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DYSPHAGIA IN CERVICAL SPINAL CORD INJURY DUE TO TRAUMA

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ABSTRACT

To identify the swallowing difficulties in patients following traumatic cervical spinal cord Injury. A total of 6 patients with traumatic cervical spinal cord injury admitted to the tertiary care hospital and referred to speech language pathology (SLP) service were enrolled in the study. The selected study subjects were in the age range of 25-45 years. Patients referred were initially assessed for bedside swallow assessment to decide the patient's eligibility for cuff deflation trials and if successful then for speaking valve trials in graded pattern and duration taken to decannulate. These patients were analyzed on time duration taken for start of cuff deflation trials, start of speaking valve trial, duration of speaking valve trial. All 6 subjects underwent bedside swallow assessment (BSE) and Videofluoroscopic evaluation of swallowing (VFSS) to confirm safety of swallowing as well as to rule out aspiration risk. The results showed that the tracheostomy rehabilitation starts 5-7 days post admission/surgical correction of cervical fractures with a referral from the physician. Following referral in 3-4 days cuff deflation trials are attempted with repeated swallowing training for management of own oropharyngeal secretions which facilitates better tolerance of cuff deflation trials. Once patient is tolerating cuff deflation trials graded speaking valve trial is done along with RT. As patient is able to exhibit volitional swallow and bedside swallow assessment is done and if patients fail consecutively the SLP decides for instrumental swallow assessment. This decides the candidacy of oral feeding with modified diet/regular diet. Once patient tolerates full time speaking valve capping trials are initiated either by SLP/RT to decide candidacy of decannulation. In conclusion, the functional swallow safety should be assessed as a routine in patients with cervical spinal cord injury to rule out silent aspiration risk and to minimize secondary health complications. Tracheostomy rehabilitation is a great challenge for speech language pathology to facilitate speech breathing and functional swallow status, which requires specialized skills and competencies for a speech language pathologist.

Keywords: Dysphagia, Traumatic Cervical spinal cord injury, Swallowing, speech language pathology, Tracheostomy.

1. INTRODUCTION

Dysphagia is a frequent problem among cervical spinal cord injury patients. A spinal cord injury is the damage to the spinal cord that causes temporary or permanent changes in its function. Symptoms may include loss of muscle function, sensation, or autonomic function in the parts of the body served by the spinal cord below the

level of the injury. Complications can include muscle atrophy, chest infections, and breathing problems. In many patients, dysphagia problem is transient and tends to recover naturally throughout the rehabilitation process [1,2]. However, the fact that aspiration risk is a major risk factor of hospital-acquired pneumonia [3], and that in spinal cord injury patients' respiratory problems, especially pneumonia, is the most common cause of death [4], makes precise evaluation of swallowing function in cervical spinal cord injury patients invaluable.

Frequently used measures for the assessment of swallowing function include various bedside evaluation methods, video fluoroscopic swallowing study (VFSS) and fibreoptic endoscopic examination of swallowing (FEES). Bedside swallowing evaluation has the advantage of simple implementation, but bears the disadvantage of low sensitivity and specificity in detecting dysphagia [5] in patients with tracheostomy post cervical spinal cord injury. VFSS and FEES both show high sensitivity and specificity, and each has its own advantages and disadvantages.

Kirshblum et al reported that in their study that 42 out of 187 traumatic cervical spinal cord injury patients who showed positive results on bedside swallow evaluation were further tested with VFSS [7]. Dysphagia was detected in 31 patients. Significant association with dysphagia was shown for age, tracheostomy and mechanical ventilation, and anterior approach for cervical spine surgery. Wolf et al reported that 51 cervical spinal cord injury patients who were admitted to the intensive care unit because of respiratory insufficiency underwent FEES [2]. Among the 21 patients who had shown severe dysphagia, all except 3 patients showed improvement of swallowing disorder. Abel et al. reported that 73 patients with cervical spinal cord injury underwent bedside swallow evaluation and 32 patients who were suspected to have dysphagia were further tested with VFSS [8]. Dysphagia was detected in 26 patients and incidence of pneumonia in these patients at least 2 weeks after the initial injury was found to be significantly higher than in the remaining patients. Moreover, the authors classified the type of dysphagia into oral, pharyngeal and esophageal dysphagia according to the VFSS findings. Seidl et al reported that 175 cervical spinal cord injury patients underwent FEES and 28 patients were diagnosed with dysphagia [9]. Moreover, the authors reported that besides history of tracheostomy, no other clinical factor was significantly associated with dysphagia.
In these previous studies, either only those patients suspected of dysphagia on bedside swallowing tests underwent the objective swallowing evaluation, or the objective study was conducted on all patients, but without additional investigation of the relationship between the study results and the clinical presentation of each patient. Thus, the present study was designed with the main purpose to identify and discuss the swallowing difficulties in patients following cervical spinal cord Injury.

2. METHODOLOGY

A total of 6 patients with traumatic cervical spinal cord injury admitted to the tertiary care hospital and referred to speech language pathology (SLP) were enrolled in to the study. The selected study subjects were in the age range of 25-45 years. Patients referred were initially assessed for bedside swallow assessment to decide the patients' eligibility for cuff deflation trials and if successful then for speaking valve trials in graded pattern. These patients were analyzed on time durations of start of cuff deflation trials, start of speaking valve trial, duration for start of capping tolerance and time taken for decannulation.

3. RESULTS

Table 1: Management of dysphagia among patients

Section Details	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Average days of trachea rehabilitation
Date of referral	11.3.19 Admission 2 weeks ago	26.3.19 Admission 2 weeks ago	18.3.19 Admission 3 weeks ago	14.3.19 Admission 3 weeks ago	4.4.19 Admission 2 weeks ago	18.1.19 Admission 12 days ago	Referral after 12.5 days of admission
Start of cuff deflation trials	11.3.2019	26.3.19	21.3.19(3 days)	20.3.19 (6 days)	6.4.19 (2 days)	23.1.19 (5 days)	2.6 days after referral
Start of Speaking valve trial	13.3.19 (2 days)	27.3.19 (1 day)	24.3.19 (6 days)	24.3.19 (10 days)	8.4.19 (4 days)	25.1.19 (7 days)	5 days after referral
Full time SV tolerance	19.3.19 (8 days)	29.3.19 (3 days)	7.4.19 (19 days)	1.4.19 (17 days)	11.4.19 (7 days)	28.1.19 (9 days)	10 days after referral
Bedside swallow evaluation	25.3.19 (14 days)	2.4.19 (6 days)	8.4.19 (20 days)	3.4.19 (19 days)	11.4.19 (7 days)	29.1.19 (10 days)	12.6 days after referral
Instrumental swallow assessment	28.3.19 (17 days)	4.4.19 (8 days)	10.4.19 (22 days)	4.4.19 (20 days)	16.4.19 (13 days)	31.1.19 (12 days)	15.3 days after referral
Start of oral feeding	29.3.19 (18 days)	5.4.19 (9 days)	11.4.19 (23 days)	5.4.19 (21 days)	17.4.19 (14 days)	31.1.19 (12 days)	16.1 days after referral

Removal of enteral feed	3.4.19 (23 days)	8.4.19 (12 days)	15.4.19 (27 days)	10.4.19 (26 days)	25.4.19 (22 days)	4.2.19 (16 days)	21 days after referral
Capping trials	3.4.19 (23 days)	8.4.19 (12 days)	16.4.19 (28 days)	10.4.19 (26 days)	26.4.19 (23 days)	3.2.19 (15 days)	21.16 days after referral
Decannulation	5.4.19 (25 days)	10.4.19(14 days)	20.4.19(32 days)	14.4.19 (30 days)	30.4.19 (27 days)	6.2.19 (18 days)	24.3 Days after referral

All 6 subjects underwent bedside swallow assessment (BSE) and following to it Videofluoroscopic evaluation of swallowing (VFSS) was done to confirm presence or absence of aspiration. The average number of days for tracheostomy rehabilitation was 12.60 days. The tracheostomy rehabilitation starts 5-7 days post admission/surgical correction of cervical fractures with a referral from the physician. Following referral in 3-4 days cuff deflation trials are attempted with repeated swallowing training for management of own oropharyngeal secretions which facilitates better tolerance of cuff deflation trials. However, candidacy of cuff deflation trials can be prolonged in duration post referral depending on patient's cognitive status and ability to manage secretions. Once patient tolerates cuff deflation, graded speaking valve trial is done along with RT/nurse. As patient is able to exhibit volitional swallow and cough reflex strengthens with minimal trach/oral suctioning requirement bedside swallow assessment is done and if patients passes/fails consecutively the SLP decides for instrumental swallow assessment which can be either Video fluoroscopic evaluation of swallowing or Flexible Endoscopic evaluation of Swallowing. This decides the candidacy of oral feeding and patient is started on modified diet/regular diet as per functional swallow status. Once patient tolerates full time speaking valve, capping trials are initiated either by SLP/RT to decide candidacy of decannulation. In brief, the trach rehabilitation starts as early as 2 days post op and can extend until 1-2 months depending upon cognitive deficits and swallow safety status of a patient.

DISCUSSION

Dysphagia, being a risk factor of pneumonia, is a problem that requires close attention and immediate treatment and oropharyngeal dysphagia increases the risk of aspiration pneumonia, which is likely to add burden to existing respiratory dysfunction [10, 11]. Pollock et al reported four cases of unexpected pharyngeal damage post cervical trauma [12]; while Grundy et al highlighted the presence of bulbar palsy with acute respiratory distress and dysphagia in eight patients with cervical injuries [13]. In a larger review, Hsu et al identified in 47 cases of cervical spinal cord injury dysphagia, dysphonia and excessive secretions [14]. The loss of phrenic nerve function with injuries above C5, interrupts normal breathing patterns and paralyses the diaphragm. Swallowing function is closely coordinated with the breathing cycle and disruption leads to accidental inhalation and aspiration during the swallow, with lack of cough preventing airway clearance [15]. Respiratory interventions including tracheostomy insertion and supported ventilation are known to cause additional disruption to swallowing and are frequently cited as factors linked to dysphagia following cervical spinal cord injury (CSCI) [9, 16-19, 20].

Cervical spinal surgery is often indicated for traumatic injuries and much of the evidence from elective surgery cohorts report both dysphagia and dysphonia as common post-operative complications often due to pharyngeal wall oedema and nerve injury due to retraction time [21-23], with both posterior and anterior approaches demonstrating neurological impact on swallowing function [24]. Gastrointestinal functions are often affected following CSCI due to the loss of autonomic control, leading to dysmotility and paralytic ileus, often requiring aspiration of gastric contents [25]. This adds another level of challenge for patients identified with dysphagia as alternative routes of nutrition need to be considered. High malnutrition rates have been reported in Spinal cord injury populations admitted to specialised units in England of which CSCI and tracheostomy patients were the largest cohort [26]. The combination of respiratory, swallowing and gastro-intestinal impairment increases the risk of aspiration and SLP need to be aware of the signs in order to prevent symptoms developing, which can be difficult to reverse.

Age was found to be statistically related to dysphagia by Kirshblum et al. but not by Wolf and Meiners, Abel et al. or Seidl et al. [2, 8, 9 18]. Even linear by linear association after categorization in different age groups showed higher prevalence of dysphagia with increasing age. The statistical correlation between aging and dysphagia seems to be reasonable, as aging itself, independently of cervical spinal cord injury, can increase the risk of dysphagia[26]. Multiple surveys in the general population also have shown higher prevalence of dysphagia in the elderly [27-29].

Gross et al also reported that the reduction of respiratory volume and subglottic pressure due to a tracheostomy tube or a thorax trauma raises the risk of aspiration [30]. Thus, we do agree with Abel et al that we should try more aggressively to close the tracheostomy earlier [8]. A correlation between the anterior surgical approach and occurrence of dysphagia was not observed in our study.

Accurate evaluation of laryngeal dysfunction helps the weaning process and permits more options for verbal communication [34]. Currently there is little guidance to SLP on optimal management of tracheostomy or dysphagia following cervical spinal cord injury [35-37]. This includes the use of thickened fluids for patients with dysphagia, on the premise that increased viscosity slows transit of the fluid allowing more time for a delayed swallow initiation to capture the bolus. In contrast, the key feature of dysphagia in CSCI patients is not delayed swallowing but ineffective pharyngeal squeeze making thickened fluids unsuitable as they are more challenging to clear from the pharynx and can increase damage to lung mucosa due to aspiration [20, 38]. Similarly, a reliance on the cough reflex to signify aspiration is problematic especially for patients with inflated tracheostomy cuffs or absent cough ability due to impairment to the vagus nerve [39, 40]. Instead, instrumental assessments, such as FEES or VFS are recommended to identify laryngeal impairments that are asymptomatic at bedside [2, 16, 18-20]

Performing VFSS or FEES routinely on all patients would be impossible because of ethical and cost/resource issues, but physicians treating patients with cervical spinal cord injury should always take the possibility of dysphagia and silent aspiration into consideration, especially in case of previous manifestation of pneumonia, presence of tracheostomy, or presence of signs and symptoms indicating dysphagia. Patients with silent aspiration

are in a higher-risk group for the development of pneumonia or other complications because of the lack of cough reflex reduces patients, family, and hospital staff to detect that aspiration is occurring [41]. However, for further research, a prospective longitudinal study would be ideal, to investigate the natural recovery of dysphagia, before we can decide the time frame in which further natural recovery is unlikely to occur, so that a permanent gastrostomy would not be recommended. Two limitations, which we encountered in this study, were the lack of specific time frame, in which we conducted VFSS, and the lack of follow-up in 6 months post decannulation data to track occurrence of pneumonia.

CONCLUSION

The functional swallow safety should be assessed as a routine in patients with traumatic cervical spinal cord injury to rule out silent aspiration risk and to minimize secondary health complications. Tracheostomy rehabilitation is a great challenge for speech language pathology to facilitate speech breathing and functional swallow status, which requires specialized skills and competencies for a speech language pathologist.

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