

Arthur E. Guedel Memorial Anesthesia Center

Fifty Years later

By Merlin Larson, M.D.



Fig. 1: Arthur E. Guedel as an Army anesthesiologist during World War I. His ideas on ether anesthetic depth originated during this period, and he reported them in 1919.

2006 is the 50th anniversary of Arthur Guedel's death in 1956, which marked the end of an era in our specialty with the passing of this great practitioner. Guedel's fame in part rested upon his classification of the stages and planes of ether anesthesia, and the use of this agent would be in decline soon after 1956. Two papers in 1956 introduced the new anesthetic, halothane, the first successful modern volatile agent. The classic Guedel signs of anesthetic depth were to become obsolete. In 1957 Woodbridge defined anesthesia in a new way by suggesting that analgesia was a necessary component in all anesthetic techniques. Administration of anesthesia with only one agent was becoming outmoded.

The introduction of the rapid onset paralyzing agent, succinylcholine, occurred in 1952. Guedel never used muscle relaxants in his practice, although he assuredly would have learned of the development of this family of drugs after he retired in 1940. Imagine the surgeon's delight in the young anesthesiologist who could simply inject the contents of the large syringe (barbiturate) and then the small syringe (muscle relaxant), intubate the trachea, and then quickly allow the operation to proceed. What a contrast to the old-timer who struggled with a mask induction through the second stage and then continued to deepen the anesthetic until tracheal intubation was possible.

Abdominal relaxation for intraperitoneal surgery was a problem that Guedel attempted to solve. By hyperventilating patients through his newly designed cuffed endotracheal tube (Figure 3), he was able to avoid the diaphragmatic movements that annoyed the surgeon. Curare and succinylcholine made these



Fig. 2. Arthur Guedel invented anesthesia apparatus in his garage workshop. Guedel's traveling bag and its contents.

techniques unnecessary, and the improved use of muscle relaxants was rapidly gaining momentum in the early 1950s.

Another innovation in 1956 was the discovery of the oxygen electrode by Arthur Clark. This discovery soon was followed by the carbon dioxide electrode in 1958 and complete blood gas analysis in 1959. During these years the polio epidemic had afflicted thousands of patients, many of whom were in ventilatory failure. These developments led directly to the idea of a special section of the hospital for intensive care. One of the first reports on intensive care units came from Norway in

1950. The anesthesiologist was now free to demonstrate his expertise in airway management outside of the operating room. A newly trained anesthesiologist was soon using new words such as "dead space" and "shunt fraction." Early retirement must have seemed logical for many of Guedel's students.

Guedel was not one to embrace regional anesthesia. His letters include several discussions of his failures with neuraxial blocks, and it appears that he was not interested in peripheral nerve blocks. In 1952, the Wooley and Roe cases were published, describing three patients who developed severe debilitating injuries following spinal anesthesia. Guedel's bias against the technique appeared to be confirmed. In 1956, however, the landmark paper of Dripps and Vandam appeared in *JAMA*. These authors reported on the successful administration of over 10,000 spinal anesthetics with surprisingly few complications. Strict attention to technique, sterile uncontaminated drugs, and limiting the method to lumbar punctures resulted in retaining spinal anesthesia as a valuable method for diverse surgical procedures.

Another early 1950s paper was the description of the newborn "well being" score by Virginia Apgar. Although there were some women anesthesiologists, none had achieved the high honor of leading a prominent Anesthesia Division (Columbia), and few had been permitted to publish in a widely circulated medical journal. Guedel was lukewarm on the subject of women in anesthesia. In a letter (April 12,

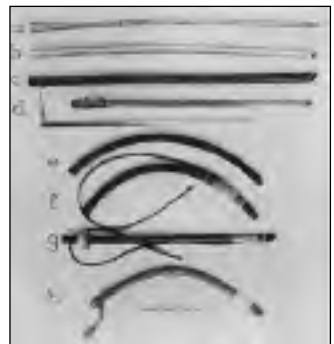


Fig. 3. Illustration from John Lundy's book showing the development of the endotracheal tube. Guedel's tube is the third from the bottom.

Guedel (cont'd)

1928) to his friend Ralph Waters, for example, he states that “women assistants are the bunk,” a thought also expressed by Waters. Of course the statement should be interpreted with some historical perspective, as it reflects a prevalent thought, perhaps unspoken, in the late 1920s. It is unlikely that Guedel ever thought his letters would be read 75 years later. But here again is a notion that has failed the test of time, as women continue to excel in all aspects of the specialty, and their participation is widely accepted.

Electronic monitoring was in its infancy during the final years of Guedel's life. Electrocardiograms and heart rate monitors were entering the operating room. Dripps described a method to continuously measure the blood pressure with a strain gauge in 1949, and the EEG changes brought about by anesthesia were described in the same year. Except for the blood pressure manometer, Guedel's monitors were his hands resting on—and his eyes looking at—the patient. His letters reveal a man in constant vigilance to discover new signs that appeared as the anesthetic levels changed. For example, as late as 1945, he realized that he had missed observing the transition to a paradoxical breathing pattern as the patient entered the third plane of the third stage of anesthesia. These skills are all but lost today as residents roll their eyes at attendings who mention them.

Guedel seemed to have a premonition that his defining role in the development of anesthesiology might not last. His later years were beset with declining health and relapses of drug addiction. His final letters suggest a man obsessed with defining his legacy, as if he had a premonition that change was “in the wind” and these changes might not require his observations on anesthetic depth. In 1945 Thomas Keys' book on the history of anesthesia was published and Guedel was not happy with the treatment he received from the historian. Here is an excerpt from a letter dated November 12, 1946, to Chauncey Leake (Professor of Pharmacology) at UCSF:

One wonders at the apparent carelessness displayed by those fellows (anesthesia historians) in handling the truth. Has no one told them about St. Peter, Guardian of the Gates, and of his violent dislike for dissimulators? Someone should tell them of the dangers of carelessness, especially at their ages with not much longer to go.

Leake's response (November 19, 1948) was to placate and mollify him by stating that his historical role was firmly established:

Don't worry about the credit for things. You know that you have done a first-class job. What's the use of getting peoples' back up? After all, you can relax with the sure knowledge and satisfaction that

Guedel (cont'd)

you have made a host of first-class contributions to the relief of human suffering. You are fortunate among men in that you have been able to do so much.

Perhaps herein lays a message for our young investigators: enjoy the discovery and not the credit. However, 50 years later we *do* honor the career of this man. He not only made important observations and developed new ideas, he engaged the anesthesia community aggressively so they would see the advantages of his innovations.

The Guedel letters, of which there are over 300, reveal his triumphs, failures, aspirations, disappointments, and frustrations. In reading them we learn that we are all in this together, not only with our contemporaries, but also with the deceased. He faced the same problems we do today ... difficult patients, stubborn surgeons, demeaning reimbursements, long hours, and administrative headaches. His problems were actually much worse than ours, yet he maintained a positive attitude most of his career. In one letter (1928) he wrote to Waters: "No job can be a success if you let it ride you. RIDE IT."

Arthur Guedel did not will or create the Guedel Memorial Anesthesia Center, nor did he express any desire for others to do so. Funding for the Center was from private donations and the CSA; the name Arthur E. Guedel Anesthesia Center was suggested by Chauncey Leake. The Library was founded in 1963 by a small group of dedicated anesthesiologists who were interested in keeping the history of our specialty alive, a role that has in actual fact been superseded and surpassed by the Wood Library-Museum in Park Ridge, Illinois. Now our leader, Selma Calmes, has decided to resign as President of the Guedel Memorial Anesthesia Center.

The future of the Guedel Library is up for discussion by all parties including the Pacific Medical Center, the Academic Departments, the members of CSA, and the Board of Directors of the Guedel Library. It seems unlikely that the documents at the Guedel will be Googled and put on the Internet. We encourage CSA members to think over this matter and express your ideas as to what role, if any, the Guedel Memorial Anesthesia Center should play in the next 50 years.

(References available on request.)

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