RESULTS

Table 3: Incidence of Complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Baseline (n=183)</th>
<th>n</th>
<th>%</th>
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<tbody>
<tr>
<td>*Includes 4 cases where patients received the unique method of sedation with a large propofol bolus.</td>
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<td>Overall</td>
<td>33</td>
<td>18.0</td>
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DISCUSSION

Study Design and Size

Complications occurred in 33 (18.0%) of 183 deep sedations performed for cardiac MRI. Significantly higher than the 10.1% incidence of complications of primarily non-cardiac MRI patients from our earlier study (p = 0.0005)10. There were 7(3.8%) major complications, significantly higher than non-cardiac MRI patients in our earlier study (p = 0.001). A study by Hoffman et al. also found a lower adverse event rate of 9.2% associated with deep sedation (DS), though with a much smaller sample size of only 65.6 A study by Cravero et al. of 30,037 pediatric patients reported a 5.3% incidence of complications but included all levels of sedation, such as anxiolysis and minimal sedation, as opposed to DS only, which could explain the difference in incidence. Certainly, our complication rate is higher than in many other studies due to the higher risk population we studied. Our patients had complex intra-cardiac defects, with mixing of oxygenated and deoxygenated blood and limited carduopulmonary reserve (Table 5). The findings of our study are a substantial addition to the current literature however, the retrospective nature of the study has inherent limitations such as self-report bias, and incomplete documentation.

General Anesthesia (GA) versus DS in Cardiac MRI Patients

Given that DS for cardiac MRI is associated with a higher incidence of complications likely due to cardiovascular compromise, GA is often considered because patients are less accessible during MRI than other imaging environments where DS is often used11. GA allows for higher-quality “breath-hold” images possible12. However, GA is more invasive than DS. Also, intubation and positive pressure ventilation often used with GA makes physiological and functional measurements of cardiac MRI less reflective of the patient’s actual cardiovascular state. A retrospective study of 660 DS and 161 GA patients with congenital heart disease (CHD) undergoing cardiac MRI found that imaging quality was similar using either technique, the adverse event rate was not significantly different (GA 3.9% versus DS 2.8% or 4.8%), and the success rate was not significantly different (DS 97.6% versus GA 100%). However, the GA group contained more critically ill patients than the DS group. In general, patients with CHD can safely undergo cardiac MRI with DS, but GA should be considered if they have major hemodynamic or respiratory compromise, or more than one procedure is to be performed, or if DS has failed13.

Pento (mixed) vs Propofol Regimens

The pento (mixed) regimen was associated with a significantly lower risk of complications than the propofol regimen (Table 6). The result was similar in our previous study of non-cardiac patients, which showed that propofol had a significantly higher risk of complications than pentobarbital14. Short-acting barbiturates have been shown to be safe and effective when used with midazolam or fentanyl for sedation during pediatric diagnostic imaging15. One study showed that oral pentobarbital and oral chloral hydrate are equally effective, the incidence of adverse effect was not significantly different (GA 3.9% versus DS 2.8% or 4.8%), and the success rate was not significantly different (DS 97.6% versus GA 100%). Use of propofol for sedation has been associated with hypoxia and/or respiratory depression in several studies16.

Implications of Large Propofol Bolus Patients

4 patients with complications received DS from one of the attending anesthesiologists who utilizes a unique method of sedation with propofol (large bolus over 10-15 minutes and no infusion) that may have significantly different physiological effects than standard propofol sedation. The findings of our study are a substantial addition to the current literature however, the retrospective nature of the study has inherent limitations such as self-report bias, and incomplete documentation. Thus, the aborted procedure likely has minimal implications for the results at large.

MULTIPLE LOGISTIC REGRESSION ANALYSIS (Table 6-7)

After adjusting for ASA physical status, type of sedation was significantly associated with developing any complication (p<0.0025): mixed pentobarbital technique (O.R. 0.78, 95% CI 0.66-0.92) vs. the propofol technique. Also, if the anesthesiologist delivering care was from the pediatric cardiac subgroup, patients were found to have decreased odds of complications when compared to all the non-cardiac pediatric anesthesiologists.

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CONCLUSIONS AND FUTURE DIRECTIONS

Our study suggests that the pento (mixed) regimen was associated with fewer complications than the propofol regimen, and that if the anesthesiologist delivering care was from the pediatric cardiac subgroup, patients were found to have decreased odds of complications. However, further study of whether propofol and/or pentobarbital dosages are significant predictor variables for complications might further elucidate the results of this study. In addition, a separate analysis on the incidence of complications in the large propofol bolus group will be necessary in order further review our institution’s sedation practices and institute protocols that have both improved patient outcomes or increase efficiency.