

Arthur E. Guedel Memorial Anesthesia Center

Richard C. Gill and the Introduction of Curare into Anesthesia Practice

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It is commonly known that curare, the first muscle relaxant, was extracted from the arrow poison of the South American Indians living in the Amazon Basin and introduced into clinical medicine over 60 years ago. The fascination of Western Medicine with these poisons goes back over 400 years but it wasn't until Richard C. Gill returned from a 4-month expedition to Ecuador with the crude curare paste in 1938 that enough of the drug could be extracted to perform meaningful studies in humans. When Richard Gill died in 1958, a substantial portion of his correspondence, photographs, books, and artifacts were donated to the Arthur E. Guedel Memorial Anesthesia Center (note the quill, arrows, and gourd on the cover of this *Bulletin*). Because of Gill's extensive correspondence and writings on the early use of curare, these materials are highly coveted by historians and, together with the papers of Arthur Guedel, combine to make the Guedel Center a prized archival collection, often overlooked by the members of CSA. The following account is a brief biography of Gill with some thoughts about his role in the development of our specialty.

Mr. Richard C. Gill was born in 1901 in Washington, D. C., where his father was a physician. As a young man Gill was expected to follow his father and his older brother into the practice of medicine. Although his initial courses at Cornell University were taken to prepare him for medical school, Richard Gill had an incurable wanderlust, and after two years of college, he dropped out of school to join a whaling fleet in Alaska. Thereafter, he traveled extensively, taking odd jobs in various remote locations, but eventually returned to Cornell for his Bachelor of Arts degree in English in 1927. He married, and briefly taught English in Pennsylvania, but the conventional American lifestyle was not suited to the Gills who were more attracted to an adventurous way of life. When the September 1929 stock market crash hit, the Gills were living in Lima, Peru, where Richard was soon to be laid off as an employee of the American Rubber Company. During their stay in Peru, the Gills had fallen in love with the natural beauty of Ecuador and Peru where they had traveled extensively. Instead of returning to the United States, they used their remaining savings to purchase 750 acres of land just east of Banos, Ecuador, where they built a hacienda, raised tropical fruits and vegetables, and studied the customs of the indigenous people.

While on vacation from his home in Ecuador (1932), Richard Gill fell from his horse and developed a neurological syndrome that led eventually to a painful spastic condition requiring a prolonged convalescence in the United States. Apparently baffled for treatment options, his neurologist Walter Freeman suggested that the arrow poison of the South American

Indians might alleviate his spastic state. This comment sparked Gill into renewed vigor and he vowed to return to Ecuador and retrieve a sufficient quantity of the crude preparation to proceed with human studies on spastic conditions. In 1936 Gill had recovered some of his strength and the expedition was launched. It was an ambitious endeavor requiring 75 Indian porters, 36 mules, 6 horses, and 12 canoes, two tons of equipment and over 4 months of travel in the formidable jungle east of Banos. The rain is unrelenting in this area and the pack animals were often stuck deep in mud. Rivers and streams were crossed with makeshift suspension bridges, over which the mules would not pass unless blindfolded. Remarkably, the Gills returned to America in 1938 with 25 pounds of the crude curare paste and 75 other jungle plants that were used by the Indians for various ailments.

Although Merck had expressed some interest in the arrow poison before Gill’s expedition was launched, they had lost interest by the time he returned. The story of how Gill’s curare paste became the muscle relaxant d-tubocurare has been recounted several times. The curare paste was eventually taken by Squibb and Sons who marketed a sterile but impure form of curare called Intocostrin. This agent took a circuitous route through the psychiatrist’s clinic before ending up in the hands of Harold Griffith and Enid Johnson of Montreal, Canada. Their 1942 landmark paper (Griffith HR, Johnson GE. The use of curare in general anesthesia, *Anesthesiology* 3:418-420, 1942) on its use for relaxation during abdominal surgery became the pivotal announcement that led to the expanded use of muscle relaxants in anesthesiology, a story that continues to unfold today.

Richard Gill spent the rest of his life promoting curare for spasticity and other bizarre indications. In a letter from Gill to the psychiatrist A. E. Bennett dated 1949 he encouraged him to use the drug for dysmenorrhea and for disorders of heightened or “aberrant tension.” To promote these uses for the drug, he moved to Palo Alto and set up a chemical laboratory in his garage to study and develop sustained release preparations of curare, personally hiring several chemists to study the drug. There is little doubt that he wanted to profit from supplying curare paste to the drug companies, but these ideas were thwarted by the pharmaceutical companies who had their own ideas. Squibb soon found other suppliers for curare and Gallamine was synthesized only 5 years after Griffith’s landmark paper. Richard Gill died at the age of 57, having failed to find a wider use for the drug.

How do we as anesthesiologists view the life of Richard C. Gill 45 years after his death? Gill did not go to Ecuador for the purpose of marketing a drug that would provide muscular relaxation of the anesthetized patient. Although muscular relaxation during abdominal and thoracic surgery was a problem for the anesthesiologists of the 1930s, before Gill’s expedition there was no thought of trying to use curare for that purpose. Solutions to the problem of muscular relaxation included regional anesthesia and deep general

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anesthesia with controlled ventilation. Alfred Lawen (Lawen A: The combination of local anesthesia with narcosis, *Beitrage zur klinischen Chirurgie* 80:168-189, 1912) had tried curare for muscular relaxation during ether anesthesia in 1912 but did not continue its use and his report generated essentially no interest. Squibb and Company, who eventually took the bulk of Gill's curare, had to vigorously promote the use of the drug during anesthesia. They initially failed to interest several prominent anesthesiologists, such as Stuart Cullen, E. A. Rovenstein, and E. M. Papper to use it, but were able to find a proponent in Griffith, a part time anesthesiologist with little interest in research.

Even if someone had suggested the novel idea of using curare before 1938, who would have procured the curare paste? No ordinary tourist/adventurer, no matter how bold, would likely have been able to accomplish the feat that the Gills were able to accomplish. Even if we discount the hardships involved in a project such as this, the fact remains that the indigenous people of the Ecuadorian jungle prize their jungle secrets highly and won't give them up readily, especially not for money, which is actually useless to them. Their drugs, food, hardware, lumber, water, exercise, and adventure are all supplied by the jungle, with which they live in harmony.

Gill understood the mentality of the indigenous people. He was not patronizing, and respected their culture and beliefs. He had a high regard for their native intelligence and treated them as equals. Clearly Gill had studied the native people and learned how to interact with them on his hacienda near Banos. In their writings, the Gills describe their relationships with the native people whom they regularly entertained as they traveled along the trade route of the Pastaza River. Gill was almost a god to the Indians. Indeed they elevated him to the status of a Brujo, or witch doctor and willingly traded their jungle remedies with him for goods that Gill knew they would treasure—items such as glass beads, pencils, linsilla cloth (unbleached muslin), and coloring pens. As an example of their high regard for him, Gill describes in his book "White Water and Black Magic" how he was able to gather many curare-makers around his makeshift home base in the remote jungle. There he learned to make curare himself but he never did divulge either the ingredients of the curare paste, nor the tribes that he traded with, because he feared this would be an abrogation of his contract with them. Although he attempted to conceal much of this information, his writings and the artifacts he collected point to clearly defined areas along the Pastaza river inhabited at that time by the Jivaro (now Shuar) and Canelos Indian tribes.

Sixty years later curare paste is still made in the Amazon basin and is still used to kill game with blowguns. Within 16 hours from San Francisco airport one can be in the same area that Gill traded for his curare paste. The rain forest is now studded with small oil towns, some with airports, and several small roads, allowing easy access to remote locations that required several days of rigorous river travel 60 years ago. Several jungle

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lodges are located along the Pastaza and Napo Rivers and the guides at these locations are eager to answer questions about the jungle from their North American and European visitors. It is not difficult to observe the blowguns and the small amounts of curare paste as it is used in the secondary rain forests bordering the Napo River. Obtaining a sufficient quantity of curare paste (like perhaps 25 pounds of the paste), however, would be very difficult. The paste is made deep inside the primary rain forests where vanishing breeds of stone-age indigenous tribes still coexist with the jungle and where the liana (vine) from which the paste is made (*Chondodentron tomentosum*) still grows wild. These people are even more wary of western travelers than they were 50 years ago. A visit there awakens a renewed respect for Richard and Ruth Gill, without whom the history of our specialty might have taken a different course.

Consider an anesthetic practice without muscle relaxants. Perhaps, with the new short acting volatile and intravenous anesthetic agents, we could do this. We would suffer a little, and the pharmaceutical firms would suffer a lot, but the surgeons would complain bitterly. There is no going back now. The surgeons all know about Gill’s poison and for some of them, the unparalyzed patient is “not relaxed” or “is tight” even with a complete motor block from a solid regional anesthetic. The best that we can do at this juncture is to use these drugs wisely... rattle the syringes and vials, and then say: “okay now there is no twitch.” Richard C. Gill, wherever he is, will then be pleased to know that his drug does, in fact, relieve a state of aberrant tension.

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