td>750</td>
<td>0.0001</td>
<td>1:10.000 = 1:50.000</td>
</tr>
<tr>
<td>Adrenalin 1:50.000</td>
<td>16</td>
<td>425.8</td>
<td>25.8</td>
<td>334</td>
<td>100</td>
<td>1100</td>
<td>0.0001</td>
<td></td>
</tr>
</tbody>
</table>

SD: Standard deviation  p value*: Kruskal-Wallis ANOVA for the three study groups  Sig. diff.**: Tukey’s multiple comparisons test at 5%.
LOCAL VASOCONSTRICTION

- Operation time was shorter (1:2,000)
- Less bleeding (1:2,000), \( p < 0.0001 \)
- Plasmatic levels of epinephrine raised in all groups, especially (1:2,000)
- There was a trend towards elevation of blood pressure in the groups using adrenaline 1:2,000 and 1:10,000, with a greater occurrence of hypertensive peaks.
- The elevation of blood pressure in the 1:2,000 and 1:10,000 was progressive but very slow throughout surgery, which could be related to the anesthesia technique.
LOCAL VASOCONSTRICTION

5 to 10 minutes

VASOCONSTRICTION
Hemostasis during functional endoscopic sinus surgery: The effect of local infiltration with adrenaline

Ta-Jen Lee, MD, Chi-Che Huang, MD, Po-Hung Chang, MD, Chee-Jen Chang, PhD, and Yi-Wei Chen, MD, Taoyuan, Taiwan
Table 1
Patient demographics, stage of chronic rhinosinusitis, pre-anesthetic mean arterial blood pressure, operation time, and intra-operative blood loss

<table>
<thead>
<tr>
<th></th>
<th>Injection group</th>
<th>Noninjection group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Cases (n)</td>
<td>226</td>
<td>226</td>
<td></td>
</tr>
<tr>
<td>Age (years)*</td>
<td>40.7 ± 14.3</td>
<td>40.8 ± 14.5</td>
<td>0.95</td>
</tr>
<tr>
<td>Sex (male/female)†</td>
<td>130/96</td>
<td>126/100</td>
<td>0.70</td>
</tr>
<tr>
<td>Body weight (Kg)*</td>
<td>63.5 ± 13.9</td>
<td>62.5 ± 13.3</td>
<td>0.41</td>
</tr>
<tr>
<td>Stage of CRS (sage II/III/IV)†</td>
<td>54/152/20</td>
<td>61/142/23</td>
<td>0.61</td>
</tr>
<tr>
<td>Pre-anesthetic mean arterial blood pressure (mmHg)*</td>
<td>93.8 ± 7.1</td>
<td>93.0 ± 7.3</td>
<td>0.25</td>
</tr>
<tr>
<td>Operation time (minute)*</td>
<td>130.4 ± 41.1</td>
<td>134.4 ± 44.7</td>
<td>0.52</td>
</tr>
<tr>
<td>Intra-operative blood loss (mL)*</td>
<td>316.9 ± 162.1</td>
<td>333.9 ± 167.8</td>
<td>0.29</td>
</tr>
</tbody>
</table>

*Analytic method: independent-samples Student t test.
†Analytic method: χ² test.

P value ≤ 0.05 was significant.

The Hemostatic and Hemodynamic Effects of Epinephrine During Endoscopic Sinus Surgery

A Randomized Clinical Trial

Ali Moshaver, MSc, MD, FRCSC; Denny Lin, MD, FRCSC; Russandra Pinto, PhD; Ian J. Witterick, MD, MSc, FRCSC

Conclusion: Submucosal injection of lidocaine, 2%, with 1:200 000 epinephrine during FESS does not lead to hemodynamic fluctuations or increased intraoperative bleeding compared with lidocaine, 2%, with 1:100 000 epinephrine.
Table 3. Mean (SD) Hemodynamic Parameters at Baseline and Postinjection of Study Drugs at 1-Minute Intervals

<table>
<thead>
<tr>
<th>Group (Dosage)</th>
<th>Time, min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>1 (Lidozone hydrochloride, 2%, with 1:100,000 epinephrine)</td>
<td></td>
</tr>
<tr>
<td>HR, bpm</td>
<td>75.4 (18.7)</td>
</tr>
<tr>
<td>SBP, mm Hg</td>
<td>107.3 (17.5)</td>
</tr>
<tr>
<td>DBP, mm Hg</td>
<td>61.1 (11.2)</td>
</tr>
<tr>
<td>MAP, mm Hg</td>
<td>76.5 (11.8)</td>
</tr>
<tr>
<td>2 (Lidozone hydrochloride, 2%, with 1:200,000 epinephrine)</td>
<td></td>
</tr>
<tr>
<td>HR, bpm</td>
<td>77.4 (14.7)</td>
</tr>
<tr>
<td>SBP, mm Hg</td>
<td>102.7 (15.4)</td>
</tr>
<tr>
<td>DBP, mm Hg</td>
<td>59.0 (12.8)</td>
</tr>
<tr>
<td>MAP, mm Hg</td>
<td>73.4 (12.1)</td>
</tr>
</tbody>
</table>

Abbreviations: bpm, beats per minute; DBP, diastolic blood pressure; HR, heart rate; MAP, mean arterial pressure; SBP, systolic blood pressure.

*P < .001 compared with baseline measurement.

**P < .01.

• Pterygopalatine fossa
  – Nasal – Endoscopy
  – Oral

• Epinephrine
  – 1:200,000 – 0,005 mg/mL
  – 1:100,000 – 0,01 mg/mL
  – 1:80,000 – 0,0125 mg/mL
  – 1:50,000 – 0,02 mg/mL
  – 1:10,000 – 0,1 mg/mL
  – 1:2,000 – 0,5 mg/mL
INJECTION

1 mL 1:10,000

ANESTHESIA

• Lidocain

• High BP

• Paradoxal bradicardia (severe)
• Time is important
• Clean and dry surgical field is crucial
• Different techniques
• Talk to your anesthesiologist
  – TESS: Tailored endoscopic sinus surgery
  – TASS: Tailored anesthesia for sinus surgery