

Considerations for SLT management of COVID-19 patients with dysphagia following critical illness: A single centre case series

Abstract

Background

Patients treated with intubation and tracheostomy for COVID-19 infection are at risk of increased incidence of laryngeal injury, dysphagia, and dysphonia. Due to the novelty of the SARS-CoV-2 virus little is known about the type of dysphagia patients experience as a result of infection and critical illness.

Methods

We conducted a retrospective case review at our UK centre of all patients who were tracheostomised because of COVID-19 and received an instrumental assessment of swallowing in the early stages of the pandemic. Our aim was to progress understanding of COVID-19 and dysphagia following Intensive Care Unit (ICU) admission and to guide Speech and Language Therapy (SLT) clinical practice in the ongoing pandemic.

Findings

Eleven patients were identified, and descriptive statistics used to present demographic data, with a narrative account of dysphagia profile used to describe presentation. Causes and presentation of dysphagia were heterogenous, with each patient requiring individualised clinical management to

maximise outcome. A positive trend was seen in terms of recovery trajectory and progressing to oral intake.

Conclusion

This study reports on our early experience of the presentation of COVID-19 patients with dysphagia and demonstrates the value of instrumental assessment. It indicates the need for further research to consolidate knowledge and guide clinical practice.

Keywords

COVID-19

Dysphagia

Tracheostomy

Deglutition

Deglutition Disorders

Introduction

By April 2021, the SARS-CoV-2 (COVID-19) pandemic had led to 35,708 admissions to critical care across England, Wales and Northern Ireland [1]. A significant number of these patients required mechanical ventilation, and, in many cases, tracheostomy has been carried out to assist with respiratory weaning and recovery [2, 3]. However, compared to usual management of critical care patients, the timing of tracheostomy for COVID-19 patients has often been delayed due a combination of necessity to prone patients for improved oxygenation and a desire to limit aerosol generating procedures (AGPs) [4, 5]. Patients who have been treated for COVID-19 with prolonged ventilation, proning and tracheostomy are at increased risk of laryngeal and tracheal injury [6]. Laryngeal oedema has been found to complicate the weaning process of COVID-19 patients [7] with speculation that the virus itself could cause a laryngopharyngitis similar to other coronaviruses [8], alongside the known risks associated with prolonged intubation. These include laryngeal trauma, myopathy and inflammation, as well as dysphagia and dysphonia [9].

The respiratory implications of COVID-19 also lead to the potential for dysphagia. Reduced breath support, altered respiratory rate and breathing-swallowing coordination are known to impair swallowing and have been shown to increase the risk of aspiration [10, 11]. COVID-19 is a multiorgan illness impacting the heart, kidneys and brain in addition to the lungs [12]. Multi-organ illnesses complicate dysphagia presentation and management, and clinicians and researchers continue to learn about their interactions [13]. The neurological complications of COVID-19 infection include thromboembolic events and neuropathy [14, 15]. Dysphagia and cranial nerve impairments are a known result of neurological impairments and case reports have indicated they can be a feature of COVID-19 illness [16].

Speech and language therapists (SLTs) are key professionals in the management of patients weaning from tracheostomy and patients with dysphagia [17, 18]. During the initial stages of the pandemic, in the UK, access to gold standard instrumental assessment, flexible endoscopic evaluation of swallowing (FEES) and videofluoroscopic swallow study (VFSS) was limited due to concerns relating to aerosol generating procedures (AGP) [19]. At our centre this meant that FEES and VFSS were suspended from the period of March 2020 to May 2020. However, with the correct access to Personal Protective Equipment (PPE) and appropriate risk management strategies as per professional guidance, SLTs at our UK centre have been able to use FEES and VFSS since May 2020 [20].

The novelty of COVID-19 means that little is known about the prevalence or type of dysphagia patients may experience. At present, consensus expert opinion, isolated case reports and case series provide the evidence for clinicians managing patients with swallowing difficulties [21, 22] with emergent data showing that dysphagia in post-ICU patients, particularly those with tracheostomies, is a common symptom [23, 24]. The aim of this study was to retrospectively review all patients who were tracheostomised early in the pandemic for management of COVID-19 and received an instrumental assessment of swallowing as part of their dysphagia rehabilitation to determine how this impacted on their care pathway. This is important since the pandemic continues to impact on clinical services, and SLTs continue to need evidence and guidance to determine best practice when working with patients experiencing dysphagia following COVID-19.

Methods

We retrospectively reviewed the medical notes of all inpatients with COVID-19 treated at Imperial College Healthcare NHS Trust (ICHT), London, who received both tracheostomy insertion and

instrumental assessment of swallowing from May to August 2020. The instrumental assessment could be VFSS, FEES or both, since both evaluations are usual practice at ICHT. The selection of VFSS or FEES is dependent on the individual clinical presentation of the patient, and the initial clinical evaluation of swallowing had taken place at least one day prior to instrumental evaluation. In some cases, patients had been on an SLT caseload for longer but due to the embargo on instrumental assessment could only access VFSS or FEES from May 2020. Demographic data were collected by all authors including age, sex, size of endotracheal tube, duration of intubation, insertion method of tracheostomy, size of tracheostomy at insertion, duration of tracheostomy, whether the tracheostomy was in situ at the time of VFSS or FEES and whether the patient had been prone as treatment for COVID-19.

Validated dysphagia outcome measures including the Functional Oral Intake Scale score (FOIS) [25] and International Dysphagia Diet Standardisation Initiative Functional Diet Score (IDDSI-FDS) [26] were recorded at three time points: pre-instrumental assessment, post-instrumental assessment and at the point of discharge from hospital to home or a rehabilitation facility. Penetration-Aspiration scales (PAS) [27] and Dynamic Imaging Grade of Swallowing Toxicity (DIGEST) [28] scores were also collected for patients who underwent VFSS. For FEES assessments, the PAS could also be used but at the time of data collection the DIGEST had not been validated for use with FEES assessments therefore the New-Zealand Secretion Scale (NZSS) [29] rating and Yale Pharyngeal Residue Severity Rating Scale (YPRSRS) [30] score were collected. Similarly, these measures could not be used for VFSS as they have been developed specifically for FEES. All outcome measures chosen were those used in usual practice at ICHT. VFSS and FEES assessments were analysed and scored by two SLTs as per clinical reliability protocols. All SLTs involved in data collection had a minimum of 10 years' experience in instrumental assessment of dysphagia. A descriptive account of each patient's

dysphagia profile including management and therapeutic techniques were recorded, as were any relevant co-existing medical conditions.

Analysis Plan

Descriptive statistics were calculated in Microsoft Excel and are used to report demographic details and outcome measures; due to the small sample size, continuous variables are presented as median and interquartile range. A narrative discussion is used to report any patterns, for example length of tracheostomy insertion, severity of dysphagia and dysphagia characteristics.

This service evaluation was approved by ICHT (reference SLT 510) and governance was provided via the ICHT Service Evaluation and Audit governance committee.

Results

There were 62 patients who received a tracheostomy as part of their treatment for COVID-19 during the specified timeframe. Of the 58 surviving patients, all received SLT input for tracheostomy weaning and swallowing management during their acute care admission. Due to the strict selection criteria and risk stratification used to identify appropriate patients for VFSS and FEES from May 2020, only 11 (18%) patients received instrumental assessment of swallowing as an inpatient following the SLT clinical bedside evaluation. Four of the eleven patients (36%) had transferred to ICHT from other hospital settings when they were already intubated and ventilated.

Table 1 shows details of demographics collected. The eleven patients were predominantly male (91%), with only one female in the group. They had a median age of 59 (range 46-86). The median duration of intubation was 24 days (range 16-38), with a median endotracheal tube (ETT) size of 8.0 (range 7.5-9.0). Eight patients (73%) were prone as part of their management on ICU. The median

length of time from tracheostomy insertion to decannulation was 27 days (range 7-93 days) and the median tracheostomy size was 8.0 (range 7.5-9.0). Ten patients (91%) had a surgically inserted tracheostomy, with the details of one patient unknown due to insertion taking place at another facility. Three patients (27%) had a tracheostomy in situ at the time of instrumental assessment, and FEES were completed in line with appropriate cuff down protocols). Three patients (27%) were diagnosed with airway complications. One patient had multi-level subglottic stenosis, one had laryngeal oedema and another a left vocal cord palsy, however all patients were successfully decannulated prior to discharge from hospital.

Five (46%) patients only had a FEES evaluation, whilst four (36%) only had a VFSS. Two patients (18%) had both assessments whilst inpatients – for descriptive purposes we have used the results from the first instrumental assessment in our analysis because the second assessment did not alter findings or management due to the severity of the dysphagia. Nine patients (82%) were discharged home, whilst two (18%) were discharged to rehabilitation facilities.

Three patients (27%) experienced a neurological event as a complication of COVID-19. A fourth patient presented with delirium, tremor, and mild cognitive impairment, although neurological investigations showed no physiological cause and his symptoms resolved following discharge. Three of these patients were discharged home on full oral diet, but one continued on oral trials only with nasogastric (NG) feeding on transfer to a rehabilitation facility because of significant oral holding and inability to initiate swallowing due to his cognitive impairments. One patient had a persisting concurrent bilateral paralysis of the hypoglossal nerve and unilateral paralysis of the recurrent laryngeal nerve (Tapia syndrome) with no central cause demonstrated on brainstem MRI. An

extracranial cause is therefore presumed secondary to iatrogenic intubation damage. This patient had the most severe swallowing difficulties of the cohort.

INSTRUMENTAL ASSESSMENT SCORES

The PAS scores for each patient following VFSS and FEES are presented in tables 2 and 3 respectively. The PAS scores represent the worst swallow across all textures during the instrumental assessment. Overall, eight patients (72%) presented with impaired airway protection. Six patients (55%) aspirated, with silent aspiration detected in five (45%) patients, indicative of an impairment of cough reflex and sensation. Two patients (18%) penetrated during the assessment, whilst the remaining three patients (27%) scored a PAS of 2 which indicates swallow function within normal limits [31].

The DIGEST scores are indicative of overall performance during the VFSS swallow study. For the four patients who aspirated during the swallowing study there was variation in their DIGEST score from a grade of 2 to a grade of 4 (the most severe score). Three of these patients had an efficient swallow (minimal residue) with reduced swallow safety only leading to a lower overall grade, but the other patient had a severely inefficient (severe residue) and an unsafe swallow. This indicates the variability of swallow presentations following COVID-19 recovery in this small cohort. This was also reflected in the two patients who aspirated during their FEES examination – one of whom had mild residue and minimal secretions but the other who had severe residue and struggled to manage secretions.

Statistical analysis of correlation between duration of intubation, length of time with a tracheostomy and proning as a treatment was not possible as part of a service evaluation with a small cohort. However, it is notable that the patients who remained tube fed at discharge despite SLT intervention all had a tracheostomy for longer than the median value of 27 days.

FOIS and IDDSI scores

Prior to instrumental assessment 7 patients (64%) had an IDDSI-FDS of 0 (no food or fluids). 6 of these patients (55%) had a FOIS score of 1 (completely tube dependent) whilst one patient had a FOIS of 2 (tube dependent with minimal attempts of food and liquid). Ten patients (91%) achieved at least a one level increase in FOIS scale at time of discharge from hospital, the remaining patient (9%) decreased in FOIS level due to the need for thickened fluids following instrumental assessment. However, most patients were able to start oral intake immediately after the VFSS or FEES, and at discharge, all patients were having oral trials or full oral diet according to FOIS score (see figure 1). This pattern of improved oral intake is also shown by the IDDSI FDS (see figure 2) with eight patients (72%) progressing between 3-8 FDS levels by the time they were discharged. Seven of these patients had an FDS score of 7 or above indicating a combination of regular or soft and bite sized diet with thin or slightly thick fluids.

NARRATIVE DESCRIPTION OF DYSPHAGIA

From our small cohort, the descriptive features of each patient's dysphagia profile demonstrate that there was no consistent pattern or cause of their swallowing difficulties. Patients presented with a range of neurogenic, respiratory, cognitive, and structural causes for dysphagia related to their COVID-19 critical illness. This impacted on sensorimotor function leading to variability in swallow timing, efficiency, and safety. Oropharyngeal deconditioning associated with prolonged ICU admission, endotracheal intubation and nil by mouth status also contributed to dysphagia presentation.

Eight patients (72%) presented with reduced laryngeal vestibule closure and epiglottic deflection, as well as reduced hyolaryngeal elevation and excursion. This led to impaired airway protection, and in

the most severely dysphagic patients this was exacerbated by absent or reduced pharyngeal and laryngeal sensation. In this small cohort, 3 patients (27%) presented with reduced pharyngeal stripping wave and base of tongue weakness. This led to reduced swallow efficiency with increased pharyngeal residue.

In the absence of specific literature related to treatment approaches specific to COVID-19, the rehabilitative protocols used were clinically driven and based on the specific deficits seen on instrumental assessment. Depending on their specific swallowing impairments patients were given an individualised dysphagia management programme including selection of therapy exercises or strategies, alongside necessary dietary modification.

The Shaker exercise and pitch glides were used to target reduced hyolaryngeal elevation and excursion as well as opening of the upper oesophageal sphincter[32]. If instrumental assessment had shown impairment of the suprahyoid muscle complex, but the supine position of the Shaker exercise was felt to be too challenging patients were given chin tuck against resistance (CTAR) exercises instead [33, 34]. This exercise was also provided where pharyngeal residue had been noted on the instrumental evaluation, as CTAR has been shown to improve swallowing efficiency [35]. The effortful swallow was provided to patients who had increased pharyngeal residue associated with tongue weakness and reduced pharyngeal stripping wave [36-38]. For two patients the Masako exercise, without a bolus [39], was used to target tongue base retraction to posterior pharyngeal wall contraction [40] alongside the effortful swallow and CTAR. One patient was given the Mendelson manoeuvre following identification of impaired hyoid movement (anterior and superior) on VFSS [41].

Patients who presented with a combination of motor deficits and sensory impairment leading to high risk of aspiration and the necessity of continuing with tube feeding following instrumental evaluation were offered therapeutic oral trials to maintain and promote swallow function. These trials included ice chips as part of a free water protocol [42], and where appropriate oral intake of a wider range of tastes and consistencies for comfort [43] and to promote motor recovery and neural plasticity [44].

Discussion

We retrospectively reviewed a small cohort of COVID-19 patients who were tracheostomized as part of their treatment and received instrumental evaluation of swallowing for dysphagia management. This information is intended to contribute to the knowledge base about COVID-19 and dysphagia following ICU admission, as well as to determine any pattern in dysphagia profile, or key treatment recommendations, to guide SLT practice in future.

In our cohort, the patient who had a tracheostomy for 96 days was ventilator dependent for the longest period. The literature demonstrates that prolonged respiratory ventilation can lead to dysphagia [45], and this patient's dysphagia profile was consistent with significant deconditioning secondary to prolonged ventilation and exacerbated by pre-existing oesophageal issues. The patient with Tapia syndrome presented with the most severe dysphagia profile. He had been intubated for 27 days prior to being tracheostomised, and had a tracheostomy for 33 days, but and his cranial nerve impairments were likely to have been caused by prolonged endotracheal intubation [46, 47].

Tapia syndrome is a rare condition that has been reported in the literature due to intubation trauma and proning for COVID-19 [48, 49], and it is important for SLTs to be cognizant of this condition as part of differential diagnosis when working with this patient cohort.

The instrumental assessment completed with this patient was vital to guiding his rehabilitation, and his swallowing recovered fully by the time he had been discharged from his rehabilitation setting. This is consistent with a case series describing Tapia syndrome following intubation, and highlights the importance of early instrumental assessment of swallowing as well as a robust therapy programme to expedite recovery of swallow function [50].

As knowledge about COVID-19 grows, it is clear that SARS-CoV-2 is a virus capable of producing a wide, individualised symptom profile [12]. The virus causes neurological and respiratory sequelae that have the potential to lead to dysphagia, alongside critical care interventions that are known to impact upper airway function such as intubation, sedation, proning and tracheostomy [21, 46, 51]. This variability is reflected in the presentation of our patient cohort who ranged from severe dysphagia to a functional swallow following instrumental assessment. This is consistent with literature for other patient groups who have the same underlying diagnosis, for example chronic obstructive pulmonary disease (COPD), but who present with significant individual variation in the type or even presence of dysphagia [52] and the known multimodal nature of dysphagia in tracheostomised patients [46]. For clinicians, the need to focus on specific dysphagia physiology and the individualised goals and needs of a patient will always take precedence over their diagnosis [53], and this is no different with COVID-19.

The benefits of being able to access instrumental assessment for this small cohort of patients are apparent. All patients were under the management of an experienced critical care SLT who had not been able to commence oral intake due to the equivocal findings on a clinical bedside swallowing assessment [54, 55]. However, following FEES or VFSS, over half of the cohort progressed from being fully tube dependent (FOIS 1) to starting some level of oral intake. This emphasises the value of

instrumental assessment in allowing SLTs to make more informed decisions that translate to improved patient outcomes.

There is a high incidence of silent aspiration in the post-ICU cohort [56]. This risk was captured in our cohort with one patient who had been started on oral intake prior to instrumental assessment but required mildly thickened fluids following the VFSS due to silent aspiration on thin fluids. The importance of using instrumental assessment to provide a clear physiological rationale for dietary modifications is well described in the literature. This is due to the risks associated with aspiration, and potentially higher rates of silent aspiration with thickened fluids [57, 58].

The presence of airway complications in 3 (27%) of the cohort also demonstrates the benefit of using instrumental assessment in this group of patients. This emphasises the value of timely identification of issues such as laryngeal oedema and acute airway damage are likely to lead to improved outcomes for patients through initiation of early treatment, which may also have a positive impact on swallowing function [46].

One of the challenges for SLTs managing patients with COVID-19 was the initial limitation on the use of instrumental assessments due to concerns relating to AGPs, and need to minimise viral transmission by reducing hospital footfall, for example when transferring a patient from ward to VFSS suite [19]. Whilst SLTs have multiple skills to be able to overcome this restriction, at our centre the cautious return to instrumental assessment was a positive step to be able to return patients safely to oral intake as well as commence individualised rehabilitation. However, initial access to instrumental assessments was very limited and led to a much smaller group of patients being assessed than in usual circumstances. Using guidance published by the Royal College of Speech and Language Therapists (RCSLT) [20] clear protocols have now been established for safe instrumental

assessment with correct PPE. This means that in the future more patients will be expected to receive the benefit of FEES or VFSS at an earlier stage in their treatment. This will undoubtedly benefit management of both dysphagia and tracheostomy weaning.

From clinician report, the weighting towards FEES (54%) over VFSS (46%) was an indicator of patients being unable to sit out for a prolonged period, and the relative efficiency of FEES in terms of scheduling and portability compared to VFSS. This tallies with the known benefit of FEES for patients who fatigue easily [59], particularly following a prolonged critical illness such as COVID-19. FEES provides an additional benefit over VFSS for tracheostomy management by allowing direct visualisation of the larynx and assessment of secretions [60].

The potential causes of dysphagia in COVID-19 patients are multifactorial and demand appropriate skilled diagnostics and management [61]. Despite this complexity, our cohort demonstrate a positive recovery trajectory, similar to other recently reported cohorts [24]. All eleven patients improved with assessment and therapy during their inpatient stay, and none developed respiratory complications due to dysphagia, despite the presence of silent aspiration in 5 patients (45%). This suggests that instrumental assessment had a beneficial impact on their care, since silent aspiration is a risk factor for respiratory illness [62, 63]. The two most severely dysphagic patients were reported to have progressed to a regular diet and thin fluids prior to discharge from their rehabilitation facilities. In the context of post-COVID-19 syndrome [64] this is a small but hopeful indication that supported recovery from dysphagia is an achievable goal, even for patients who experience very severe difficulties.

Limitations

299 This paper reports on our early clinical experiences of dysphagia and COVID-19 in a single, UK based
300 centre. Of the 58 patients who received tracheostomy where SLT were involved in their clinical care,
301 only 11 had an instrumental swallow evaluation. This relates to the rigorous risk assessment process
302 required prior to undertaking VFSS or FEES within the context of COVID-19, and the cautious
303 approach adopted by the multidisciplinary team to mitigate risks associated with AGPs and patient
304 transfer. There were other patients within the initial cohort of 58 who would have benefited from
305 instrumental assessment of their swallowing based on clinical findings and in keeping with the
306 evidence base [45]. However, these patients did not meet the strict urgent and essential selection
307 criteria, and commenced oral intake based on clinical evaluation of swallowing alone. Following
308 discharge from hospital, several of these patients went on to have instrumental assessments as
309 outpatients due to unresolved swallowing symptoms, for example sensation of food sticking,
310 indicating that return to oral intake alone is an insufficient marker of dysphagia recovery. This
311 limitation reflects the real-world clinical challenges experienced by SLT in providing gold standard
312 dysphagia and tracheostomy care in the early stages of the pandemic and highlights the importance
313 of establishing pandemic protocols as soon as possible to allow usual care.

314 This paper reports on clinical experiences and was not designed as a research study, as such we did
315 not complete intra- and inter-rater reliability measures when scoring VFSS and FEES assessments.
316 However, in all cases, instrumental assessments were conducted by two experienced SLTs with
317 greater than 10 years clinical practice in performing and analysing FEES and VF, and who have
318 previously undertaken reliability training.

319 The small sample size limited analysis to description of presentations and patterns and prevented
320 statistical analysis. Therefore, we were unable to analyse associations between factors such as

dysphagia severity and duration of tracheostomy insertion. Despite this, the descriptive data showed that the involvement of SLT in the dysphagia assessment and management of patients was positive.

Conclusions

This paper reports on our experience of managing people recovering from critical illness due to COVID-19. Although the underlying reason for admission and tracheostomy insertion was COVID-19, there was marked variation in cause and type of dysphagia for each patient. This corresponds to the increasing understanding of SARS-CoV-2 as a multifactorial virus, and the need for an individualised approach to each patient in terms of dysphagia management with instrumental assessment a key part of this. Future research would be strengthened by multi-centre collaborations with larger patient samples to provide greater certainty for the clinical implications regarding dysphagia profiles following critical illness with COVID-19.

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