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Dysphagia and laryngeal pathology in post-surgical cardiothoracic patients

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ABSTRACT

Purpose: Cardiothoracic surgery is known to result in dysphagia and laryngeal injury. While prevalence has been explored, extent, trajectory and longevity of symptoms are poorly understood. This retrospective, observational study explored dysphagia and laryngeal injury in patients following cardiothoracic surgery referred for instrumental swallowing assessment.

Methods: Clinical notes and endoscopic recordings of 106 patients (age range 18–87 yrs; mean 63 yrs; SD 15 yrs) (including 190 endoscopes) at one large tertiary centre were reviewed by two speech-language pathologists and a laryngologist. Standardized measures of laryngeal anatomy and physiology, New Zealand Secretion Scale, Penetration-Aspiration scale and Yale Residue Scale were rated.

Results: Prevalence of abnormality included 39% silent aspiration, 65% laryngeal edema and 61% vocal paralysis. The incidence of pneumonia was 36% with a post-operative stroke rate of 14%. Forty percent of patients were receiving a standard diet by discharge from acute care; while, 24% continued to require enteral feeding and 8% received laryngeal surgery within twelve months of discharge. Vocal fold motion impairment was significantly associated with ventilation time and tracheostomy tube duration ($p < .05$).

Conclusion: Early endoscopic assessment for identification of dysphagia and laryngeal injury in patients following cardiothoracic surgery may allow early management and prevention of secondary complications.

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1. Introduction

Cardiovascular disease is a leading cause of death worldwide [1]. Cardiothoracic surgeries can be lengthy and complex requiring prolonged periods of intubation and coronary bypass. They hold a risk of neurological injury both to the cranial nerves at the site of the surgery as well peri-operative stroke. Dysphagia and laryngeal injury are recognized complications of cardiothoracic surgery, and yet little is known about extent, trajectory and longevity to guide management. The incidence of swallowing difficulties after cardiothoracic surgery varies from 3% to 84% depending on diagnostic and recruitment criteria [2-5]. Risk factors for increased probability of swallowing difficulties include older age [2,4], sepsis [4,6], perioperative stroke [4], postoperative stroke [7], transoesophageal echocardiography [7], non-coronary bypass surgeries for congestive heart failure [2] and increased intubation time [4,6,7]. Cardiothoracic surgery is frequently associated with endotracheal intubation >48 h, with prevalence of swallowing symptoms such as aspiration greater with increasing intubation time [4,6,8]. Morbidity and mortality rates increase greatly for those patients after cardiothoracic surgery who present with swallowing difficulties [4,5,9].

Length of endotracheal intubation, irrespective of the underlying medical condition or procedure, has been recently established as a strong correlate with dysphagia [4,5,10-14], aspiration [15-17] and laryngeal injury [18]. For many patients presenting with dysphagia, dysphonia and airway difficulties following cardiothoracic surgery, contributors to their symptoms likely include localised trauma to the upper aerodigestive tract (pharynx, larynx and trachea), sedative medications, disuse atrophy, recurrent laryngeal nerve injury, impaired cognition, fatigue and neurological injury (e.g. stroke or hypoxia). The aims of this retrospective, observational study were to characterize swallowing and laryngeal injury patterns and recovery in patients after cardiothoracic surgery referred for instrumental assessment using flexible endoscopic evaluation of swallowing (FEES) following an abnormal clinical swallowing evaluation.

Abbreviations: FEES, flexible endoscopic evaluation of swallowing; CSE, clinical swallowing evaluation; CVICU, cardiovascular intensive care unit's; NYHA, New York Heart Association functional classification; NZSS, New Zealand Secretion Scale; MaxPAS, Maximum Penetration-Aspiration Scale; MaxYale, Max Yale Residue Scale score; DOSS, Dysphagia Outcome and Severity Scale; FOIS, Functional Oral Intake Scale.

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2. Methods

A retrospective review was performed on all patients who underwent cardiothoracic surgery at one tertiary hospital between July 2013–July 2016 who received a FEES. The standard protocol for swallowing assessment and referral to FEES at the research site is presented in Fig. 1. Frequency of instrumental assessments in individual patients was clinically driven and not controlled. Typically first FEES occur within the first week post-surgery. Patients who died during hospitalization and patients with tracheostomies were included in the study. This study received national-level and local authority ethical approval (UOAHPEC011721/A+6293).

2.1. Procedures

All FEES were performed at the patient's bedside according to the hospital's standardized procedure using an Olympus ENF-V2 Ultra slim videoendoscope, Olympus OTV-SI compact video enabled digital processor and ADVAN 21″ monitor (Olympus Corporation, Tokyo, Japan). Recordings were transferred to DVD for analysis. A water-soluble lubricant was used to minimize patient discomfort. No topical anaesthetic was used. Prior to oral trials, patients were observed at rest and during vocalization tasks (prolonged vowel, singing). Fluids were mixed with blue dye (Hansells Blue Coloring, Old Fashioned Foods Ltd. NZ) to improve visualization. The set protocol for administration of oral intake was: 3 × 5 ml water, 1 × 50 ml water via straw or cup, 3 × 5 ml mildly thick water (Level 2, Flavor Creations Australia), 1 × 50 ml mildly thick water via cup or straw, 3 × 5 ml pureed apple sauce and finally, 1× biscuit. All fluids were given at fridge temperature. The FEES protocol was truncated, as required at the discretion of the clinician completing the assessment to ensure patient safety, for example stopping after 5 ml water trials due to severe aspiration without adequate cough response to clear.

2.2. Measures

Demographic, perioperative and postoperative variables were collected from the hospital's cardiovascular intensive care unit's (CVICU) database and from scanned clinical records up to 12 months after discharge from hospital. The CVICU database is collected prospectively by clinical specialist nurses. The European System for Cardiac Operative Risk Evaluation 2 (Euroscore2) and The New York Heart Association functional classification (NYHA) are calculated by a cardiology specialist at the time of admission. Clinical outcomes [e.g. length of stay, nasogastric feeding duration and presence of pneumonia during the hospital admission (established using the NSHN (2005) "Criteria for Defining Nosocomial Pneumonia")] were recorded by an experienced speech-language pathologist from scanned clinical notes. Forty percent of all records were second-marked by another speech-language pathologist to check for reliability. Data extractors were blinded to FEES results at the time of extraction.

Approximately 750 patients receive cardiac surgery at the research site per year with 106 patients receiving a FEES in the three year research period. One hundred and ninety FEES recordings from 106 patients (106 1st FEES, 59 2nd FEES, 20 3rd FEES, 5 4th FEES) were analysed by a speech-language pathologist with >3 years of experience

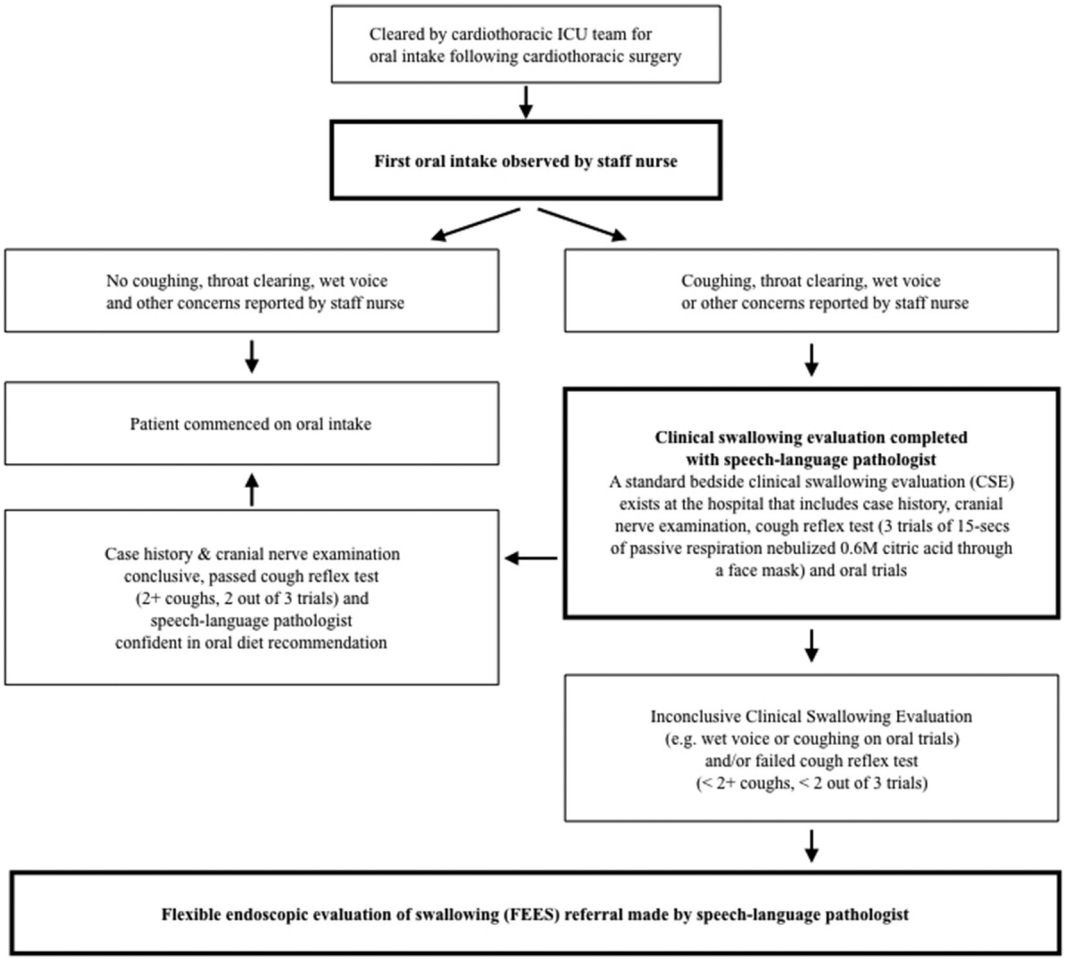

Fig. 1. Swallowing referral process at Research Site.

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