MERVYN MAZE, M.B., CH.B.
Department of Anesthesia
Stanford University School of Medicine
Stanford, California 94305

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Another Cause of Upper Airway Obstruction

To the Editor:—Laryngeal or pharyngeal edema following tracheal intubation, although clinically not frequent, is a serious complication. The following report describes episodic airway obstruction caused by edematous lingual follicles that was successfully diagnosed by fiberoptic laryngoscopy.

A 44-yr-old, 45-kg man underwent emergency irrigation and external fixation of multiple open fractures of the legs. Concomitant hemorrhagic shock was successfully treated with 8,500 ml crystalloid solution, 1,000 ml 6% dextran solution (dextran-70), and two units of red blood cells.

Ten days later, advanced repair of the legs was performed. Anesthesia was induced with thiopental and isoflurane in oxygen. The trachea was easily intubated at the first attempt under neuromuscular blockade with vecuronium. Anesthesia was maintained with isoflurane in a nitrous oxide/oxygen mixture. Surgery lasted for 10 h. Fluid infusion therapy consisted of 6,500 ml crystalloid solution, 500 ml dextran-70, and a unit of red blood cells. Emergence from anesthesia was uneventful, and the trachea was extubated after the successful reversal of the residual neuromuscular blockade. Approximately 5 min after extubation, marked inspiratory stridor lasting for several respiratory cycles occurred and was abruptly alleviated with the patient vocalizing and complaining of dyspnea. Similar episodes occurred repeatedly at intervals of 5–10 min, with breath sounds almost normal during the intervening periods.

Because the episodic airway obstruction persisted in the intensive care unit, fiberoptic laryngoscopy was performed. Although no abnormalities were noted in the rest of the upper airway, the lingual follicles were extremely edematous and compressed the epiglottis against the posterior pharyngeal wall (fig. 1). The trachea was intubated using a fiberoptic bronchoscope as a stylet. Methylprednisolone 125 mg was administered intravenously, and the edema subsided 20 h postoperatively without any evidence of traumatic injury to the site. The trachea was successfully extubated, and the remaining hospital course was uneventful.

To our knowledge this is the first report of airway obstruction by edematous lingual follicles. The cause of the edema in this case remains obscure. Although the most likely causes of laryngeal or pharyngeal edema are mechanical injury or infection, these seem unlikely in this case. The tracheal intubation was performed easily without any forceful maneuvers and with the use of a carefully sterilized laryngoscope. An oropharyngeal airway was not used. The endotracheal tube, which may have exerted continuous pressure on the epiglottis and the lingual follicles, is also unlikely to be the major cause considering the normal-appearing epiglottis. Had any of these factors been responsible, other pharyngeal and laryngeal structures would probably also have been involved.

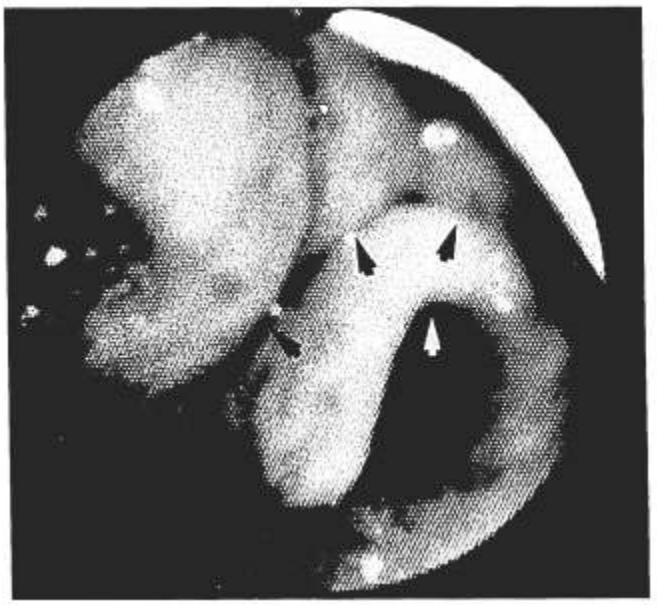

FIG. 1. The bubblelike edematous lingual follicles (black arrows) compressing the epiglottis (white arrow). The other structures in the upper airway remained almost intact.

Although no abnormalities were noted in the palatine tonsils, some intrinsic hypersensitivity of the tonsillar system, triggered by the minimal mechanical stimulation of the laryngoscope, may have participated in the edema formation. This may have been exacerbated by massive crystalloid infusion therapy.

Fortunately, in this case, we were able to observe the upper airway with a fiberoptic bronchoscope. Direct laryngoscopy is recommended in most cases of postextubation edema, which usually require prompt intervention. However, direct laryngoscopy may fail to reveal the

edematous lingual follicles, most of which are hidden behind the blade of the laryngoscope. Furthermore, mechanical stimulation by the blade can exacerbate the edema formation. Our findings in this case demonstrate the necessity for fiberoptic laryngoscopy if time allows, when no abnormalities are noted by direct laryngoscopy.

TETSUO HATANAKA, M.D.
Chief Anesthesiologist
Department of Anesthesia
Kohoku General Hospital
Shiga, Japan
Research Fellow

Department of Anesthesiology
Kyoto Prefectural University of Medicine
Kyoto, Japan

TAKU YAMASHITA, M.D.
Staff of Orthopedics
Department of Orthopedics
Kohoku General Hospital
Shiga, Japan

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The First Anesthetic Mixture

To the Editor:—Historians[1–4] quote John Gabb as the inventor of the first anesthetic mixture. Indeed, in May, 1848, Gabb[5] suggested mixing one part chloroform with two parts ether to provide a rapid, pleasant, and safe anesthesia. There is no evidence that he actually tried this mixture, but other practitioners did so shortly thereafter.[6] Gabb's idea was condemned by Jones[7] one week after its publication and by Snow[6] in 1849; both critics pointed out that the components' different volatilities would produce an unpleasant and dangerous anesthesia.

In fact, a Viennese dentist and surgical anesthetist preceded Gabb by several months. In December, 1847 or early January, 1848, Weiger[8,9] prepared a 1:4 chloroform–ether mixture* and on January 15, 1848 reported several hundred anesthesias, stating

> I mixed both drugs to combine the good properties of chloroform with those of ether . . . reaching the exact proportions after experiments on myself, my assistants, and technicians. . . . The induction is pleasant, without the sickening-sweet taste of chloroform nor the penetrating smell of ether. . . . Anesthesia is reached in 1 . . . 2½ minutes. . . . It gives such analgesia that the patient experiences no pain from the surgical stimuli even after return of his vision. . . . He wakes up cheerful . . . from pleasant dreams . . . and with full muscular strength. . . . The anesthetic's smell on his breath is slight and very transient. . . . I have used my mixture on several hundred patients . . . of all ages and conditions . . . and am convinced that we now have an anesthetic fulfilling all our wishes. . . . I recommend it to produce a rapid and safe anesthesia, free of sequelae, in all patients.[8,9]

Thus, Weiger, not Gabb, introduced "polypharmacy"[1] to anesthesia.

A German surgeon[10] reported using Weiger's compound in June, 1848. The famous "Vienna anesthetic" of the early 1850s may have derived from Weiger's mixture, although its origin is obscure[11] and its composition uncertain: some authors[12,13] describe it as one part chloroform and three parts ether; others[2,11,14,15] as one part chloroform and six or eight parts ether. A preparation with Weiger's proportions (1:4 chloroform–ether) is mentioned in the German literature[13,16] as "Lienhard's mixture." Buxton may have meant the same compound when he (mistakenly?) listed a "Linhart's mixture," of 1:4 alcohol–chloroform content, in his textbook.[12]

The Vienna anesthetic and, after 1872, Billroth's mixture (3:1:1 ether–chloroform–alcohol) were extensively used throughout the Habsburg empire and German speaking countries until World War I.[2,14] They were believed to be safer than chloroform because their ether and alcohol content diluted chloroform or offset its myocardial depression.

In Great Britain, except for Kidd's Vienna mixture[11] and the practitioners mentioned by Snow[6] in 1849, the mixtures were ignored until 1860, possibly because of Snow's vigorous condemnation.[6,17] Keys[18] and Clark[19] are mistaken in associating Thomas Nunneley with the alcohol–chloroform–ether (ACE) mixture in 1849; Nunneley at the time was experimenting with chloric ether, an alcoholic solution of chloroform.[20] Curiously, despite his opposition to mixtures, Snow, like J. C. Warren in Boston, preferred a 1:1 or 1:2 chloroform–alcohol preparation when he used a sponge or handkerchief rather than his inhaler.[6,17]

The concern over the many chloroform accidents and, possibly, Snow's death in 1858 led to a resurgence of the mixtures in Great Britain around 1860. The then three most popular mixtures were the 1:2 and 1:4 chloroform–ether solutions and George Harley's ACE mixture (1:2:3 alcohol–chloroform–ether). The Chloroform Committee of the Royal Medical and Chirurgical Society,[21] set up in 1864 to study the chloroform deaths, found the 1:2 and, especially, the ACE mixtures satisfactory and possibly safer than chloroform. The Committee, however, acknowledged the problem of the different volatilities of the liquid components, and some of its members gave up the mixtures—*e.g.* Kidd,[11] who adopted the chloroform–ether sequence, and Ellis,[15] the inventor of the first obstetric self-inhaler, in which chloroform and ether (mixed with alcohol) were separately vaporized to produce variable gaseous mixtures.

The mixtures, especially Harley's ACE and Hewitt's 3:2 ether–chloroform preparations, became popular in Great Britain, where they persisted until the late 1930s. They were used and recommended by such authorities as Buxton, Hewitt, Gardner, Bloomfield, Probyn-Williams, Minnitt, and Gillies.[3,22] They represented 6.2% of the 25,920 recorded anesthetics given in the United Kingdom in 1891.[23] The British Army extensively used ACE during World War I.[13,24,25]

Harley's ACE and Hewitt's mixtures were equally popular in the United States from the early 1860s until World War I, both in military[24,26] and civilian[1,18] practices. ACE was commonly used at the Mayo Clinic in the 1880s and 1890s, and the first anesthetic given by Charles H. Mayo (at the age of 12) was indeed ACE.[1,18] Both chloroform

* All proportions in this article are given in weight; di-ethyl-ether is abbreviated to ether.