Subglottic Stenosis: An Evaluation of an Elderly Treatment-Seeking Population

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INTRODUCTION

Adult subglottic stenosis (SGS) is a rare, progressive condition characterized by inflammation, fibrosis, and narrowing of the subglottis and proximal trachea. Etiologies for SGS include trauma, intubation-related SGS (irSGS), idiopathic SGS (iSGS), and granulomatosis with polyangiitis (GPA). SGS is a challenging problem for the otolaryngologist, as a definitive understanding of the pathophysiology and optimal treatment continues to elude us. Despite the number of studies published on adult SGS, no consensus exists regarding risk factors, prevention, or management.1–4

Patients present with progressive dyspnea, cough, dysphonia, stridor, and globus,2 and interventions are directed at relieving airway obstruction and symptoms. Approaches to treatment include medical management such as antireflux medications, systemic or inhaled steroids, and antibiotics,5 as well as endoscopic or open surgical techniques.1–4 Topical mitomycin C2 and intralesional steroid injection6 have shown promise in reducing the interval between interventions. Unfortunately, recurrence after surgical intervention for SGS is common.

There is a great deal of published literature on the diagnosis, risk factors, and treatment outcomes for SGS, but to our knowledge, no study has specifically looked at the elderly population. Not surprisingly, multiple changes occur to the respiratory system with aging, including calcification of costal cartilages with reduced compliance of the chest wall, reduction in static elastic recoil of the lungs promoting air trapping, and a general decline in respiratory muscle strength.2 A 1999 study by Wolff et al.7 reported that 82% of Medicare beneficiaries aged ≥65 years had one chronic condition, whereas 24% had four or more chronic conditions. The proportion was 31% among those individuals ≥85 years of age. One would predict elderly patients would not tolerate SGS as well as younger patients. We hypothesized that patients aged ≥65 years would have a greater number of medical comorbidities, be more symptomatic, and require more frequent surgical intervention.

MATERIALS AND METHODS

Institutional review board approval was obtained at the University of Texas Health Science Center at San Antonio. A retrospective chart review was performed of all adult patients aged 18 years and older with a diagnosis of SGS treated between January 2008 and December 2016. Electronic medical records were reviewed, and the following data were extracted: age, gender, follow-up duration, subjective complaints, etiology of SGS, comorbidities, Voice Handicap Index-10 (VHI-10) scores, and...
RESULTS

Forty-eight patients met the inclusion criteria. In the aged ≤65 years group, 41 patients were identified (33 female, eight male), with a median age of 45 years (range = 20–61 years), and seven (six female and one male) aged ≥65 years were identified, with a median age of 67 years (range = 65–74 years). Comparing the aged <65 years group to the aged ≥65 years group, the etiology was iSGS in 50.0% versus 42.8%, irSGS in 22.5% versus 28.6%, and GPA in 27.5% versus 28.6%, respectively (P = .99) (Table I). Overall, women represented 81.2% of the study population, and iSGS (48.9%) was their most common etiology. The majority of patients with iSGS and GPA were women, 90.0% and 69.2%, respectively.

Dyspnea (92%) was the most common symptom, whereas dysphonia (77%) was the second most common. The median preoperative VHI-10 was 20 (range = 0–31) for the aged ≥65 years group and 8 (range = 0–40) for the aged <65 years group (P = .95) (Table I). The ΔVHI-10 and DI was not significant between the groups (P = .45 and P = .28, respectively) (Table I).

There was no statistically significant difference found when comparing the two groups for comorbid conditions (Table I). The median number of comorbidities was two for both groups. Gastroesophageal reflux disease was noted in 63.4% of patients aged <65 years and in 42.9% of patients ≥65 years and older (P = .41) (Table I). Pulmonary disease and CVD were each more frequently found in the aged ≥65 years group (42.9% and 42.9%, respectively) than in the aged <65 years group (24.4% and 19.5%, respectively), but these findings were not statistically significant (P = .37, P = .33) (Table I). A history of autoimmune disease was seen in 43.9% of patients aged <65 years and in 57.1% of patients aged ≥65 years (P = .69). No patients in the aged ≥65 years group had DM (Table I).

The location and length of stenosis (LOS) was not documented in the operative report for all patients. The median LOS was 10 mm in each group (aged <65 years, range = 2.5–25 mm; aged ≥65 years, range = 10–15 mm). The median location of the stenosis was 12 mm below the vocal folds. Data for length and location of stenosis was not recorded for three patients.

All patients were treated with endoscopic techniques by the senior author. Surgical intervention was performed under general anesthesia with jet ventilation when feasible. The larynx was exposed using a rigid laryngoscope, and examination of the larynx and trachea were performed with a 0° Hopkins rod telescope documenting the location and length of the stenosis. Treatment included: 1) radial incision of the stenosis with a CO2 laser or CO2 laser radial incisions, 4.9% with balloon dilation alone and 4.9% with CO2 laser alone. Mitomycin C was used in 64.6% of patients, steroids in 20.8%, and neither in 14.6% patients. No statistically significant difference was seen when comparing the two age groups with regard to use of mitomycin C and steroids (Table I). No clinically significant perioperative complications were noted. All patients aged ≥65 years and 90.2% of those aged <65 years required more than one surgery (Table I). There were two patients in the aged <65 years group and none in the aged ≥65 years group that went on to have a laryngotracheal reconstruction. Twelve patients (29.3%) in the aged <65 years group and one (14.3%) patient in the aged ≥65 years group were transitioned to in-office steroid injections and did not require further surgical intervention during the study period. ITI tended toward older patients requiring surgery more frequently but was not statistically significant between the groups. Patients aged <65 years had a median of 462 days (range = 186–1,929 days) to their next surgery, whereas patients aged ≥65 years had a median of 343 days (range = 79–1,480 days). The median follow-up for the aged <65 years group (1,614 days; range = 11–3,095 days) was over twice (715 days; range = 115–2,472 days) that of the aged ≥65 group (Table I). An 80-year-old female GPA patient died of multiple-organ failure during the study period.

DISCUSSION

Within the present study we analyzed demographics, symptoms, comorbidities, and operative findings in...
patients with SGS with respect to patient age at the time of endoscopic surgical treatment. Nearly half (48.9%) of our study population had iSGS, 23.4% had irSGS, and the remaining had GPA. There is wide variation in the literature\(^4,9,10\) regarding the predominant etiologies in SGS, and it is unclear if our study group is a true reflection of the population. Women represented 90.0% of patients with iSGS in our study group, which is consistent with previous reports.\(^4,5,9\) The female predominance in iSGS has long been thought to contribute to its pathophysiology, though there have been challenges in illuminating this relationship.\(^11\) Fiz et al.\(^12\) recently reported an imbalance of hormone receptors in the larynx, which may further help to elucidate the pathophysiology of iSGS.

We hypothesized the aged ≥ 65 years group would have a greater number of comorbidities and be more symptomatic, but the data did not support this. The overwhelming majority of patients (92%) in our study reported dyspnea, which is consistent with the clinical presentation of SGS. The lack of significant difference in the VHI-10, DI, \(\Delta\)VHI, \(\Delta\)DI, and presence of pulmonary disease between the age groups was unexpected, given the known physiologic and structural changes that occur with aging in both the larynx (e.g., vocal fold atrophy, loss of pliability) and lower respiratory system.\(^7\) There were 29 patients (70.7%) for whom scores for VHI-10 and DI were not available, which may have contributed to the lack of significant differences between the two groups. GERD has been suggested to contribute to the pathophysiology of SGS. Reports of its coexistence in patients with SGS range from 45% to 69%,\(^9,10,13\) and our results (60.4%) are consistent with this. However, for the purpose of this study, the presence of GERD was assumed if patients were listed in the electronic medical record as taking an antireflux medication. Testing for GERD was not routinely performed, so we do not truly know who had GERD.

Both groups had a median number of two comorbidities, with a range from 1 to 7 in the aged <65 years group.
and a range from 1 to 6 in the aged ≥65 years group. Reports of the number of comorbidities in SGS are scarce, so it is difficult to assess this finding. For our study, patients with GPA were counted as having rheumatologic disease, which may have falsely elevated the counts for comparison of comorbidities. This was corrected for, and still no difference (median = 1) in the number of comorbidities was found between the groups. It is plausible that as an academic tertiary care center, we are caring for patients felt to be too ill to be cared for by community otolaryngologists, and as such our patient population tends to be unhealthier regardless of age.

Operative intervention in SGS is directed at reducing airway obstruction and relieving symptoms. No widely accepted treatment algorithm exists for SGS, and as a result, wide variations in treatment and outcomes have been reported. A 2014 study by Hseu et al.⁴ evaluated 92 adult patients with all etiologies of SGS treated endoscopically (CO₂ laser, dilation, steroids, and mitomycin C in select cases), and found that 55% of patients required more than one procedure with an average interval between surgeries of 13.7 months (median follow-up was 2.4 years). The median ITI of 462 days (15.2 months) and median follow-up of 1,470 days (48.3 months) for our study group was consistent with Hseu et al.’s findings. Nearly all of our patients required more than one endoscopic procedure, which is consistent with the findings by Aarnæs et al.⁴ They also report that age has a significant influence on the time between procedures, with the ITI increasing with age (1 year for ages 20–48 years, 1.3 years for ages 49–61 years, and 3.0 years for ages 62–85 years), and submit that higher health expectations among younger Norwegians might explain the finding. We observed the opposite phenomenon in our study with patients ≥65 years having a shorter ITI (P = .23).

We have identified several limitations to this study. The total number of subjects is limited, and some comparisons will be underpowered. Patients with GPA are followed by rheumatology, and may be lost to follow-up once commencing systemic therapies. In the early part of the study period, VHI-10 and DI scores were inconsistently recorded in the medical record, which led to the exclusion of a large number of patients from these analyses. Although the senior author routinely prescribes a systemic steroid taper and antireflux medications postoperatively, the adherence to this regimen is not documented in the electronic medical record, and we could not account for any effects these medications may have had on recurrence of symptoms. Finally, it should be noted that during the study period, the senior author began performing in-office steroid injections on appropriately selected patients, many of whom have not required subsequent operative treatment. This transition in may have altered the study findings.

CONCLUSION
SGS continues to be a perplexing disease for the otolaryngologist due to the incomplete understanding of its pathophysiology and the lack of standardized treatment algorithms. We sought to analyze an older patient population with SGS and found no statistically significant differences compared to a younger population. However, there may be differences not elucidated in this small study, and further study of the elderly SGS population is warranted.

BIBLIOGRAPHY