An Anesthetic Curiosity in Philadelphia (March, 1849)

To the Editor.—On March 15, 1849, Washington L. Atlee, a gynecologist in Philadelphia and Professor of Medical Chemistry at the Pennsylvania College of Medicine, removed a large (3.5 kg. 65 cm diameter) fibrocartilaginous ovarian tumor from a 29-year-old woman. The operation was successfully completed in 37 min and there were no postoperative complications. The anesthesia administered for that operation presented two remarkable features:

1. Atlee used a 1:2 mixture (v/v) of chloroform and ether (C.E) as anesthetic. Thirty to forty drops were poured on a cone made from a handkerchief and placed a few centimeters above the patient’s face. The induction was smooth and rapid (1 min), the diaphragm remained quiet, the guts were contracted and quiescent, and the abdominal wall was well-relaxed, thus allowing ideal operating conditions for this difficult procedure.

2. The patient was unconscious during the incision of the abdominal wall, the administration of anesthesia was discontinued as soon as the peritoneal cavity was entered and the patient was allowed to regain consciousness. She was awake but completely analgesic during the rest of the operation, conversing with her surgeon and observing the removal of her tumor.

This intriguing case report calls for some comments. The report is to our knowledge, the first mention of an anesthetic mixture of chloroform and ether in the US literature. Atlee gives no reference for his choice of that anesthetic, but mentions that Dr. Gilbert, a Philadelphia surgical colleague, had used a 1:7 C.E mixture before him. Atlee, however, preferred a higher concentration of chloroform (1:2).

A 1:4 C.E mixture was reported in January 1848 by the Viennese dentist J. Weger and in June 1848 by the German surgeon Horning. The Philadelphia surgeons were probably ignorant of Weger’s and Horning’s articles, published in little-known German journals. J. Gabbie in England had proposed a 1:2 C.E mixture in May 1848, but his suggestion was condemned as dangerous by V. Jones a few weeks later and by J. Snow a few months after him, because of the large difference in vapor pressure between both compounds. Those mixtures, therefore, were initially ignored in England, except by C. Kidd who advocated one of the Vienna mixtures (1:6 or 1:8 C.E) and a few practitioners mentioned by Snow. The mixture used by Gilbert in Philadelphia (1:7 C.E) was thus very similar to Kidd’s Vienna mixture.

Atlee’s choice of a 1:2 C.E ration may have been inspired by J. C. Warren’s practice at Massachusetts General Hospital. At the end of his article, Atlee indeed mentions that Warren was now using a 1:2 dilution of chloroform in pure ethyl alcohol. In fact, Warren rarely used that compound and preferred the product of the first distillation of chloric of lime and sulfuric acid, which also contained approximately 35-35% chloroform in alcohol. Snow, at the time, occasionally administered a 50% alcohol solution of chloroform (C.A 1:1) when he used a sponge or a handkerchief rather than his inhaler. He, however, much preferred to administer chloroform mixed with air slowly through his dosimeter inhaler.

Adding ether, alcohol, or both to chloroform became popular after the publication in 1864 of the report of the Chloroform Committee set up in Great Britain to study the causes of, and prevent, the increasing number of chloroform deaths. Among several suggestions, the Committee recommended the use of various preparations: Harley’s A.C.E (1:2:5), Hewitt’s 2:3 C.E, and the 1:2 and 1:4 C.E mixtures. The committee reported that these last two mixtures were extensively used in the United States. However, we have found little evidence for such allegations in the contemporary American literature, except for a death report with a 1:4 C.E mixture in Virginia in 1857 and a discussion of Atlee’s anesthesia in L. Turnbull’s book in 1878. Turnbull, an eminent ‘aural surgeon’ at the Jefferson Medical College, and other Philadelphia surgeons had been taught by Atlee himself how to give his C.E mixture. Atlee at that time had performed more than 500 ovariotomies with his compound without a death.

Turnbull himself a skilled anesthesiologist, thought that the parts of Atlee’s preparation should be measured by weight rather than by volume. In his initial report, however, Atlee clearly mentioned that he mixed his two agents by volume.

Atlee, according to Turnbull, thought that the components of his mixture formed a chemical union. Dr. Green, a colleague of Turnbull, found that the making of a 1:2 C.E solution (by volume) was markedly exothermic. Atlee’s compound may thus have been an azeotrope. Claims that various mixtures of ether and chloroform, with or without alcohol, were azeotropes have been made at various times, but distillation studies in 1939 cast serious doubts on most of those allegations.

After 1864, Harley’s and Hewitt’s compounds and various Vienna mixtures (especially Billroth’s 3:1:1 C.E.A) became widely used in Great Britain and especially on the Continent and persisted until the 1920s when ether slowly displaced chloroform and its preparations. Harley’s A.C.E mixture was also popular in the United States, especially in military practice, until chloroform and its mixtures were condemned by the American Medical Association in 1912.

Atlee preferred chloroform to ether because of the former’s smooth and rapid induction and deep relaxation; he judged it safe when mixed with room air. He, however, abandoned it in mid-1848 because of the increasing number of chloroform deaths reported on both sides of the Atlantic. Warren, in Boston, also an early enthusiast of chloroform, gave it up in March 1848 after gathering 15 well-documented cases of chloroform deaths and several other reports of suspected deaths or near-fatal accidents. He turned to a 33-34% alcoholic solution of chloroform that he called strong chloric ether. Shortly thereafter, chloroform was banned at Massachusetts General Hospital by its Board of Governors, and ether returned as the sole anesthetic in Boston and Philadelphia.

The excision of a large abdominal tumor from a nervous young woman who remained conscious and analgesic throughout her operation is worth noting. This case is, to our knowledge, the first American report of deliberate “analgiesia of emergence.” Atlee’s practice was to induce a fast and deep anesthesia with ½-2 drams (1.8-7.1 ml) of his anesthetic mixture for the onset of the operation; the anesthetic was then withheld and the patient was allowed to breathe room air and to

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return to a state of conscious analgesia. The presence of ether in the mixture must have helped reach that state.

Snow had already mentioned 'ether analgesia of emergence' in 1847. This conscious analgesia was later investigated by A. Dastre of Paris, in 1890 ('anesthesia de retour' or anesthesia of return), and used clinically by A. Kronacker of Munich, in 1901 ('koupirte Aethernarkose' or interrupted ether anesthesia), and more recently, by J. F. Artusio, Jr. of New York, in 1954 ('ether analgesia').

Atlee, the author of this report, was a well-known Philadelphia gynecologist and surgeon. He was born in Lancaster, Pennsylvania in 1808, received his medical degree from Jefferson Medical College in 1839, and, after 10 yr of private practice in Mount Joy and Lancaster, Pennsylvania (1834-1844), joined the Pennsylvania Medical College (1844-1852). He was president of the Pennsylvania Medical Society in 1874 and vice president of the American Medical Association in 1875. With his brother John L. Atlee, he pioneered and developed the surgery of the ovarian and uterine tumors. He was a founder of the American Gynecological Society and wrote several textbooks and numerous articles regarding gynecologic tumors and other problems. He died in Philadelphia in 1878.

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