

Oropharyngeal dysphagia and related factors in post-cardiac surgery: a systematic review

Systematic Review

Revisão Sistemática

Fatores relacionados à disfagia orofaríngea no pós-operatório de cirurgia cardíaca: revisão sistemática

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ABSTRACT

Purpose: To identify the main factors associated with oropharyngeal dysphagia following cardiac surgery through a systematic review of the literature. **Methods:** A bibliographic search was conducted in the PubMed and ScienceDirect databases using the following keywords: “cardiac surgery”, “deglutition disorders”, and “dysphagia”. **Selection criteria:** Articles published in Portuguese, English, or Spanish addressing oropharyngeal dysphagia following cardiac surgery were selected with no time limitation. Only studies available in full were included. **Data analysis:** First, articles were screened for title and abstract. Subsequently, they were submitted to full assessment by two blinded referees. The following data were extracted: authors, year of publication, study design, sample size, variables evaluated, and main results. **Results:** The main factors related to oropharyngeal dysphagia in post-cardiac surgery were advanced age, presence of comorbidities and other diseases, intubation time, and surgical conditions. **Conclusion:** The studies showed high heterogeneity, demonstrating that individuals who undergo cardiac surgical procedures, especially the elderly, present several factors related to oropharyngeal dysphagia postoperatively, such as cardiopulmonary bypass, transesophageal echocardiography, associated comorbidities, development of postoperative sepsis, and previous heart conditions.

Keywords

Heart Diseases
Thoracic Surgery
Deglutition Disorders
Risk Groups
Intensive Care Units

RESUMO

Objetivo: Identificar os principais fatores relacionados à disfagia orofaríngea no pós-operatório de cirurgia cardíaca, por meio de uma revisão sistemática de literatura. **Método:** Foi realizada pesquisa bibliográfica nas bases PubMed e ScienceDirect, utilizando os termos *cardiac surgery*, *deglutition disorders* e *dysphagia*. **Critérios de seleção:** Foram selecionados artigos sem limitação de ano escritos em português, inglês ou espanhol e que referissem disfagia orofaríngea no pós-operatório de cirurgia cardíaca. Apenas os estudos disponíveis na íntegra foram incluídos. **Análise dos dados:** Cada artigo passou pela análise de títulos e resumos, sendo posteriormente submetido à avaliação na íntegra por dois juízes cegados. Os seguintes dados foram extraídos: autores/ano, desenho do estudo, amostra, variáveis avaliadas e principais resultados. **Resultados:** Os principais fatores relacionados à disfagia orofaríngea no pós-operatório de cirurgia cardíaca foram: idade avançada, presença de comorbidades e outras doenças associadas, tempo de intubação e condições cirúrgicas. **Conclusão:** Os estudos foram bastante heterogêneos, demonstrando que sujeitos submetidos a procedimentos cirúrgicos cardíacos, em especial idosos, apresentam diversos fatores relacionados à disfagia orofaríngea no pós-operatório, como o uso de circulação extracorpórea e ecocardiografia transesofágica, comorbidades associadas, desenvolvimento de sepsis pós-operatória e condições cardíacas prévias.

Descritores

Cardiopatias
Cirurgia Torácica
Transtornos de Deglutição
Grupos de Risco
Unidades de Terapia Intensiva

Study carried out at Programa de Pós-graduação em Distúrbios da Comunicação Humana, Universidade Federal de Santa Maria – UFSM - Santa Maria (RS), Brazil.

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Financial support: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES).

Conflict of interests: nothing to declare.

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Received: August 03, 2015

Accepted: October 08, 2015

INTRODUCTION

Transmissible chronic diseases are the leading causes of disability and mortality worldwide. Cardiovascular conditions, cancer, and diabetes mellitus are among the most important diseases in the field of public health. Among the cardiovascular diseases (CVD), cerebrovascular ischemia and systemic arterial hypertension should be highlighted⁽¹⁾. Epidemiological studies indicate that CVD accounts for one third of all deaths in the world, with myocardial ischemia as the main cause^(1,2). Also, it is estimated that CVD will be responsible for 25 million deaths in 2020⁽³⁾.

Heart surgery is among the therapeutic methods commonly employed for the management of cardiac patients. Heart surgeries can be corrective (defects of the ductus arteriosus; atrial or ventricular septum), reconstructive (coronary artery bypass grafting (CABG); aortic, mitral or tricuspid valve plasty), or of replacement (valve transplants and replacements)⁽¹⁾. Reconstructive surgeries, particularly CABG, occur most often. In adults and the elderly, the conditions that require cardiac surgery most often are coronary atherosclerosis and valvular diseases^(4,5).

Deglutition is a complex activity involving coordinated voluntary and involuntary actions, as well as neuromuscular structures of the oropharyngolaryngeal region and the esophagus, which aims to maintain the nutritional status and protect the airways. Any alteration in this process is identified as dysphagia. Dysphagia is associated with increased morbidity and mortality, and it may cause several clinical complications, such as dehydration, malnutrition, and aspiration pneumonia^(6,7).

Impairment of the swallowing function may be present in various conditions in hospitalized patients, such as in the cases of trauma, stroke, and chronic obstructive pulmonary disease, as well as in patients with cardiopathies⁽⁸⁾. In this context, in recent years, research has indicated a possible relationship between cardiac surgery and the development of oropharyngeal dysphagia in the postoperative period due to exposure of patients to various risk factors, such as endotracheal intubation (OTI), cardiopulmonary bypass (CPB), transesophageal echocardiography (TEE), among others⁽⁸⁻¹¹⁾.

A study conducted with 361 patients undergoing CABG showed an incidence of 53.5% of respiratory infection postoperatively⁽¹²⁾, indicating the need to evaluate the presence of oropharyngeal dysphagia in this population, especially in individuals at risk for aspiration⁽¹³⁾.

PURPOSE

In this context, the aim of the present study was to identify the main factors associated with oropharyngeal dysphagia following cardiac surgery through a systematic review of the literature.

METHODS

Study design

The guidelines of the Cochrane Handbook⁽¹⁴⁾ and the information provided by Sampaio and Mancini⁽¹⁵⁾ were considered for the realization of this systematic review. The following survey

question was used: What are the factors related to oropharyngeal dysphagia in patients following cardiac surgery?

Search strategy

A search was conducted in the PubMed and ScienceDirect databases. The keywords “cardiac surgery” and “deglutition disorders” and the free search term “dysphagia” were used in the search for published works. Association between them was conducted by means of the Boolean operator “AND”. The search occurred between April and May 2015.

Articles published in Portuguese, English, or Spanish addressing oropharyngeal dysphagia following cardiac surgery were selected with no limitation of time. Only studies available in full were selected. The following publications were excluded from the search: expert opinions, dissertations, theses, monographs, reviews, and studies involving other types of thoracic surgery, children, drugs, esophageal dysphagia, and epidemiological data.

Selection of studies

Initially, articles were screened for title and abstract. All articles that met the eligibility criteria of the proposed theme were selected. They were then submitted to full, independent assessment by two blinded referees.

Data analysis

After selection, in case of disagreement, a third referee evaluated the article and provided a final opinion on its inclusion or exclusion. Using a standardized form, each reviewer extracted the following data: authors, year of publication, study design, sample size, variables evaluated, and main results, which compose the descriptive summary presented in Chart 1.

RESULTS

Selection of studies

The search found 12,127 articles with the proposed keywords published in the databases consulted (3009 at PubMed and 9118 at ScienceDirect). Of these, 10,324 were excluded for duplicate and 1793 for other reasons. Eventually, 10 studies were read in full by the researchers, but five of them were case reports that addressed only esophageal dysphagia for heart or vascular compression and, consequently, were also excluded. Only five studies addressing oropharyngeal dysphagia following cardiac surgery were left. One master's thesis⁽⁸⁾ and one doctoral dissertation⁽¹⁶⁾ accomplished in Brazil were found; however, they were not considered in the analysis of results and were used only for the theoretical substantiation of this review.

Figure 1 shows the flowchart of the search strategy and selection of studies.

Chart 1. Descriptive summary of studies

Authors	Study design	Total of sample/ dysphagia patients	Surgical procedures	Variables assessed	Factors related to oropharyngeal dysphagia
Rousou et al. ⁽⁹⁾	Retrospective cross-sectional	838/ 23	CABG, coronary bypass and valve repair/replacement	Time of OI, previous S, CPB, left ventricular ejection fraction, time of surgery, type of surgery (with or without CABG).	Time of OI and CPB, reduced left ventricular ejection fraction, time and type of surgery (CABG).
Ferraris et al. ⁽¹⁰⁾	Retrospective cross-sectional	1042/ 31	CABG	Age, height, weight, ejection fraction, CPB, DM, creatinine>2.5, increased cholesterol level, presence of COPD, PVD, S, CCF, aspirin therapy preoperatively, preoperative shock, SAH, unstable angina, non-CABG heart surgery, NYHA>2, and reoperations.	Advanced age, DM, hyperdyslipidemia, RI and CCF.
Skoretz et al. ⁽¹¹⁾	Retrospective cross-sectional	909 / 51	CABG and valve repair/replacement	Age, comorbidities, time of OI, reintubation, reoperation, atrial fibrillation, readmission in ICU post-extubation, length of stay in ICU, pre- and post-operative hospitalization time and total length of hospitalization.	Advanced age, CCF, atrial fibrillation, previous S, NYHA>2, OI>12 h, reoperation, reintubation, length of stay in ICU, pre- and post-operative hospitalization time, total length of hospitalization and use of TEE.
Hogue et al. ⁽¹⁷⁾	Retrospective cross-sectional	869/ 34	CABG, coronary bypass, valve repair/replacement, cardiac tumors, aortic aneurysm repair, and congenital abnormalities identified in adulthood,	Age, history of MI, SAH, DM, S, COPD, RI and OI, left ventricular function, transthoracic echocardiography, time of EC, aortic clamping, low cardiac output after the operation, use of intra-aortic balloon pump, new development of S, RI, hepatic dysfunction, parenteral nutrition, sepsis.	Advanced age, time of OI, use of TEE.
Barker et al. ⁽¹⁸⁾	Retrospective cross-sectional	254/ 130	CABG and valve repair/replacement	Age, gender, smoking history, family history of heart disease, surgical risk, DM, NYHA, CCF, SAH, hyperdyslipidemia, previous S, sinus rhythm, COPD, renal risk.	Time of OI, perioperative S and sepsis.

Caption: S - stroke; CPB - cardiopulmonary bypass; CABG - coronary artery bypass grafting; DM - diabetes mellitus; COPD - chronic obstructive pulmonary disease; PVD - peripheral vascular disease; SAH - systemic arterial hypertension; MI - myocardial infarction; CCF - congestive cardiac failure; OI - orotracheal intubation; RI - renal insufficiency; NYHA - The New York Heart Association functional classification; ICU - intensive care unit; TEE - transesophageal echocardiography

Characterization of studies

Only studies published in English conducted in the United States (60%)^(9,10,17) and Canada (40%)^(11,18) were included in this literature review. The study sample ranged from 254⁽¹⁸⁾ to 1042⁽¹⁰⁾ individuals (mean 781.2). Age varied from 65.4±12.1⁽¹⁸⁾ to 74.3±8.7⁽¹¹⁾ years between the groups of patients with dysphagia and from 62.8±11.8⁽¹⁰⁾ to 63±0.4⁽¹⁷⁾ years between the groups of patients without dysphasia. The study by Rousou et al.⁽⁹⁾ did not consider age as a factor for the development of dysphagia between the groups of individuals undergoing TEE.

All of the articles selected in the review search were retrospective, cross-sectional studies which included analysis of medical records of patients who underwent cardiac surgery. The most common interventions were valve repair/replacement, coronary bypass, and CABG. Chart 1 shows the descriptive summary of every study listed for the literature review.

According to the studies investigated, the main factors related to oropharyngeal dysphagia following cardiac surgery were advanced age, presence of comorbidities and other diseases, intubation time, and surgical conditions.

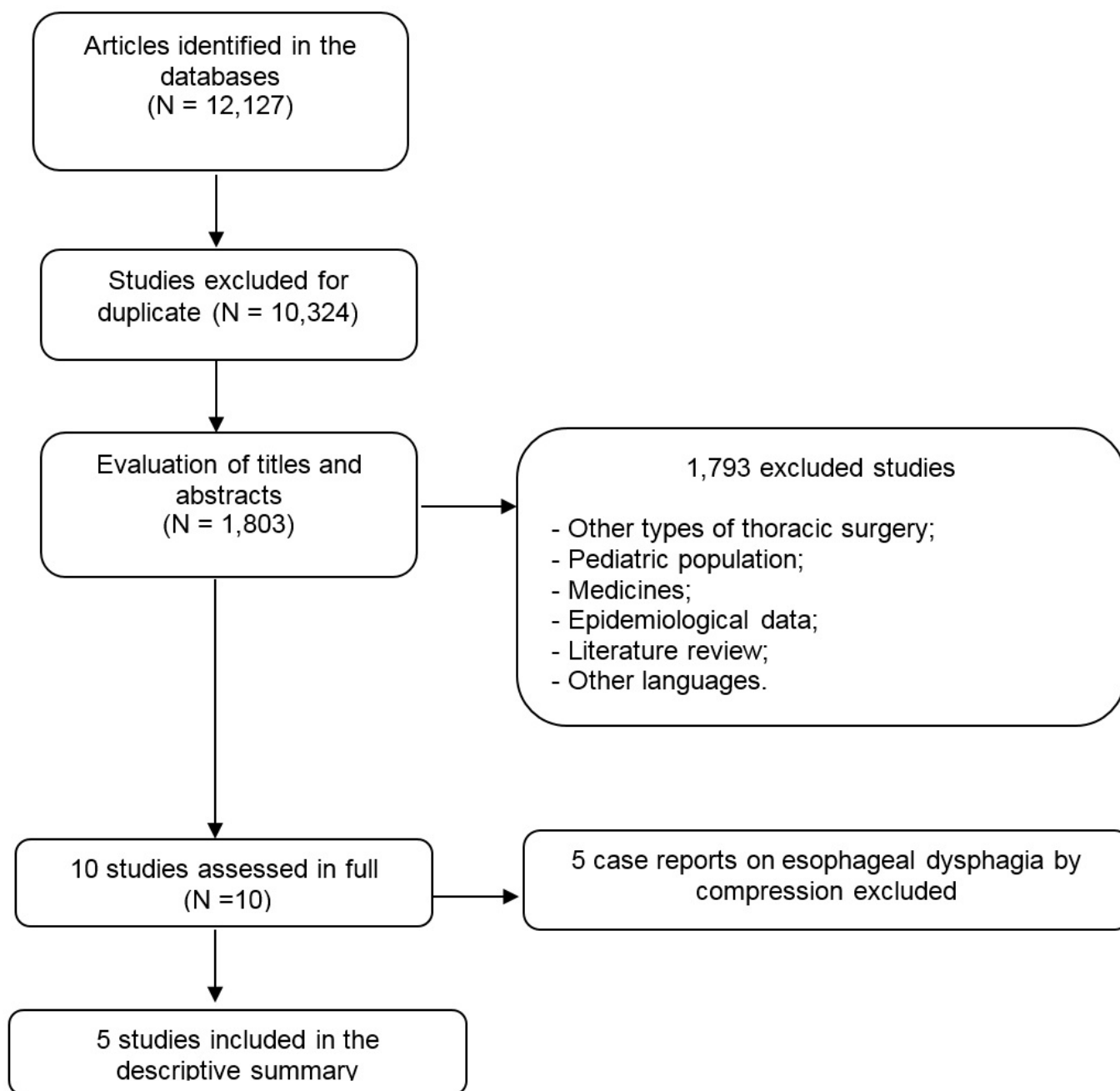


Figure 1. Flowchart of the articles at the ScienceDirect and PubMed databases

The elderly are more likely to develop CVD, thus cardiac surgery rates in this population outnumber those in other age groups⁽¹⁹⁾. In this population in particular, heart surgery is related to high morbidity and mortality rates because of the high prevalence of associated comorbidities, especially metabolic disorders such as diabetes mellitus and dyslipidemia, and the lower functional reserve and depletion of lean body mass^(10,19-21).

In this context, the elderly may present presbiphagia, which occurs owing to the physiological process of aging, which affects the phonoarticulatory neuromuscular structures responsible for the swallowing process⁽²²⁾. Presbiphagia associated with other factors, such as comorbidities and the presence of CVD, can

negatively affect deglutition, predisposing for oropharyngeal dysphagia⁽²³⁾.

Congestive heart failure (CHF) is the most common cardiac diagnosis in patients over 65 years old and is a common cause of hospitalization and demise, presenting significant financial burden⁽²⁴⁾. Gyalai-Korpos et al.⁽²⁵⁾ found that elderly people with CHF often present hospitalization time longer than 12 days, according to the New York Heart Association classification (NYHA>4), presence of one or more comorbidities, and associated chronic renal failure, as well as decreased pulmonary condition and physical functional capacity. These changes are associated with increased NYHA functional class, regardless of

the values of the left ventricular ejection fraction, reflecting the impact of enhanced disease severity⁽²⁶⁾. Therefore, CHF alone presents a number of factors that may explain the appearance of oropharyngeal dysphagia in the postoperative period of cardiac surgery, as reported by the studies listed in present review.

Another factor reported by the studies was the presence of preoperative cerebrovascular accident (S). Stroke is the leading cause of severe neurological disability and constitutes a public health problem due to its high treatment costs and because it is a major cause of death⁽²⁷⁾. Approximately 45% to 65% of patients develop oropharyngeal dysphagia, and its presence is associated with increased risk of pulmonary complications owing to aspiration of saliva and/or food, malnutrition, dehydration, prolonged hospitalization, and demise^(28,29).

Dysphagia is common among critically ill patients⁽³⁰⁾, with asymptomatic or symptomatic aspiration as an important risk factor for the development of acute lung injury, prolonged hospital stays, and increased mortality rates⁽³¹⁾. Swallowing dysfunction in critical illness has been identified as an important area of research because of its negative influence on the clinical prognosis of patients⁽³²⁾.

Recently, research has shown a possible correlation between the development of sepsis and oropharyngeal dysphagia among seriously ill patients. The incidence of severe sepsis increases morbidity and mortality rates in this group of patients^(33,34). A study conducted with 30 patients with severe sepsis and 30 without sepsis reported that 19 patients evolved to oropharyngeal dysphagia 14 days after ICU admission in the group with sepsis, whereas only seven individuals in the group without sepsis developed oropharyngeal dysphagia⁽³⁵⁾.

Therefore, severe sepsis is an independent factor related to dysphagia development in severely ill patients, justified by the electrophysiological findings of polyneuropathy and myopathy in all septic patients, causing muscle weakness and playing an important role in the development of dysphagia⁽³⁵⁾.

Artificial airways have a negative effect on the larynx and general physiology of swallowing. The literature describes high incidence of dysphagia following intubation, varying widely between 3% and 83%^(10,36). The studies investigated showed that prolonged intubation may be an independent predictor for dysphagia⁽¹⁸⁾ and that artificial airways increase the risk of lesions in the upper airways and the larynx, which, in turn, affect the mechanics, aerodynamics, and reflex protection of the first⁽³⁶⁾.

Kwok et al.⁽³⁷⁾ demonstrated that orotracheal intubation (OI) time is strongly associated with post-extubation dysphagia. Each day, after the first 24 hours on mechanical ventilation, increased the odds of developing dysphagia by 25%. Two days after OI, the risk of oropharyngeal dysphagia reached 50%. The mechanisms that lead to post-extubation dysphagia include multifactorial aspects, such as prolonged inactivity of oropharyngeal muscles, glottal injury, mucosal inflammation, and ulceration of the vocal cords, in addition to mechanical and sensory changes⁽³⁸⁾.

Another important factor mentioned in the studies analyzed addresses the surgical condition, such as the use of CPB and/or TEE. CPB is commonly used during surgery of coronary and

valvular insufficiencies because it allows safety optimization and provides reproducibility of results; however, due to its systemic inflammatory response, CPB is associated with postoperative complications^(8,39). Respiratory complications are the most important, because systemic inflammation alters the vascular permeability of the lung and also causes acute pulmonary injury, respiratory distress syndrome, increased incidence of pneumonia, and longer mechanical ventilation (MV) time^(8,40,41).

TEE allows dynamic visualization of the surgical procedure, especially in valvular and revascularization surgeries, by means of an esophageal tube; thereby it detects the functionality of the heart and the newly implanted valve⁽⁸⁾. Studies have reported association between the use of TEE and the development of oropharyngeal dysphagia postoperatively owing to injuries that can occur in the oropharynx and/or esophagus during OI^(7,17).

Also, the retrospective, cross-sectional studies included in this review only provided data regarding factors related to oropharyngeal dysphagia. Nevertheless, case-control and/or cohort studies, which can identify risk factors for oropharyngeal dysphagia in the population undergoing cardiac surgery, are extremely important.

CONCLUSION

Through this literature review, it was possible to observe that patients undergoing cardiac surgery present several factors related to the development of oropharyngeal dysphagia. The most prevalent factors found in the studies assessed were advanced age, use of cardiopulmonary bypass (CPB) and transesophageal echocardiography (TEE) during the surgical procedure, and associated comorbidities (neurological, metabolic, development of postoperative sepsis, and previous heart conditions).

Furthermore, articles conducted in Brazil were not found; therefore, the authors suggest research in this theme in order to highlight the reality of the country, such as the characterization of the population undergoing cardiac surgical procedures and incidence and identification of factors that may affect deglutition.

It is worth mentioning the limitations of this review regarding the small number of studies; restriction to Portuguese, English, and Spanish in the inclusion process; and the inability to perform meta-analysis owing to the heterogeneity of the outcomes assessed and the surgical interventions to which the individuals were submitted.

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Author contributions

RWW and EMSS contributed to the design, development, and execution of the study and writing of the manuscript; RM contributed to the design, development, and execution of the study and writing and revision of the manuscript.