**INTRODUCTION**

Fluoroscopic swallowing studies of the upper aerodigestive tract are an invaluable method of assessing form and function of the oral cavity, oropharynx, hypopharynx and pharyngoesophageal segment. Some regions however, are more difficult to assess.

We define the posterior cricoid (PC) region as the area immediately adjacent to the posterior rim of the cricoid cartilage on the anterior surface of the esophageal arch (Figure 1). The posterior cricoid (PC) region is somewhat challenging to evaluate on fluoroscopy due to rapid transit of contrast, its short length, tonic sphincteric closure, and difficulty in correlating fluoroscopic findings with endoscopic anatomy. Modern techniques now give us better definition, clarity and the ability to analyze digital images frame by frame.

In our Institution more than 400 fluoroscopic swallowing evaluations are performed each year. These are reviewed in detail by experienced clinicians, objectively analyzed and then further reviewed by a multidisciplinary dysphagia panel. We noted the recurring presence of posterior cricoid region irregularities and sought to clarify and categorize these findings.

**METHODS AND MATERIALS**

Permission to conduct this study was obtained by the Institutional Review Board of the University of California, Davis. The findings of all fluoroscopic swallow studies performed at the Center for Voice and Swallowing of the University of California, Davis between 08/01/08 and 09/01/08 were queried from a clinical database for evidence of posterior cricoid (PC) abnormalities. Patient demographics, diagnoses, symptoms, and past medical history were abstracted. All studies that were identified were re-reviewed and analyzed on digital media.

A radiopaque ring of known diameter is positioned on the mid-chin of each patient undergoing dynamic swallow study so that actual displacements can be calculated later. The fluoroscopy studies, recorded on DVD’s, were played back using WinDVD7 (Intervideo, Corel Corp., Ottawa, Canada) for measurement. The fluoroscopy studies, recorded on DVD’s, were played back using WinDVD7 (Intervideo, Corel Corp., Ottawa, Canada) for measurement.

**RESULTS**

There were forty-four eligible studies. The mean age of the cohort was 57 (+/- 13) years. 54% percent was female. Analysis of the PC region demonstrated three classifications of findings.

**Webs**

Pharyngoesophageal webs were seen in 45% (20/44) of the cohort. The webs were located on the anterior wall of the esophageal inlet dorsal to the cricoid arch. Webs were thin and immobile, typically located at the level of the 5th cervical vertebrae. There were eight CP bars seen in conjunction with the webs (40%).

**Jags**

Posterior cricoid jags were seen in 56.8% (25/44) of the cohort. The jags were located on the posterior surface of the cricoid arch. Jags were mobile hyperbolic protrusions that initiated at the inferior border of 5th cervical vertebrae and elevated to the level of C4 with the swallow. Cricopharyngeal bars were seen in conjunction with the jag in 36%.

**Impressions**

Posterior cricoid impressions were seen in 4.5% of the cohort (2/44). The PC impressions were located at the posterior rim of the cricoid and appear to represent an outline of the posterior arch of the cricoid cartilage. There were no CP bars seen in conjunction with the PC impressions.

Opening of the pharyngoesophageal segment was reduced in 45% of patients with web but in no patients with a PC jag.

**DISCUSSION**

In 1965 Pitman and Fraser described an impression of the barium stream in the posterior cricoid region in 104 barium studies. Pitman felt that it represented a submucosal venous plexus. They felt that the venous plexus was ubiquitous and described it as a normal finding not to be mistaken for a web or neoplasm. With more than 400 fluoroscopic studies performed each year in our Institution, the recurrent observation of posterior cricoid abnormalities prompted our evaluation and description. With the advantage of modern fluoroscopic imaging we feel that we can distinguish three distinct groups based on characteristics of the posterior cricoid region abnormalities. Forty-five percent of the posterior cricoid abnormalities identified in our cohort was classified as a web. We feel that a web is a thin eccentric ring of normal esophageal mucosa and submucosa. Webs may be symptomatic or asymptomatic. Forty percent of patients with webs in our cohort demonstrated reduced opening of the pharyngoesophageal segment. Two other groups with distinct findings were observed. The posterior cricoid impression was identified in 7% of our cohort. We feel that the PC impression represents an outline of the posterior surface of the cartilaginous cricoid arch. It is not mobile, nor does it change shape. We have termed the final category of PC irregularity the posterior cricoid jag. The jag was identified in 57% of our cohort of PC irregularities. The indentation in the barium stream caused by the jag is more broad-based than a web but not as broad as a cricoid impression. The observation that it elevates with the swallow suggests attachment to the hyolaryngeal complex, and its common association with a cricopharyngeal bar in dysphagic patients suggests mucosal hypertrophy or hyperfunction may play a role in its evolution.

**CONCLUSIONS**

Posterior cricoid region irregularities on fluoroscopic swallow studies can be classified as pharyngoesophageal webs, posterior cricoid jags, and posterior cricoid impressions. These findings likely represent a variant of normal although further study is necessary to fully associate symptoms with fluoroscopic findings.

**REFERENCES**