

Laryngospasm

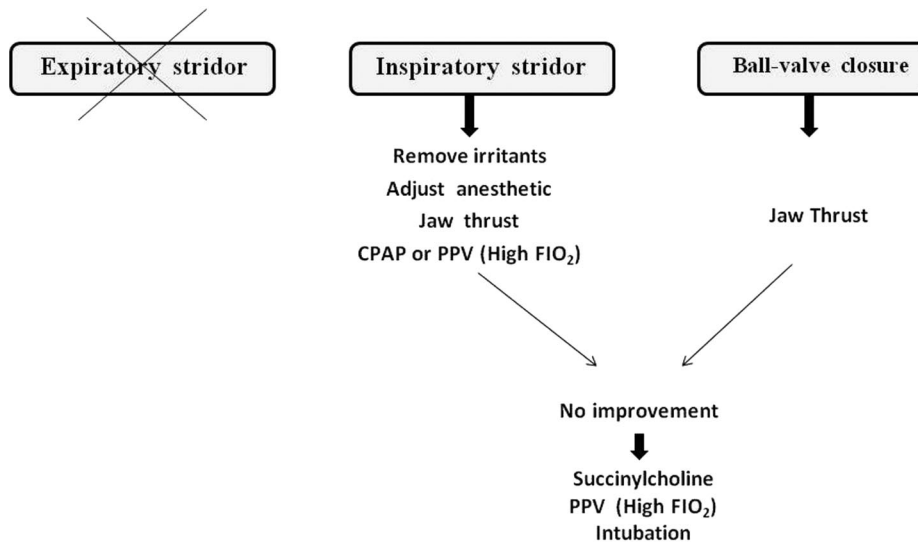


Fig. 1. Algorithm for management of laryngospasm. Ball-valve obstruction is diagnosed by cessation of gas entry in spite of active inspiratory efforts. Succinylcholine is administered intravenously, but can be administered intramuscularly in case an intravenous access is not available. CPAP = continuous positive airway pressure; F_{IO_2} = fraction of inspired oxygen; PPV = positive pressure ventilation.

ever, it is frequently necessary, as in the case presented by Orliaguet *et al.*, to administer succinylcholine to relieve this type of severe obstruction.

It is interesting that the expiratory stridor, which was common in the days of ether anesthesia and was regarded as “a vocal protest by the patient against inadequate anesthesia,” has virtually disappeared in modern anesthesia practice. In our recent quality-improvement study of laryngospasm, expiratory stridor did not occur in any patient. This is probably related to the use of sevoflurane yielding faster induction because of its low blood/gas partition coefficient.

We propose a simple algorithm (fig. 1) for the management of laryngospasm, which can be easily remembered and utilized by clinicians. Based on the mechanics of laryngospasm, this algorithm addresses both inspiratory stridor and ball-valve obstruction, but ignores the expiratory stridor because it is no longer observed in modern anesthesia practice. Positive pressure, which is effective in the management of inspiratory stridor, is avoided in ball-valve obstruction because it can worsen the obstruction. If a jaw thrust fails to correct ball-valve obstruction, succinylcholine is administered, followed by positive pressure ventilation and tracheal intubation.

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References

1. Orliaguet GA, Gall O, Savoldelli GL, Couloigner V: Case scenario: Perioperative management of laryngospasm in children. *ANESTHESIOLOGY* 2012; 116:458-71

2. Salem MR, Ovassapian A: Difficult mask ventilation: What needs improvement? *Anesth Analg* 2009; 109:1720-2
3. Fink BR: The etiology and treatment of laryngeal spasm. *ANESTHESIOLOGY* 1956; 17:569-77
4. Roy WL, Lerman J: Laryngospasm in paediatric anaesthesia. *Can J Anaesth* 1988; 35:93-8
5. Isono S: One hand, two hands, or no hands for maximizing airway maneuvers? *ANESTHESIOLOGY* 2008; 109:576-7

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Ebenezer Hopkins Frost

To the Editor:

Ebenezer (Eben) Hopkins Frost (1824–1866) was the first patient to receive ether from William T. G. Morton (1819–1868) in the evening of September 30, 1846, in Morton’s dental rooms at 19 Tremont Row, Boston, Massachusetts. While researching the earliest known photographs of anesthesia,¹ the author found that there was little information, some of it contradictory, on Frost. There were no publications on Frost, although there was significantly more information available on Edward Gilbert Abbott (1825–1855), who received ether from Morton on October 16, 1846, at Massachusetts General Hospital, Boston, Massachusetts.²

This biography of Frost will review the recorded information on Frost, and correct some of the errors in the details of his life and career. Frost’s encounters with Morton are also described.

Frost's Family Details

The anesthesia literature was searched for the year of Frost's birth and the year of his death. One publication recorded the years as 1824–1866.³ An Internet search revealed several Eben Frosts. Felicia Reilly, M.A.L.S., archivist at the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois, eventually located information regarding Ebenezer Hopkins Frost (personal communication: e-mail, January 30, 2010).^{4†} Frost was the second of four children of Solomon Frost (1797–1843) and Dorcas Hopkins (1795–1865). He was born on December 7, 1824, in Groton, Middlesex, Massachusetts, and died on September 7, 1865, in Fitchburg, Massachusetts.^{4†} His wife's surname was Hurd.^{4†} No children were recorded. Frost was educated at Moors School, in District No. 2, Groton, and at the Groton Academy.⁵ Samuel A. Green, M.D., who documented the history of Groton, Massachusetts, also recorded Frost's year of death as 1865.^{6,7} These dates were present in four references,^{4,6,7†} were considered to be reliable, and were used by the author in a publication.¹ However, in 2011, the author received copies of two newspaper reports of Frost's death, which were conclusive evidence of his death on September 7, 1866.^{8,9} According to the newspaper reports, Frost died of a febrile illness.^{8,9}

The name of Frost's wife was also recorded incorrectly, as Hurd.^{4†} Information received from Sukumar Desai, M.D., Assistant Professor of Anesthesiology, Harvard Medical School and Brigham and Women's Hospital, Boston, Massachusetts, was that her name was Frances Heard (personal communication: e-mail, December 22, 2011).

Frost's Occupation

There are a wide range of descriptions of Frost's age and occupation at the time he received ether from Morton. He was described as a "boy,"¹⁰ as "elderly,"¹¹ a "merchant,"¹² a "businessman,"^{11,13,14,15} a "musician,"^{4,16,17} a "music teacher,"^{3,6,7} a "bisquit [*sic*] manufacturer,"¹⁸ and "engaged in cracker-making."¹⁹ The Boston Directory of 1848 listed him as a baker,²⁰ and he was listed in later directories as a music teacher;^{21,22} these contemporary descriptions are more reliable than some of the later descriptions of Frost. According to Green,^{6,7} Frost was "quite noted as a singer and teacher of music, and was a member of the Handel and Haydn Society in Boston." Two newspaper reports of Frost's death referred to him as "Professor Eben H. Frost, the well-known teacher of music."^{8,9}

September 30, 1846: Frost Receives Ether from Morton

Frost presented to Morton's rooms in the evening of September 30, 1846, in great pain and asked if he could be mesmerized for the extraction of a tooth.²³ Morton stated that he had

something better, and administered ether to Frost using a handkerchief. A "firmly-rooted bicuspid tooth" was extracted by Morton. Frost recovered in a minute from the ether, and did not report any awareness of the procedure.

Rice's description of a seemingly benign administration of ether²³ is in contrast to Morton's more dramatic and colorful account to an audience of schoolchildren, and a writer for *Harper's New Monthly Magazine*¹⁹: As it [Frost's tooth] came out the patient turned as white as a sheet of paper, and slid from the chair to the floor. "I never saw a body with breath in it look more like a corpse," is Morton's account. Seconds seemed ages while his patient lay there as in the embrace of death. A fearful dread seized his heart lest he might have sent that soul into eternity. With trembling hands, while the perspiration stood in great drops on his brow, Morton seized his patient by the collar, raised him at arm's length, where he hung for a moment as straight as a fish, when, losing his hold, the patient dropped into the chair with a bound which inflated his lungs, and started the circulation; the color returned to his face, and immediately he shouted "Glory!" He proved to be a good Methodist. "And I wanted to cry 'Glory hallelujah' with him," said Dr. Morton; "there was not a dry thread on me, I had been so thoroughly frightened, supposing he was dead."

Morton was fortunate that the lamp held by Grenville G. Hayden (a dentist who assisted Morton that evening) did not trigger a fire or explosion, and that there was no significant delay in awakening Frost. Morton's medical knowledge was limited: He had initially been unable to convince his students (William Leavitt and Thomas Spear) to inhale ether, and they even failed to find a willing subject at the wharf and at the market.

Frost provided Morton with a statement, dated September 30, 1846, regarding the anesthetic he had received that day.^{23,24} Newspaper reporter Albert G. Tenney and Grenville G. Hayden certified that Frost's statement was true.^{23,24} The author has not been able to determine if the original statement still exists. The following is the text of the statement as recorded in a document submitted in 1853 to a Select Committee appointed by the U.S. Senate²⁴:

Boston, September 30, 1846

This is to certify that I applied to Dr. Morton, at 9 o'clock this evening, suffering under the most violent toothache; that Dr. Morton took out his pocket-handkerchief, saturated it with a preparation of his, from which I breathed for about half a minute, and then was lost in sleep. In an instant more I awoke, and saw my tooth lying upon the floor. I did not experience the slightest pain whatever. I remained twenty minutes in his office afterwards, and felt no unpleasant effects from the operation.

Eben H. Frost, 42 Prince Street, Boston

We witnessed the above operation, and the statement is, in all respects, correct – and, what is more, the man asked where his tooth was, or if it was out.

A. G. Tenney [*sic*], Journal Office
G. G. Hayden, Surgeon Dentist

† Results of a search for "Ebenezer Hopkins Frost" on www.familysearch.org. Accessed January 30, 2010, and December 6, 2011.

Frost's Address

Frost's address in the statement he made for Morton was 42 Prince Street, Boston.^{23,24} This address was later incorrectly recorded as Frost's residential address.^{4,6,7} The Boston Directory of 1848²⁰ listed Eben Frost as a "baker, boards 52 Friend" Street (fig. 1); this address was the home of William Heard, Frost's father-in-law. This directory also listed Eben Stone as a baker at 42 Prince Street, so Frost probably worked for Stone as a baker.²⁰ Eben Frost was not listed in the Boston Directory of 1851.²⁵ The Boston Directory of 1858 listed Eben H. Frost as "teacher of music, 13 Tremont Temple. house 2 Hull st. court" (page 143).²¹ By 1861, Frost was listed as "teacher music, Park street Church" (page 175).²²

October 1, 1846: Postoperative Visit and Newspaper Article

Morton visited Frost on the morning after the administration of ether and "found him perfectly well and enraptured with the novelty and successful result of the experiment."²³ Morton provided further details in 1865¹⁹: He had "called upon his patient, Mr. Frost, and found him whistling merrily, and engaged in cracker-making, which proved to be his business." Frost said, "That's a capital way you've got of pulling out teeth, Doctor. I shall send all my friends to you."¹⁹

A newspaper report of the anesthetic that Frost received was published in the *Boston Daily Journal*, October 1, 1846^{23,26,27}: "We would call the attention of our readers to the advertisement of W. T. G. Morton, Dentist, No. 19 Tremont Row. This gentleman has been very successful in his practice, in this city. Last evening, as we were informed, by a gentleman who witnessed the operation, an ulcerated tooth was extracted from the mouth of an individual, without giving him the slightest pain. He was put into a kind of sleep, by inhaling a preparation, the effects of which lasted for about three quarters of a minute, just long enough to extract the tooth. The gentleman, who detected the principal ingredient of the preparation by the odor, states that the use of it is entirely free from danger."

An article by Moore²⁷ contains an image of the newspaper report. Rice²³ quoted only part of the newspaper report, and

Frost Eben, baker, boards 52 Friend

Heard William, machinist, house 52 Friend

Stone Eben, baker, 42 Prince

BAKERS.

Stone E. 42 Prince

Fig. 1. Excerpts from the Boston Directory of 1848 showing the occupation of Frost, and his residential and work addresses.²⁰

there are a few minor errors in the text quoted by Wolfe.²⁶ The author of the report was not named. Tenney, who had certified that he was present when ether was administered to Frost,^{23,24} testified in 1849 that he had written the newspaper report after Morton had agreed to place an advertisement in the newspaper.²⁶ Morton must have been quite bold, and confident of his technique, to have invited a reporter to witness the event. Yet, just over 2 weeks later, Morton asked Frost to be present at Massachusetts General Hospital, to back up the successful use of ether in his rooms.²⁸ Henry J. Bigelow, M.D. (1818–1890), recently appointed as a visiting surgeon at Massachusetts General Hospital, would have been a more reputable referee, if reports that he witnessed some administrations of ether in Morton's rooms were correct.²⁶

October 16, 1846: Massachusetts General Hospital

Frost was in the amphitheater at Massachusetts General Hospital on October 16, 1846, when Morton administered ether to Abbott. Before administering ether, Morton explained the inhalation to Abbott and sought to reassure him. Morton then pointed to Frost, and informed Abbott that Frost could testify to its success.²

Images of Frost

There are no known portraits or photographs of Frost. His face is not visible in an engraving that depicts the anesthetic he received in Morton's rooms on September 30, 1846 (fig. 2).^{23,26} The depictions of Frost and Morton in a 20th-century oil painting, *The First Use of Ether in Dental Surgery, 1846* (image V0018140, Wellcome Library, London, United Kingdom), by Ernest Board (1877–1934) are probably not accurate.

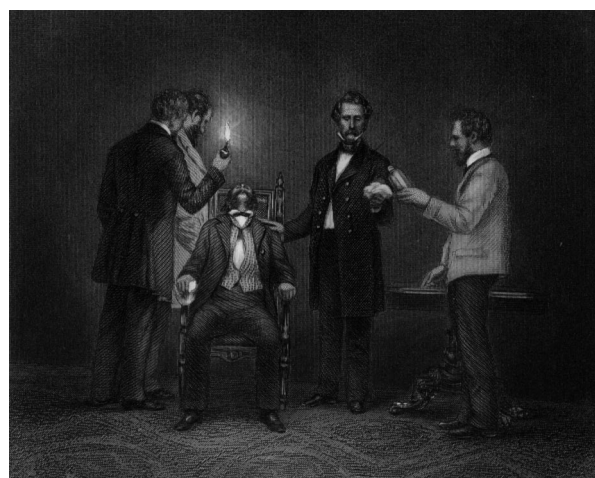


Fig. 2. W.T.G. Morton administering ether to Ebenezer Frost on September 30, 1846. Engraving by G.R. Hall, from Nathan P. Rice's *Trials of a Public Benefactor*.²³

Frost's presence at the first administration of ether at Massachusetts General Hospital on October 16, 1846, was depicted in *The First Operation under Ether*, the iconic painting by Robert C. Hinckley (1853–1941).^{3,11,12,13} Viets, in interpreting the Hinckley painting, described Frost as “short, stout, elderly man, bald and round of face ... this plethoric gentleman.”¹¹ The accuracy of this description of Frost cannot be determined. However, Frost is unlikely to have been an elderly man in 1846; he was 21 yr old when he received ether from Morton.

Conclusion

The information available on Frost has been reviewed, and errors in the description of his occupation, address, and year of death have been discussed. Frost was a baker when he received ether from Morton, and he was later a highly respected musician and music teacher in Boston.

There are three known encounters between Frost and Morton, all in 1846: September 30, October 1, and October 16. Frost's statement regarding his anesthetic was included in a document supporting Morton's attempt to gain recognition and financial reward for the introduction of ether.²⁴ Frost did not make any testimony, or write another statement on anesthesia, and he does not appear to have been involved in Morton's subsequent quest for recognition.

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References

1. Haridas RP: Photographs of early ether anesthesia in Boston: The Daguerreotypes of Albert Southworth and Josiah Hawes. *ANESTHESIOLOGY* 2010; 113:13–26
2. Vandam LD, Abbott JA: Edward Gilbert Abbott: Enigmatic figure of the ether demonstration. *N Engl J Med* 1984; 311:991–4
3. Desai SP, Desai MS, Maddi R, Battit GE: A tale of two paintings: Depictions of the first public demonstration of ether anesthesia. *ANESTHESIOLOGY* 2007; 106:1046–50
4. Frost NS: Frost Genealogy in Five Families. West Newton: Frost Family Association of America; 1926:183–4
5. Richardson EA: Moors School at Old District No. 2, Groton, Massachusetts: The Story of a District School. Ayer: H. S. Turner; 1911:10
6. Green SA: A Collection of Papers Relating to the History of the Town of Groton, Massachusetts, Volume 1. Groton: 1887:30–1
7. Green SA: Facts Relating to the History of Groton, Massachusetts, Volume 2. Groton: 1914:147–8
8. The Boston Evening Transcript. September 8, 1866:4
9. The Daily Spy. Worcester, MA. September 8, 1866
10. Colton GQ: Anaesthesia. Who Made and Developed this Great Discovery? New York: A. G. Sherwood & Co.; 1886:6
11. Viets HR: Hinckley's Who Was Who On Ether Day. Boston Medical Library, 1962
12. Vandam LD: Robert Hinckley's "The First Operation with Ether." *ANESTHESIOLOGY* 1980; 52:62–70
13. Wolfe RJ: Robert C. Hinckley and the Recreation of the First Operation Under Ether. Boston: The Boston Medical Library in the Francis A. Countway Library of Medicine; 1993:33, 37, 74
14. Schatzki SC: Ether Day. *Am J Roentgenol* 1995; 165:560
15. Guralnick WC, Kaban LB: Keeping ether "en-vogue": The role of Nathan Cooley Keep in the history of ether anesthesia. *J Oral Maxillofac Surg* 2011; 69:1892–7
16. Hodges RM: A Narrative of Events Connected with the Introduction of Sulphuric Ether into Surgical Use. Boston: Little, Brown, and Company; 1891:24
17. Bett WR: William Thomas Green Morton (1819–68). *Postgrad Med J* 1946; 22:321–2
18. Vandam LD: Charles Frederick Heywood. House surgeon at the ether demonstration. *ANESTHESIOLOGY* 1995; 82:772–8
19. Barker SW: Anaesthesia. *Harper's New Monthly Magazine* 1865; 31:453–60
20. Adams G: The Boston Directory. Boston: James French and Charles Stimpson; 1848:132,151,247,284
21. Boston Directory, for the Year 1858. Boston: Adams, Sampson & Co.; 1858:143
22. The Boston Directory. Boston: Adams, Sampson, & Co.; 1861:175
23. Rice NP: Trials of a Public Benefactor, As Illustrated in the Discovery of Etherization. New York: Pudney & Russell; 1859:62–4, 88–9
24. Statements, Supported by Evidence, of Wm. T. G. Morton, M.D. on his Claim to the Discovery of the Anaesthetic Properties of Ether, Submitted to the Honorable The Select Committee Appointed by Senate of the United States. 32nd Congress, 2nd Session, January 21, 1853. Washington: 1853:257–8
25. The Boston Directory, for the Year 1851. Boston: George Adams; 1851:97
26. Wolfe RJ: Tarnished Idol: William Thomas Green Morton and the Introduction of Surgical Anesthesia. San Anselmo: Norman Publishing; 2001:65–9, 72–3, 86
27. Moore FD: John Collins Warren and his act of conscience: A brief narrative of the trial and triumph of a great surgeon. *Ann Surg* 1999; 229:187–96
28. Desai SP, LeVasseur R. Why was Ebenezer Hopkins Frost invited to the ether demonstration of October 16, 1846? Presented at the Annual Meeting of the American Society of Anesthesiologists, October 15–19, 2011, Chicago, IL, Abstract A942

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