Introduction

Patients who suffer cervical spine injuries are prone to developing dysphagia and increasing risk for aspiration with an attendant morbidity of chemical pneumonitis, pneumonia, sepsis or even death. A diagnosis of dysphagia is generally followed by diet restrictions, a nasogastric tube, or at times, a gastric feeding tube. However, in patients not diagnosed with dysphagia, these precautions may not be in effect thus placing the patient at increased risk of aspiration. Usually secretions may generate volumes of up to 100 mL/day and patients with an undiagnosed problem of the upper gastrointestinal tract may be at significant risk for aspiration-associated morbidity. Upper cervical spine injuries are particularly dangerous in terms of inadequate airway protection. While evaluation of these injuries include detailed computed tomography (CT) or magnetic resonance (MRI) imaging of the cervical spine, it is generally not standard protocol to scan those patients for dysphagia.

Dysphagia can be assessed using methods ranging from an informal, nurse-directed bedside swallowing evaluation to a formal speech pathologist directed assessment. At times, more advanced gastrointestinal evaluations including a video-rhinopharyngeal swallowing study may be performed. However, the determination of the need for this test is generally left to the discretion of the care team and often based on the patient’s level of alertness. There is minimal literature looking at how to assess the risk of aspiration based on the presence of a cervical spine injury and in particular, an upper cervical spine injury. The aim of our study was to analyze available data on upper cervical spine injuries that would ascertain the risk of aspiration in patients with cervical spine injuries other than their level of alertness. These included the presence of pneumonia, cardiac events, the need for intubation, oxygen desaturation, or even death, with the purpose of assessing whether or not an undiagnosed risk of aspiration in these patients exists.

Materials/Methods

A single institution retrospective study was completed at an ACS (American College of Surgeons) verified Level I Trauma Center. The trauma registry from 2014 to 2019 was queried for patients with a cervical spine injury using EDC (830.10-19, 833.7-9, 952.0-2) and ICD-10 (S10-S14) coding resulting in 168 patients. Those with isolated ligamentous injuries, injuries to associated fractures were also excluded. This narrowed our cohort from 168 to 137 patients. Data collected included demographics (age, gender, BMI), comorbidities (diabetes mellitus, hypertension, osteoporosis, cardiovascular disease), and pulmonary complications including pneumonia/OPD, injury details (atlanto-axial vs. sub-axial), and completion of a swallow evaluation. Five surrogate markers that would ascertain the risk of aspiration in patients with cervical spine injuries include oxygen desaturation (<85% at any point), intubation (non-surgical), pneumonia (documented by chest X-ray), cardiac event (infarction or arrhythmia), and death.

We propose that surrogate markers for aspiration include oxygen desaturation, pneumonia, intubation, cardiac abnormalities, and death. Chemical pneumonitis and pneumonia may present with any of these clinical findings. Patients were divided into groups based on whether or not a swallow evaluation was completed. Swallow evaluation included informed bedside bedside swallowing evaluation by nursing, formal swallowing evaluation by a speech language pathologist, or a barium swallow test. If there was no documentation in the EMR of any swallow evaluation, this was recorded as a “no swallow evaluation.”

In the final account, we considered 3 groups as follows: 1. Swallow evaluation performed; confirmed dysphagia 2. Swallow evaluation performed; confirmed no dysphagia 3. Swallow evaluation not documented; dysphagia status unknown

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Conclusion

Aspiration related events, in particular pneumonia, occurred at high frequencies whether or not dysphagia was suspected or detected among patients with cervical spine injuries. Clinicians caring for these patients need to be aware that dysphagia is a common complication following a cervical spine injury. This manuscript, namely oxygen desaturation, the need for intubation, pneumonia, and cardiac events, may help determine whether a patient has dysphagia and is at risk for aspiration; a formal swallowing study would be cost effective and allow more definitive identification of such patients. All patients with cervical spine injuries may be at risk for aspiration related complications and should be considered for bedside or formal swallow evaluation.

References

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Table 1: Penetration-Aspiration Scale. Tostandardize the results of different swallow evaluations, we converted all results to the standard penetration-aspiration scale (PAS) developed in 1996 by Dr. Rosebush and colleagues.

Table 2: Demographics and Clinical Characteristics of Patients Suffering Cervical Spine Injuries. A description of the demographics and clinical outcomes of our patient cohort.

Table 3: Bilateral Frequencies of Aspiration Outcomes by Dysphagia. The free report variables are assessed for each of three dysphagia groups (dysphagia, no dysphagia, and no swallow study).

Table 4: Unadjusted Effects of Dysphagia on Aspiration Outcomes (Excluding Non-Fracture, Ligamentous Injuries). To rule out the dysphagia groups and their correlation to the surrogate variables of aspiration, we conducted multiple adjusted odds ratios (MAR).

Figure 1: Bilateral Frequencies of Aspiration Outcomes by Dysphagia. The free report variables are assessed for each of three dysphagia groups (dysphagia, no dysphagia, and no swallow study).

Figure 2: Bilateral Frequencies of Aspiration Outcomes by Dysphagia. The free report variables are assessed for each of three dysphagia groups (dysphagia, no dysphagia, and no swallow study).