● History Article

Edward Tuohy: The Man, His Needle, and Its Place in Obstetric Analgesia

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The introduction of a needle designed by Ralph Huber and Edward Tuohy made continuous epidural anesthesia for labor possible. Neither the needle nor the regional anesthetic technique evolved in a vacuum; both were the culmination of a range of ideas developed by individuals around the world. *Reg Anesth Pain Med 2002;27:520-523.*

The evolution and expansion of obstetrical anesthesia has followed the development of the specialty of anesthesia, and an interesting account within obstetrical anesthesia is introduction of the Tuohy needle. Described by Edward Tuohy, M.D., this needle increased the accuracy in placing an indwelling epidural catheter, furthering the development of continuous analgesia. Who was Edward Tuohy, and how did he develop his needle? What role would the Tuohy needle (Fig 1) and Tuohy's technique play in the development of modern day obstetric analgesia? Why is there controversy surrounding Dr. Tuohy's description of his needle?

Midwestern Roots

Edward B. Tuohy (Fig 2) was born on March 17, 1908, in Duluth, Minnesota. He spent his early life in the midwest, completing a Bachelor of Science degree from the University of Minnesota in 1929. He completed medical school at the University of Pennsylvania and began his medicine residency at the Mayo Clinic in 1933. By 1935, he changed his focus from internal medicine to anesthesia and in 1936 became the first physician in the United States to receive the M.S. degree in anesthesiology. During World War II, while serving in the US Army Medical Corps, he utilized an indwelling catheter for continuous spinal anesthesia.[1] No doubt influenced by the techniques he had learned while at the Mayo Clinic, he returned to a staff position there after the war. In 1947, he left the Mayo Clinic to become the head of the department of anesthesia at Georgetown Medical Center. He completed his academic career in California as a professor of surgery (anesthesiology) at the University of Southern California School of Medicine, starting there in 1951. Tuohy died on February 12, 1959 of a cerebrovascular accident.

In addition to his notable academic contributions, he was very active politically. A longstanding member of the American Medical Association (AMA), Edward Tuohy was affiliated with the American Society of Anesthesiology (ASA) since its inception in 1936 and served as its president in 1947. While he held an impressive academic resume, he is most linked today with the needle that bears his name.

The Search for Continuous Neuraxial Analgesia

Continuous spinal anesthesia was originally described by Henry Percy Dean in 1906[2] and was unpopular.[3] The widespread use of continuous neuraxial blocks for surgical patients did not occur until William Lemmon's description of his technique for spinal block in 1940.[4] Lemmon used an indwelling malleable needle to provide extended anesthesia, but this imposed additional risks. The flexibility of the malleable needle made lumbar puncture difficult, and extra work was needed to

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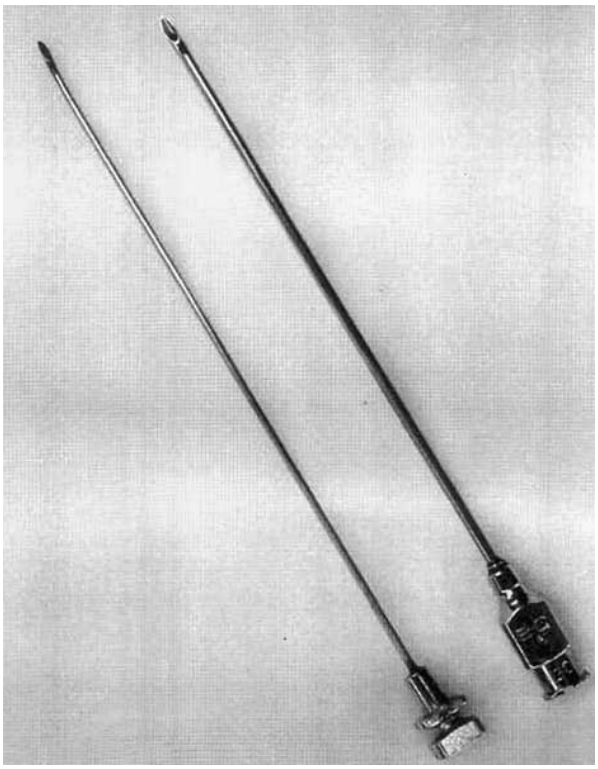

Fig 1. The Tuohy Needle (photograph courtesy of the Wood Library-Museum of Anesthesiology).

position and manage the patient without dislodging the needle. Concurrently, Robert Hingson was using Lemmon's malleable needle technique for caudal anesthesia in the pain management of labor and delivery.[5] His article in 1942 described a 1-year experience with continuous caudal anesthesia. This article by Hingson documented his findings from 65 patients receiving this form of obstetric analgesia. It was his observation that the use of caudal anesthesia resulted in comfortable labor and nearly painless delivery, as well as providing a safe environment for mother and child.[5] Hingson did note that this form of analgesia had inherent difficulties and risks, including unilateral anesthesia, absent caudal spaces, and instances of needle breakage. While he believed this method to be safe, he did advocate further research and investigation. By 1944, Hingson had expanded on his earlier work and now was providing obstetrical anesthesia through lumbar epidural analgesia, continuing the use of the malleable needle. Hingson noted the epidural space to be only 6 mm in width, anterior to posterior. Due to this narrow space, care was required in maintaining an indwelling needle in a stable position. He understood the advantages of an indwelling catheter and cited experimental data using a ureteral catheter for continuous epidural anesthesia. Hingson would later abandon the practice due to the technical difficulties in insertion of the catheter through the straight Love-Barker needle.[6] His results with the indwelling malleable needle technique led him to believe it was impractical for continuous epidural anesthesia. Hingson's concern was that minimal movement could result in advancement of the malleable needle into the subarachnoid space. He later stated that this technique could be safe, provided a test dose was administered before each supplemental dose of anesthetic. The use of continuous epidural anesthesia would not begin until the development of a method for the placement of an indwelling catheter. This development would occur with use of the needle described by Edward Tuohy.

Dr. Tuohy and His Needle

In 1944, while a Captain in the US Army Medical Corps, Tuohy described the first use of an indwelling nylon ureteral catheter for continuous spinal anesthesia, expanding on the techniques already described by Lemmon.[4] Familiar with J. Grafton Love's work with ureteral catheters as subarachnoid drains at the Mayo Clinic in the mid-1930s,[7]

Fig 2. Capt. Edward Tuohy, M.D., in uniform, 1944 (photograph courtesy of the Wood Library-Museum of Anesthesiology).

Tuohy was trying to find a method that eliminated some of the technical difficulties involved with Lemmon's malleable needle. Tuohy's concerns centered on introduction, proper stabilization in the subarachnoid space, and trauma to the tissues caused by the needle. Lastly, the hazard of needle breakage was a major problem with Lemmon's technique.[8] Tuohy maintained that a catheter was not only less traumatic to the tissues, but alleviated the need for a special mattress required in positioning. Using the indwelling catheter technique, Tuohy described fewer mechanical complications with no greater frequency of spinal headaches. One major concern remained: migration of the catheter with advancement through the straight tipped needle. In an attempt to influence the cephalad migration of the catheter tip, he first suggested bending the catheter before insertion through the needle. The following year Tuohy described the use of a 15-gauge needle with a Huber point, a curved tip with a lateral orifice.[9] It was this design that evolved to become the Tuohy needle, allowing direction of the catheter in a cephalad or caudad direction.

In November of 1946, Manuel Martinez Curbelo's visit to the Mayo Clinic introduced Curbelo to the use of the Tuohy needle and the introduction of a ureteral catheter for continuous subarachnoid anesthesia. In 1947, Curbelo, using the technique demonstrated by Tuohy, combined the idea of Hingson's continuous caudal anesthesia with Touhy's needle to successfully insert an indwelling ureteral catheter within the epidural space.[6] In this first description of the procedure, Curbelo credits Hingson and his colleagues, along with the 16-gauge Tuohy needle with a Huber point, in enabling him to develop continuous epidural anesthesia. Hingson and his colleagues reported on the use of a plastic catheter in the epidural space in 1949.[10] With these developments and the improvement in epidural catheter manufacturing, the use of epidural analgesia for obstetrical practice increased over the next few decades.

Currently, the Tuohy needle, occasionally slightly modified from its original description, has become the standard needle for epidural placement in most practices. Spinal-epidural analgesia[11] was reintroduced by M.B. Coates with a needle through needle technique in 1982,[12] and combined with subarachnoid-epidural (CSE) analgesia, has become the latest trend in obstetric anesthesia. Although there are differences between manufacturers' CSE sets, almost all provide a Tuohy needle for introduction of an epidural catheter and a slightly longer spinal needle for subarachnoid injection of either local anesthetics or opioids.[13]

The Controversial Needle

While obviously beneficial to regional analgesia, Tuohy's addition to medical practice is subject to debate. Tuohy's original article in 1945 has sparked some interest among historians. In 1995, Joseph Eldor published an article concerning the misguided credit derived by Tuohy for his invention.[14] Tuohy's original description of his 15-gauge needle with a Huber point made no reference to the origin of the Huber tip. In 1946, Ralph L. Huber (Fig 3), a dentist from Seattle, applied for a patent on a needle with a "transversely curved wall . . . end portion".[15] Eldor contends the true needle's creator was Ralph Huber, and that he was never properly referenced in early anesthesia literature. How Tuohy came to describe his needle with the Huber point prior to Huber's original patent is unclear. It is well known that Ralph Huber was a prolific inventor. In fact, with his ingenuity and through his patronage, many of his inventions were offered to the US Army during the War, including the first disposable hypodermic syringe.[16] As his patent in 1946 notes, the Huber point is a continuation of his earlier needles, and perhaps Tuohy encountered the Huber point during his time in the military. While this can only be presumed, it is known that Huber's syringe

Fig 3. Ralph Huber, D.D.S. (photograph courtesy of the *Seattle Times*).

and needle were adopted by the military as early as 1942, 3 years before Tuohy's description of the needle with the Huber point. Nonetheless, the intended purpose of Huber's needle and that proposed by Tuohy were quite different. Huber designed his needle for hypodermic use with the laterally facing orifice offering the theoretical advantage of reduced pain on insertion and absence of tissue coring. Tuohy adapted Huber's needle to use the lateral orifice to direct the catheter in the subarachnoid space, and subsequently, the epidural space. Where similarities once existed between the 2 needles, the original Huber needle now differs from the modern Tuohy needle. The original Huber tip had secondary bevels making it much sharper compared with the single, primary bevel of the modern Tuohy needle. Tuohy claimed no originality for the design, in fact, describing it as a "needle with a Huber point".[17]

Conclusion

Philip Bromage has written that "the escape" of epidural analgesia during the general decline in regional techniques after World War II was, in part, due to the introduction of the Tuohy needle and the placement of the indwelling catheter.[18] During his training, Edward Tuohy was influenced by others who used continuous spinal block. Realizing the potential benefits of continuous analgesia and the inherent risks of the malleable needle technique, he sought an alternative approach. Despite the origin of the curve tipped needle, it was Edward Tuohy who used it first to effectively place an indwelling subarachnoid catheter. These technical refinements allowed neuraxial anesthesia to be maintained continuously, or intermittently, for long periods of time.[18] The description by Edward Tuohy of this needle and his approach is an important step in the concept of continuous epidural analgesia.

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