

Author Year Country Research Design Sample Size	Methods	Outcomes
Shem et al. 2012 USA Prospective Cohort N=40	<p>Population: Mean age: 41.0 yr; Gender: males=31, females=9; Injury etiology: Motor vehicle accident=9, Fall=7, Gunshot wound=3, Diving=6, Bicycle accident=4, Motorcycle accident=2, Other=9; Level of injury: C4 or higher=29, C3 or lower=11; Level of severity: Not reported; Mean time since injury: 14.3 days.</p> <p>Intervention: Presence of dysphagia was determined in patients using a Bedside Swallowing Examination (BSE), and a Videofluoroscopy Swallow Study (VFSS).</p> <p>Outcome Measures: Dysphagia incidence.</p>	<ol style="list-style-type: none"> 16/40 patients were diagnosed with dysphagia by the BSE. While VFSS found 12 cases of dysphagia and four cases of aspiration.
Shem et al. 2012b USA Prospective Cohort N=39	<p>Population: Mean age: 41.6 yr; Gender: males=30, females=9; Injury etiology: Motor vehicle accident=9, Fall=7, Gunshot wound=3, Diving=6, Bicycle accident=4, Motorcycle accident=2, Other=8; Level of injury: C4 or higher=28, C3 or lower=11; Level of severity: Not reported; Mean time since injury: 14.1 days.</p> <p>Intervention: Presence of dysphagia was determined in patients using a Bedside Swallowing Examination (BSE), and a Videofluoroscopy Swallow Study (VFSS). Sensitivity and specificity of the BSE was determined in reference to the VFSS.</p> <p>Outcome Measures: Dysphagia incidence, sensitivity, specificity, positive predictive value, negative predictive value of the BSE in reference to VFSS.</p>	<ol style="list-style-type: none"> 15 participants were diagnosed with dysphagia based on the BSE. 11 participants were diagnosed with dysphagia, and four participants with aspiration, based on the VFSS. Of the 26 participants who underwent both BSE and VFSS, a dysphagia diagnosis was different in only one case. When comparing the BSE to the VFSS, the BSE's sensitivity was 100% (95% CI: 71.5% to 100%), specificity was 93.3% (95% CI: 68.1% to 99.8%), positive predictive value was 91.7% (95% CI: 61.5% to 99.8%), and the negative predictive value was 100% (95% CI: 76.8% to 100%). For diet recommendations, when comparing the BSE to the VFSS, the BSE's sensitivity was 76.9% (95% CI: 46.2% to 95%), specificity was 84.6% (95% CI: 54.6% to 98.1%), positive predictive value was 83.3% (95% CI: 51.6% to 97.9%), and the negative predictive value was 78.6% (95% CI: 49.2% to 95.3%).
Shem et al. 2011 USA Prospective Cohort N=29	<p>Population: Mean age: 41.0 yr; Gender: males=22, females=7; Injury etiology: Motor vehicle accident=5, Fall=7, Gunshot wound=3, Diving=3, Bicycle accident=3, Motorcycle accident=3, Other=5; Level of injury: C1=1, C2=3, C3=7, C4=10, C5=4, C6=2, C7=2; Level of severity: Not reported; Mean time since injury: 12.9 days.</p> <p>Intervention: Presence of dysphagia was determined in patients using a Bedside Swallowing Examination (BSE), and a Videofluoroscopy Swallow Study (VFSS).</p> <p>Outcome Measures: Dysphagia incidence.</p>	<ol style="list-style-type: none"> 12/29 patients were diagnosed with dysphagia by BSE, and 9/29 with VFSS. VFSS also showed that 4/29 patients had aspiration.
Seidl et al. 2010 Germany Retrospective Cohort N=175	<p>Population: Mean age: 43.5 yr; Gender: males=144, females=31; Injury etiology: Fracture 1 vertebral body=73, Fracture 2 vertebral bodies=47, Fracture >2 vertebral bodies=16, Spondylodiscitis=15, Contusio spinalis=10, Tumour=5, Spinal stenosis=4,</p>	<ol style="list-style-type: none"> Swallowing disorders were identified in 28/175 patients. Swallowing disorders were most common in patients with the highest grade of sensorimotor deficit, however this was not significant ($p>0.05$).

	<p>Nuclear pulposus prolaps=3, Knife wound=1, Postoperative=1; Level of injury: C0=1, C1=1, C2=4, C3=14, C4=58, C5=53, C6=33, C7=6, C8=5; Level of severity: Frankel A=103, Frankel B=19, Frankel C=21, Frankel D=24, Frankel E=8; Time since injury: Participants were recruited within 8 wk of their injury.</p> <p>Intervention: Swallowing ability was examined with a clinical bedside bolus-swallowing test by a speech therapist, and an endoscopic-swallowing test.</p> <p>Outcome Measures: Dysphagia incidence.</p>	
<p>Kirshblum et al. 1999 USA Case Control N=187</p>	<p>Population: Mean age: 44.3 yr; Gender: males=156, females=31; Injury etiology: Fall=64, Motor vehicle accident=65, Gunshot wound=9, Diving=31, Other=18; Level of injury: C7 and below=15, C6=21, C5=43, C4=63, C3=25, C2 and above=20; Level of severity: AIS A=71, AIS B=5, AIS C=59, AIS D=48, AIS E=4; Median time since injury: 30 days (range: 5-264 days).</p> <p>Intervention: Videofluoroscopic Swallowing Study (VFSS) to confirm the presence of dysphagia.</p> <p>Outcome Measures: Dysphagia incidence.</p>	<ol style="list-style-type: none"> 1. VFSS confirmed the presence of dysphagia in 31 patients.
<p>Chaw et al. 2012 USA Observational N=68</p>	<p>Population: Mean age: 43.0 yr; Gender: males=57, females=11; Injury etiology: Motor vehicle accident=18, Fall=13, Diving=9, Bicycle accident=5, Gunshot wound=5, Motor cycle accident=4, Medical=4, Myelopathy=4, Trauma=4, Other=2; Level of injury: C1=2, C2=6, C3=14, C4=6, C4 (incomplete)=21, C5 (incomplete)=10, C6 (incomplete)=4, C7 (incomplete)=3, C8 (incomplete)=2; Level of severity: Complete=28, Incomplete=40; Mean time since injury: 31.8 days.</p> <p>Intervention: Bedside Swallowing Examination (BSE), which was followed by Videofluoroscopy Swallow Study (VFSS) within 72 hr.</p> <p>Outcome Measures: Dysphagia incidence.</p>	<ol style="list-style-type: none"> 1. BSE results found 21 cases of dysphagia. Of these 21, 14 were diagnosed with dysphagia via VFSS.
<p>Abel, Ruf & Spahn 2004 Germany Observational N=73</p>	<p>Population: Mean age: 42.9 yr; Gender: males=51, females=22; Injury etiology: Trauma=56, Spondylitis=5, Tumour=3, Other=9; Level of injury range: C1-C7; Level of severity: AIS A (complete)=41, incomplete=32; Mean time since injury: Not reported.</p> <p>Intervention: Patients with cervical SCI admitted to an initial care facility between January 1997 to December 2000. Prevalence of pneumonia via x-rays, and dysphagia via methylene blue test and videofluoroscopic swallowing, were determined at intake and discharge. Changes in dysphagia status were observed after tracheostomies, surgery to the cervical spine and dietary restrictions.</p> <p>Outcome Measures: Dysphagia and pneumonia incidence.</p>	<ol style="list-style-type: none"> 1. 26 cases of dysphagia were confirmed: three cases of severe impairment of deglutition, eight cases of moderate impairment, and 15 of minimal impairment. 2. 24 patients had only one episode of pneumonia, 11 patients experienced early and multiple episodes of late pneumonia. 3. Incidence of late or multiple late pneumonia was significantly higher for patients with dysphagia (p<0.01).
<p>Wolf & Meiners 2003 Germany</p>	<p>Population: Mean age: 43.4 yr; Gender: males=35, females=16; Injury etiology: Not reported; Level of injury: C2=20, C4=19, C5=7,</p>	<ol style="list-style-type: none"> 1. The use of the FEES was able to detect severe dysphagia with major aspiration in 21 patients, mild dysphagia with a leading

<p>Cross-sectional N=51</p>	<p>C6=4, C7=1; Level of severity: AIS A=30, AIS B=13, AIS C=7, AIS D=1, AIS E=0; Time since injury: Less than 3 months. Intervention: Presence of dysphagia was determined by Fiberoptic Endoscopic Examination of Swallowing (FEES) upon admission and was followed-up at intervals of 4 to 6 wk until discharge. Patients were given artificial respiration and supplementary treatments (tracheotomy, nasogastral tube, speech therapy) dependent on their level of dysphagia determined by admission FEES. Outcome Measures: Prevalence and severity of dysphagia by five levels of laryngeal function (level 1-complete dysfunction, level 2-severely impaired, level 3-moderate impairment, level 4-mild dysfunction, level 5-unimpaired function), risk factors for dysphagia.</p>	<p>symptom of either laryngeal edema or mild aspiration with sufficient coughing reflex in 20 patients, and no detectable dysphagia in 10 patients.</p> <ol style="list-style-type: none"> 2. FEES was not only found to be effective in detecting and classifying patients within the levels of dysphagia, it was also found to be useful in evaluating the treatment program with a high number of patients experiencing successful treatment outcomes. 3. Multiple FEES examinations were performed with a range of one to nine examinations conducted per patient.
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