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Do Additional Pulses per Second in Pediatric Deglutition Studies Increase the Rate of Aspiration Detection?

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Background: Deglutition studies are fluoroscopic procedures that utilize swallowed barium with concurrent x-ray imaging to diagnose swallowing disorders. The x-ray images during these studies can occur at variable pulses per second (p/s) depending on the institution and its available fluoroscopy equipment. At many institutions, radiologist preference is the main factor in determining which of the p/s settings is used.

Significance of the Problem: Increasing the p/s setting increases the patient's exposure to ionizing radiation, and the risks of radiation exposure have been well-established in literature for both children and adults. Exposure to radiation has been linked to increased rates of leukemia and a wide array of solid organ cancers. Compared to adults, children are more sensitive to radiation and ten times more likely to develop these radiation-induced cancers. Exposure to ionizing radiation during diagnostic imaging has demonstrated a small but significant increase in cancer development in children. While undergoing a deglutition study at a higher p/s setting increases the patient's exposure to radiation, it is possible that a higher p/s setting may be more sensitive at detecting swallowing disorders since additional imaging frames are collected and analyzed. Increasing p/s setting may also lead to a more accurate diagnosis with a more fitting treatment plan.

Hypothesis: If the higher p/s setting has a significantly higher rate of aspiration compared to the lower p/s setting, then we can conclude the higher p/s setting is more sensitive for detecting aspiration. On the contrary, if no difference is found in the aspiration rate between different p/s groups, then this study will help limit unnecessary radiation exposure by recommending lower p/s settings for future deglutition studies.

Methods: We conducted a large-scale, retrospective study where we collected data from each deglutition study performed at Children's Hospital & Medical Center over a two-year period that met specific criteria. A separate data point was included for each consistency tested within each deglutition study. For each consistency tested, we tracked whether aspiration was present and the p/s setting used for that consistency. Chi-square tests of independence were performed to examine the relationship between the rate of aspiration and the two p/s settings for each of the five consistencies: thins, thin nectar, thick nectar, honey, and puree. We utilized an alpha level of .05 for significance.

Results: Aspiration rate was not significantly impacted by whether the 3 or 7.5 p/s settings was used when the type of swallowed consistency (thins, thin nectar, thick nectar, honey, and puree) was controlled for chi-square. In other words, p/s setting and rate of aspiration were found to be independent of one another.

Conclusions: Our results suggest that aspiration rate was not significantly different between the 3 and 7.5 p/s settings when the type of swallowed consistency was controlled for. Therefore, we can conclude that the rate of aspiration detection does not increase with use of the higher 7.5 p/s setting.

Because our data concludes that the higher 7.5 p/s setting does not increase aspiration detection, we recommend utilizing the lower 3 p/s setting for future deglutition studies to minimize unnecessary radiation exposure.

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