Critical Review: What Are the Factors that Increase Risk of Aspiration Pneumonia Following Abdominal Surgery in Adult Patients?

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This critical review examines the evidence regarding risk factors for aspiration pneumonia following abdominal surgery in adult patients. Study designs include informational reviews of the literature, retrospective between group designs and a non-randomized clinical trial. Overall, the evidence gathered from this review is suggestive, but limited due to the lack of available evidence addressing the specific clinical question. Recommendations for future research and clinical practice are provided.

Introduction

There is risk for aspiration pneumonia following various abdominal surgery procedures. Although the incidence of aspiration pneumonia following abdominal surgery is quite low (1%) (Kozlow, Berenholtz, Garrett, Dorman, Pronovost, 2003; Studer, Raber, Ott, Candidas, Schnuriger, 2016), abdominal surgery may be one of the most common procedures to result in aspiration pneumonia (Brooks, 2001; Rudra & Das, 2006).

Research demonstrates that after abdominal surgery, early oral feeding is the preferred method over enteral feeding, or oral feeding after the resolution of ileus/after the passing of flatus. These methods were the previously preferred methods of feeding following abdominal surgery (Hartsell, Frazee, Harrison & Smith, 1997; Reissman, Teoh, Cohen, Weiss, Nogueras, & Wexon, 1995). Oral feeding after surgery is preferred given that it maximizes patient nutritional status. However, some patients experience aspiration pneumonia, which can result in medical complications and even death. Although one conservative approach might be to adopt enteral feeding post abdominal surgery for all patients, this approach is clearly not preferable. A better approach would be to only put those post abdominal surgery patients on enteral feeding who are at significant risk of experiencing aspiration pneumonia. This, in turn, necessitates that we understand the factors that might put patients at higher risk of aspiration pneumonia, a problem addressed in the current review. An understanding of this evidence would allow speech language pathologists to put in place prevention and intervention strategies that follow evidence based practice.

Objectives

The primary objective of this paper is to critically evaluate the literature regarding the risk factors for aspiration pneumonia following abdominal surgery. The secondary objective is to provide recommendations for clinical speech language pathology practice, as well as for future research.

Methods

Search Strategy

Articles related to the topic of interest were found using: PsychINFO, PubMed, and Google Scholar. Keywords used for the data base search were as follows:

[(Aspiration pneumonia) or (dysphagia) and (abdominal surgery)]
[(Risk factors) and (aspiration pneumonia) OR (aspiration) and (surgery) OR (abdominal surgery)]

Selection Criteria

Papers selected for inclusion were required to investigate aspiration or aspiration pneumonia following any type of abdominal surgery in adults. In cases where several surgery types were reported, at least some results specific to abdominal surgery must have been presented.

Data Collection

Papers included in this review include two informational reviews of the literature (level 4 evidence), three retrospective between group studies (level 2a evidence) and one non-randomized clinical trial (level 2a evidence).

Results

Informational Reviews of the Literature

Informational reviews of the literature provide somewhat suggestive evidence through a number of important key references. However, most reviews of the literature do not provide information regarding how evidence is weighted and selected for inclusion and

therefore these reviews of the literature must be interpreted with caution.

Brooks (2001) conducted an informational review of the literature on postoperative nosocomial pneumonia. The review asked a clearly focused question regarding risk factors for nosocomial pneumonia following abdominal, cardiac and thoracic surgery. Risk factors for nosocomial pneumonia following cardiac and thoracic surgery will not be addressed in detail in this review. Abdominal surgery itself is listed as one risk factor for nosocomial pneumonia. With reference to aspiration pneumonia following abdominal surgery, the article states that pneumonia occurs in 9-40% of patients who undergo abdominal surgery with one cause being aspiration from the oropharynx or aspiration of gastric contents. Patients who have an abnormal swallow because of anesthesia, narcotics, supine positioning, dementia, those with increased age, and decreased level of consciousness are more likely to experience aspiration, although this includes cardiac and thoracic surgery, in addition to abdominal surgery.

Although this article focuses primarily on nosocomial pneumonia and surgery, it provides compelling evidence that aspiration pneumonia can occur following abdominal surgery with reasonable incidence. The review also provides suggestive evidence of possible risk factors that might be associated with aspiration in patients following abdominal (and other) surgeries.

Rudra and Das (2006) conducted an informational review discussing risk factors for postoperative pulmonary complications but only abdominal surgery and aspiration pneumonia will be discussed in this review. Although not discussing abdominal surgery specifically, the review states that following surgery risk factors for aspiration pneumonia include decreased neurological status and the use of anesthesia in high-risk patients due to impaired cough and airway clearance. High-risk patients have a history of tobacco use, dyspnea as well as unexplained pulmonary disease with anticipated prolonged surgery. This review also states the following can occur following abdominal surgery: microaspiration, impairment of cough and mucocilliary clearance as well as impaired gas exchange and pneumonia.

This article provides limited evidence on the risk factors of aspiration pneumonia following abdominal surgery but does discuss risk factors of aspiration pneumonia following surgery (abdominal surgery included) in general. Common complications that are often associated with aspiration were identified.

Retrospective Between Groups Studies

Retrospective studies can be a good starting point for research if there are a number of variables to be examined. However, with these studies control around variables can be lost. Therefore, these designs typically provide suggestive evidence and the limitations must be considered.

Fukuda et al. (2012) conducted a retrospective between groups study to examine the clinical features of abdominal surgery and risk factors for mortality in elderly patients. A total of 94 well-described patients met criteria for inclusion, although some details regarding recruitment were not provided. Clinical features were recorded from patient charts including the occurrence of aspiration pneumonia and other factors not of interest to the present review. The main analyses presented in the paper examined clinical factors affecting mortality without specific consideration of aspiration pneumonia status, and will not be reviewed here. In descriptive statistics, pneumonia was observed to occur in approximately 12.8% of the sample, which included 8 cases of aspiration pneumonia. The second most common cause of death was pneumonia in 4 patients. Overall, this study provides evidence that aspiration pneumonia is one possible complication of abdominal surgery in the elderly. The authors interpret the data by saying that swallowing ability is diminished in the elderly, which is why the elderly undergoing abdominal surgery are at higher risk for aspiration pneumonia.

Milgrom et al. (2013) also conducted a retrospective between groups study to characterize when, and why reintubation occurs following surgeries. A total of 104 well-described patients that underwent unplanned intubation following operations met criteria to be included in the study. These patients were compared to those who remained extubated in this time period.

Although no statistical analysis was provided, descriptive statistics indicated higher proportions of abdominal surgery among those experiencing aspiration pneumonia. Descriptive statistics also indicated that those who experienced aspiration pneumonia following abdominal surgery were more likely to be male, smokers, had inflammatory bowel disease, cancer, and low preoperative serum albumin levels.

Although the purpose of this paper addressed the current question in only a limited way, the results provide suggestive evidence indicating that aspiration pneumonia is an important potential complication following abdominal surgery and identifies some

possible risk factors for aspiration pneumonia following abdominal surgery.

Studer et al. (2016) conducted a between groups retrospective study to examine pre, intra and postoperative risk factors for mortality in those who suffer from aspiration pneumonia following abdominal surgery. A total of 70 patients who had clinically and radiologically confirmed aspiration pneumonia following abdominal surgery met criteria for inclusion. Exclusion criteria were clearly stated in detail. One investigator completed chart reviews and one independent attending radiologist reviewed the X-rays and CT scans of these patients providing some control for potential biases in recording.

Patient characteristics, preoperative variables (12 variables), postoperative variables (9 variables) and intraoperative variables (17 variables) were gathered from patient charts and risk factors between survivors and non-survivors were compared. Although an appropriate multivariate regression was completed, the number of variables to include in the analysis was determined based on an arbitrary and unjustified p-value from a separate Mann Whitney U or Fisher exact test. It is possible that this approach increased the number of significant predictors in the regression.

The significant risk factors for fatal outcome after aspiration pneumonia following abdominal surgery were as follows: increasing age, the need for intraoperative blood component transfusion and bilateral infiltrates, of which only age was a significant predictor. Blood transfusions was a marginally significant predictor. It is possible that blood transfusions is a proxy for another variable that the authors were not able to measure such as complex surgery or difficult/long surgery, but the authors do not comment on this in their analysis.

This article provides suggestive evidence for risk factors for fatal aspiration pneumonia following abdominal surgery with increasing age as the most significant factor.

Non Randomized Clinical Trials

Non-randomized clinical trials are appropriate when the factors being study cannot be randomized, such as who experiences aspiration pneumonia and who does not. Non-randomized clinical trials characterize the initial states of research in an area. However, without careful consideration, this type of design can be fraught with biases, for example, in subject selection and grouping. Given these concerns, cautious interpretation should be utilized.

Martignoni (2000) et al. conducted a non-randomized between groups clinical trial to examine whether enteral nutrition played a role in delayed gastric emptying in 64 patients who underwent a type of abdominal surgery known as Whipple surgery. Explanation of exclusion criteria for 2 participants was stated resulting in 62 patients included in this study. However, this study did not include an intention to treat analysis such that patients who did not complete the study were not included in the analysis of delayed gastric emptying. The authors state which patients were excluded but do not clearly explain why these patients could not be included in the analysis.

Participants had either enteral feeding or non-enteral feeding and using appropriate analysis both groups were evenly matched for type of Whipple surgery (classic or pylorus preserving), gender and age. The decision for enteral or non-enteral feeding was according to a “pre operative decision by the responsible surgeon” (p. 19) but the article does not explain how this was decided or how many surgeons were involved in this decision making process. The exact method of enteral and non-enteral feeding are described in great detail; however, some in the non enteral group had to have some parenteral feeding and it is not stated whether this might have affected results. Appropriate statistics were used to analyze postoperative complications with delayed gastric emptying in particular. The study found that there was no significant difference for postoperative complications between the enteral and non-enteral group. However, there was more delayed gastric emptying in the enteral nutrition group. Of note, delayed gastric emptying can cause aspiration pneumonia.

This study provides suggestive evidence that delayed gastric emptying is more common among those receiving enteral feeding following Whipple surgery. Although aspiration pneumonia is not directly addressed, aspiration pneumonia can occur in cases of delayed gastric emptying due to a delay in the transfer of ingested food from the stomach to the duodenum, which can lead to vomiting.

Discussion

The question of what the risk factors are for aspiration pneumonia following abdominal surgery is an important clinical question for speech language pathologists. However, there is currently very little available evidence on this specific question and the ability to piece together pertinent evidence is limited. The current review described studies that have provided some important information on this topic but without a

clear purpose to address this specific clinical question. As a result, it is necessary to recognize that the current review creates extensions from the current evidence in consideration of the current question.

Given the nature of this sample of evidence and the variability of the data, it is difficult to draw a unifying view of the current evidence available and predict who might experience aspiration pneumonia following abdominal surgery. However, based on available indirect information, the findings of the current review are as follows: (1) Aspiration pneumonia is a complication that can occur following various surgical abdominal procedures. (2) Increased age is one risk factor for aspiration pneumonia following abdominal surgery, and may be more highly associated with fatal outcomes. (3) In addition, delayed gastric emptying, which is a complication of enteral feeding following abdominal surgery, can lead to aspiration pneumonia. (4) The need for intraoperative blood component transfusion and bilateral infiltrates may be risk factors for fatal outcome following abdominal surgery. (5) Risk factors for aspiration pneumonia following multiple types of surgeries, with abdominal surgery included in this list are: anesthesia, narcotics, supine positioning, dementia, decreased level of consciousness, tobacco use, male sex, inflammatory bowel disease, cancer, and low preoperative serum albumin levels.

It is important to note that increased age was the one risk factor found across more than one study. The demographics of surgery have recently changed as a result of an increase in life expectancy (Arenal et al., 2007). As the population is aging, there is an increase in the use of major abdominal surgery in the elderly due to the increase in elderly patients who have surgical pathology (Racz et al, 2012). Therefore, increased age as a risk factor for aspiration pneumonia following abdominal surgery should be kept in mind by the speech language pathologist working with this population.

Future Research Considerations

Future research considerations for this clinical question might include a prospective study. This research should examine certain expected risk factors for aspiration pneumonia. For example, a study might characterize what is already known about the risk factors for aspiration pneumonia generally such as dementia and increased age, and then monitor the occurrence of abdominal surgery. Future research might also look at the risk factors for aspiration pneumonia following specific abdominal surgery procedures, such as only upper abdominal surgery, instead of grouping the various procedures into one study.

Retrospective between groups studies characterize most of the original research on the topic of risk factors for aspiration pneumonia following abdominal surgery, as this clinical topic is in its early development. Therefore, future research could involve conducting a retrospective review of large academic hospital electronic databases focusing on patients in intensive care units with suspected or proven aspiration pneumonia. This would allow for a large data set to be used for the statistical analysis of risk factors.

Clinical Implications

There is some knowledge about aspiration pneumonia following abdominal surgery but no concrete list of risk factors. Identifying few significant risk factors would be a clinically relevant finding for speech language pathologists. However, this review shows the importance of assessing patients individually since there is a chance for aspiration pneumonia to occur following surgery in any patient, but few if any clear-cut risk factors that apply to all patients undergoing abdominal surgery. Therefore, it is the responsibility of the speech language pathologist to use expert judgment in these cases based on the knowledge of the mechanisms of swallowing and what is currently known about the risk factors of aspiration pneumonia in general.

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