Case

- You are called by a parent of a child who you took care of a week and a half ago. The child, a 4 year old boy, came to IR for the first of many sclerotherapy of a Venous Malformation of the LLE. Per mom, the boy has been having night terrors and although he was previously potty trained has been wetting the bed almost every night.
During the case the boy came back to the IR room with his mom, who was anxious at the time. He underwent a “rocky” mask induction.

The remainder of the anesthetic was uneventful and he was discharged home following the procedure.
Preoperative Anxiety
Post-op Delirium
Pre-operative Anxiety

![Bar chart showing negative behavioral responses, % of subjects over follow-up periods and categories.](image)
Risk Factors

- Age
- Prior stressful medical encounters
- Temperament- shy and inhibited
- Anxious parents
Low Sensory Environment
## Parental Inductions

<table>
<thead>
<tr>
<th>Cohort group</th>
<th>Children’s state anxiety during induction of Anesthesia*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With PPIA</td>
</tr>
<tr>
<td>Calm parent, calm child</td>
<td>39.9 ± 22 (63)</td>
</tr>
<tr>
<td>Calm parent, anxious child</td>
<td>51.9 ± 24 (47)</td>
</tr>
<tr>
<td>Overly anxious parent, calm child</td>
<td>52.4 ± 28 (55)</td>
</tr>
<tr>
<td>Overly anxious parent, anxious child</td>
<td>71.0 ± 23 (35)</td>
</tr>
</tbody>
</table>

* As measured by the modified Yale Preoperative Anxiety Scale (mYPAS).
Values are mean ± sd (n).
PPIA = parental presence during induction of anesthesia.
† Denotes statistically significant differences.
Parental Induction vs Premed
Distraction

Table 3
Anxiety and behavior scores in different groups

<table>
<thead>
<tr>
<th></th>
<th>Video game (n = 38)</th>
<th>Midazolam (n = 38)</th>
<th>Parent presence (n = 36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Yale Preoperative Anxiety Scale</td>
<td></td>
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</tr>
<tr>
<td>Baseline</td>
<td>37.4 ± 2.3</td>
<td>45.2 ± 3.1</td>
<td>34.3 ± 2.0</td>
</tr>
<tr>
<td>Induction</td>
<td>41.7 ± 4.1</td>
<td>53.9 ± 2.7**</td>
<td>51.5 ± 4.0**</td>
</tr>
<tr>
<td>Posthospital Behavior Questionnaire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>5.5 ± 0.5</td>
<td>6.4 ± 0.7</td>
<td>5.7 ± 0.4</td>
</tr>
<tr>
<td>Postsurgery</td>
<td>6.1 ± 0.9</td>
<td>6.6 ± 0.6</td>
<td>5.7 ± 0.6</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SEM.
Two-sided Wilcoxon-signed ranks test; **P < 0.01 compared with baseline.
Pharmacologic Interventions

- Midazolam
- Ketamine
- Precedex
Methods of Administration

- Oral
- Intranasal
- Sublingual/Bucosal
- Rectal
- Intramuscular
Midazolam

- Short acting benzodiazepine
- Imidazole ring allows for easy absorption across mucous membranes
Oral Midazolam

- Low bioavailability (27%) due to first pass metabolism
- Dose = 0.2-0.5mg/kg
- Onset in 10 minutes
- Peak effect in 20 minutes
Oral Midazolam

- Decreases anesthetic requirements
- Delays emergence and Stage I PACU recovery, but not discharge from the hospital
- Decreases post-op maladaptive behavior
Other Routes for Midazolam

- Intravenous- 0.05-0.1 mg/kg
- Nasal Midazolam- 0.2 mg/kg
  - Significant stinging during administration
  - Potential for neurotoxicity via the cribiform plate- use only preservative free
- Intramuscular- 0.1-0.15mg/kg
  - Onset within 10 minutes
- Rectal- 0.5-1mg/kg
  - Associated with hiccups (22%)
Ketamine

- Phencyclidine
- Produces sedation and analgesia while preserving respiratory drive and upper airway tone
- Increased sympathetic stimulation, direct cardiac depressant
- Associated with increased oral secretions, nystagmus, increased post-op nausea and vomiting
- Less post-op delirium in kids
**Intramuscular Ketamine**

- A good option for the child who refuses to take oral medication or who is combative
- Dose = 2-5 mg/kg
- Can add atropine/glyco to reduce secretions
- Can add midazolam
  - Significantly prolongs recovery during short procedures
Ketamine

- Intravenous - 1mg/kg
- Oral - 5-6mg/kg sedates within 12 minutes
- Nasal - 6mg/kg
  - Potentially neurotoxic
- Rectal - 5mg/kg sedates within 30 minutes
Precedex

- $\alpha$-2 agonist- sedation with maintenance of spontaneous respiration
Intranasal Precedex

| Table 3. Distribution of Behavior and Sedation Status at Parental Separation and at Induction, Proportion of Children Who Had Change of Behavior and Sedation from Satisfactory to Unsatisfactory at Induction, Time Ready for Discharge from Postanesthetic Care Unit (Minutes) |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                 | Group M         | Group D\textsubscript{0.5} | Group D\textsubscript{1} | P               |
| Successful parental separation  |                 |                              |                              |                 |
| Yes                             | 31 (96.9%)      | 30 (93.7%)                  | 32 (100%)                   | 0.771           |
| No                              | 1 (3.1%)        | 2 (6.3%)                    | 0 (0%)                      |                 |
| Sedation at separation from parent |                |                              |                              |                 |
| Satisfactory                    | 7 (21.9%)       | 19 (59.4%)                  | 24 (75%)                    | <.001\textdagger|
| Unsatisfactory                  | 25 (78.1%)      | 13 (40.6%)                  | 8 (25%)                     |                 |
| Behavior at induction           |                 |                              |                              |                 |
| Satisfactory                    | 31 (96.9%)      | 29 (90.6%)                  | 26 (81.3%)                  | 0.148           |
| Unsatisfactory                  | 1 (3.1%)        | 3 (9.4%)                    | 6 (18.8%)                   |                 |
| Sedation at induction           |                 |                              |                              |                 |
| Satisfactory                    | 6 (18.8%)       | 13 (40.6%)                  | 17 (53.1%)                  | 0.016\textast   |
| Unsatisfactory                  | 26 (81.3%)      | 19 (59.4%)                  | 15 (46.9%)                  |                 |
| Change of behavior at induction from satisfactory to unsatisfactory | 0/31 (0)        | 1/30 (3.3)                  | 6/32 (18.8%)               | 0.012           |
| Change of sedation at induction from Satisfactory to Unsatisfactory | 1/7 (14.3)      | 6/19 (31.6)                 | 7/24 (29.2)                | 0.828           |

Values in number (%) or mean ± sd.
\textast Significantly different between Group M and Group D\textsubscript{1} at 0.05 level.
\textdagger Significantly different between Group M and Group D\textsubscript{0.5} at 0.05 level.
Conclusion

- Perioperative anxiety can be associated with increased pain scores, post-operative delirium and prolonged regression and maladaptive behaviors.
- There should not be a one size fits all approach.
- However, a tailored plan should be made for high risk patients while being cognizant of pre-operative and post-operative/PACU effects.
Sources