

MARTIN KIRSCHNER An Outstanding Surgeon and Anesthetist

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Cries and groans have no place in the operating room" claimed the surgeon Martin Kirschner at the end of the 1920's.¹ This statement, with which he began the chapter on pain alleviation in his textbook of general and special surgery, displays Kirschner's emphasis on the importance of adequate perioperative pain therapy. The extensive representation of various anesthetic devices and techniques is historical proof of just how much Kirschner contributed to this specialty. Many of his pain-relieving methods leave much to be desired, but this was probably due to the general non-acceptance of anesthesiology as a specialty.

A typical example of this lack of acceptance is the following statement by the reputable German surgeon, Fredrich Pels Leusden (1866-1944), concerning the surgical textbook written by Kirschner and Otto Nordmann (1878-1946): "Narcosis specialists simply do not exist and hopefully never will!"²

In the later editions of his textbook, his chapters on anesthesia became even more detailed.^{3,4} This was for Kirschner a logical

consequence of the ever continuing specialization of surgery. Many of Kirschner's contributions to anesthesiology and pain therapy, developed in the 30's, are still applicable today. In a memorial to the 50th anniversary of his death, a review of a few of his more important contributions are presented.

Biography

Martin Kirschner was born on October 28, 1879, in Breslau, belonging to a family of surgeons from his father's side (Fig. 1).⁵ His grandfather had been a surgeon serving Frederick the Great in the Seven Year War, and he was probably the reason why the young Martin chose medicine as a profession.⁵ He studied at the universities of Freiburg, Straßburg and Munich, writing his medical doctorate on "Syryngomyelia and Tabes Dorsalis."^{5,6} After receiving his license to practice in 1904, he was a medical resident under the internist Rudolf von Renvers in Berlin.^{7,8} It was at this time that Kirschner's father became mayor of the city of Berlin.⁵ In 1907, deciding to see the eastern



Fig. 1. Martin Kirschner (1879-1942).⁵

world, he travelled to Ceylon and India. It was during his journey that he realized the inadequacy of physicians in emergency situations. Upon his return to Germany, the 28-year-old Kirschner accepted a residency in the Surgical Department of the University of Greifswald, at Königsberg, and was appointed professor. He later accepted the post of chief of surgery at this University in 1917, when Payr left to go to the University of Leipzig as chief.⁵ During the Balkan wars, Kirschner gained the recognition as a reputable surgeon. It is worth mentioning that during this time he published several reports of the war atrocities he had seen as chief of a German Red Cross Ambulatory Corps.^{9,10,11,12} Kirschner led the surgical department in Königsberg until 1927, when he moved to Tübingen. Seven years later, he became head surgeon to what his predecessor and many colleagues believed to be "The Worst Surgical Clinic in Germany," the University Clinic of Heidelberg.⁵ There he remained chief of surgery until his death in 1942.⁵

Kirschner was an excellent surgeon and developer of surgical techniques. Above all, his name is connected with the improvement of the wire extension for bone fractures, the first successful pulmonary embolectomy (the patient lived longer than Kirschner himself), and the introduction of a new technique in the operation for esophageal cancer.^{5,13,14,15,16} He was also responsible for many of the modernisations and expansions of the surgical clinics of Königsberg, Böttingen and Heidelberg. He published more than 200 scientific articles on the topics of surgery, anesthesia and hygiene.⁵ In 1927, he founded a reputable textbook of surgery and was the editor of a new surgical journal – "Der Chirurg" – in which he and others reported the latest advancements in the area of anesthesiology.¹ These numerous anesthesia related articles played a major role in the development of German Anesthesiology. The following is a brief description of a few of Kirschner's contributions to the development of anesthesia and analgesic methods.

Prophetic Concepts

Shortly after moving to Tübingen, Kirschner published a report titled, "Essential problems of Surgery," in which he discussed, not only topics of surgery, but also those of emergency medicine and anesthesiology.¹⁸ He outlined the basic concepts of emergency medicine and the transportation of severely wounded patients. He even mentioned the possibility of the chain of patient transfer existing today. He himself considered his own ideas to be "fancies of Jules Verne that were perhaps too futuristic to be fulfilled." Nevertheless, he believed that, in a time of radios and televisions, anything could be possible. Kirschner also discussed the applicability of the aeroplane as a means of transportation, seeing not only its speed of travel, but also its lack of vibration as an advantage to the automobile. He mentioned also that the only remaining problem was that of the runway, but perhaps in the future that aeroplanes would be invented which could use a

shorter runway than that which they required at the time. "Since aeroplanes are being developed that can land and take off on ever shorter runways, it would perhaps be wise to construct such runways for newly built hospitals to take advantage of the ever increasing possibility of using aeroplanes as vehicles for patient transport." Kirschner wrote this before the helicopter had been invented. He discussed another unsolved surgical problem within his article. In order to be fully cognizant of the severely wounded patient, he strongly suggested that operations should be with a "continual graphic representation of the heartbeat, pulse rate and blood pressure to observe any associated major deviations of these parameters." It was 10 years later that Vienna's surgeon, Fritz von Schürer (1896-1990?), actually recommended such a device with the invention of his Kardiotron.¹⁹ Kirschner mentioned pain alleviating techniques, such as Avertin anesthesia and various local anesthetic methods, stressing the importance of such sedation and anxiolysis. A revolutionary idea was a conceptual solution to the problem of parenteral nutrition, in particular for the cachectic patients: "Should not we be able to develop a solution that can be parenterally tolerated and yet provide the needed nutrition for a longer duration?"¹⁸

The First Realizations

In the early thirties, Kirschner described the realization of some of his concepts at the newly built University of Tübingen in a series of articles published in the reputable surgical

journal, "Der Chirurg."^{20,21} His first action, when he moved from Königsberg to Tübingen, was to build a new hospital wing for postoperative and ill patients, following a concept created seven years earlier by the Boston neurosurgeon, William Harvey Cushing (1869-1939). Kirschner pointed out the advantages of such a department for high risk patients, stating that "the care and night round could be supervised by serious and experienced medical personnel." He also believed that "the head of such an intensive care department should have a knowledge and experience necessary for such a serious undertaking, capable of taking appropriate actions when such actions were called for."²⁰ This belief is a reality in the intensive care units of today.

Further Realizations

Another modern concept — probably due to his analysis of the ever increasing number of automobile and train accidents — was that of a "mobil surgical unit" (Fig. 2). In many ways, this concept resembles that of today's ambulatory: "The physician should be able to go to the wounded patient and not vice-versa."²² These were the premises with which he propagated an idea which today is an irreplaceable part of clinical practice. It should be mentioned that Kirschner had thought not only of applying this concept to public accidents such as aeroplane, fire and theater accidents, but also had considered it necessary in the case of war. One year later, World War II broke out. In reviews concerning the treatment of wounded soldiers, he repeatedly pointed out the necessity



Fig. 2. Kirschner's ambulance, circa 1938.²²

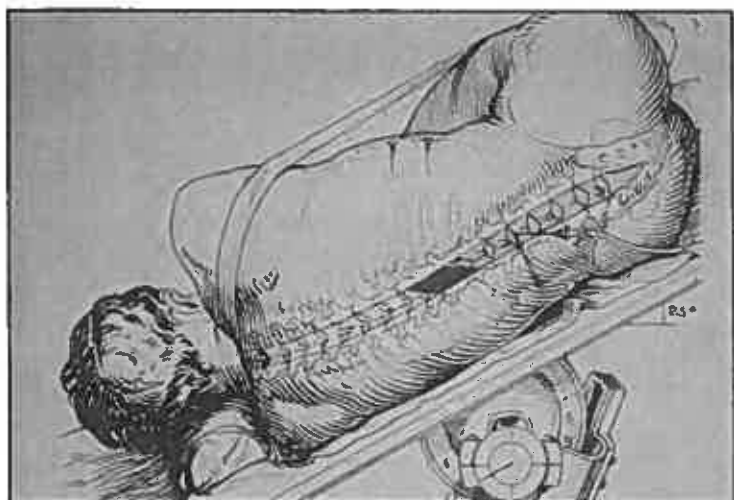


Fig. 3a. Positioning of the patient when "segmental anesthesia" is performed.³

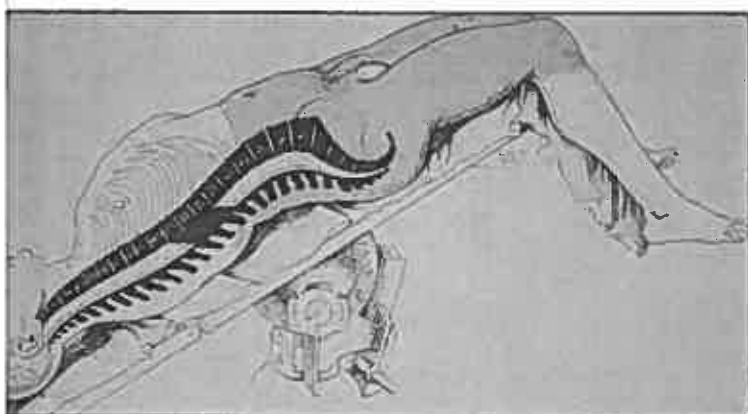


Fig. 3b. The position of the anesthetic charge and the extent of anesthetic area in low spinal anesthesia.³

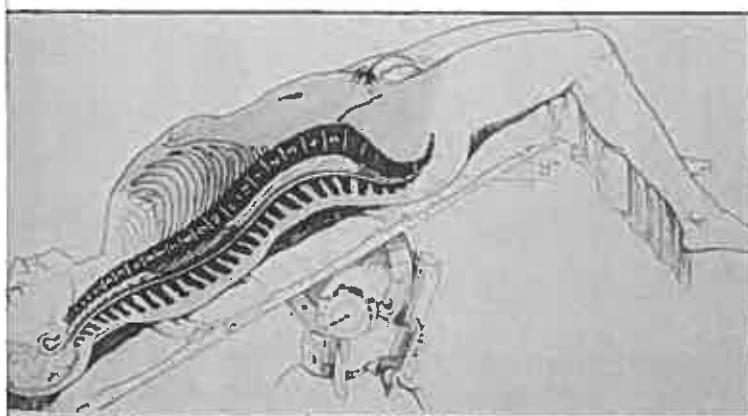


Fig. 3c. The position of the anesthetic charge and the extent of anesthetic area in high spinal anesthesia.³

of adequate pain therapy.^{23,24} He adamantly promoted the frequent as well as liberal use of analgetics; a belief which was to slowly replace that of the common medical commandment, "nihil nocere."^{24,25,26} Besides the use of regional anesthetics for spinal anesthesia, he also advocated the intravenous administration of pain alleviating drugs, such as Morphine, Eukodal, Pantopon and Scopolamine among others.²⁴ He had recognized the importance of Evipan in 1934 as a hypnotic to be used in all military hospitals, although he noted the difficulty of its appropriate dosing.^{27,28}

Kirschner's Segmental and Lumbal Anesthesia Technique

The modified technique of spinal anesthesia and high pressure anesthesia are two of Kirschner's important contributions to the development of anesthesiology.⁵ In 1919, Kirschner had already displayed his interest in spinal anesthesia, publishing an article concerning its complications: spinal headache, circulatory disturbances and respiratory arrest associated with this procedure.²⁹ He attributed these complications to the pharmacologic impurity of the then commonly administered tropacocain, and saw no further use of his clinic for spinal anesthesia. Years later, in 1931, he was the first to report the success of his newly conceived segmental anesthesia (Fig. 3a, 3b, 3c).³⁰ A major problem of the former "caudallumbar anesthesia" was the initial side-effect of the drastic decrease of blood pressure and the uncontrolled distribution of the anesthetic within the spinal fluid. The conceptional idea of a segmental anesthesia was that it would only affect the sensory nerves of a desired area, the air injected into the subarachnoid space hindering the uncontrolled distribution of the anesthetic.^{30,31,32} The patient was positioned on his side in a head-down position of about 25 degrees. Then the patient's buttocks were in a higher position than the head. A spinal tap was then made with a syringe specially designed for this technique by Kirschner himself. Air was injected into the sacral end of the spine in order to prevent the

uncontrolled distribution of the following hypobaric anesthetic. The fluid level of the drug could be controlled, the desired level attained by drawing out or newly injecting a predetermined amount of air into the subarachnoid area. The local anaesthetic was then fractionally injected, the needle left in place so as to allow any necessary compensatory injections. The control of the distribution was astonishingly exact when the procedure was practiced by an experienced operator. Nevertheless, the procedure was too complicated and time consuming for the patient who would have to wait for hours in the head-down position until the anesthetic lost its effect. Out of 1000 procedures performed with the described method, only three had related life-threatening complications, one of these ending with the death of the patient.^{33,34} Other complications included a drastic decrease in blood pressure, which could not be alleviated with the injection of Ephetonin. The incidence of post-spinal headaches was said to be less than with the conventional method. Although Kirschner repeatedly proclaimed in various articles that his segmental anesthesia was "safe and advantageous for the patient," the technique did not become popular among surgeons.⁵

In 1931, Kirschner introduced another variant of local anesthesia, the so-called "High Pressure Local Anesthesia" which, unlike the former variant, achieved more frequent use among operating physicians (Fig. 4).³⁵ The new method was a variant of the original Schleich infiltration procedure. Shortly after his death, a monograph written by Kirschner appeared with an exact description of, and a list of indications for, the high pressure technique. A preferred local anesthetic solution of 5 percent Novocaine was injected with specially designed needles of appropriate length. The procedure was carried out 10-20 minutes before the operation, allowing the anesthetic to take effect. Kirschner saw an advantage in the almost immediate effect of the anesthetic which, due to its facilitated tissue infiltration, required only one injection site. Each and every nerve fiber was infiltrated with anesthetic so that the distribution was more even, widely spread, and less time consuming

C. Erbe, Tübingen FABRIK ELEKTROMEDIZINISCHER APPARATE

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Einziges Patent-Anspruch in Europa

Literatur: Deutsche Zeitschrift für Chirurgie 1931, Band 89, Kirschner: „Die Hochdruck-Anästhesie“.
Zeitschrift für Chirurgie 1932, Nummer 43, Kirschner: „Über Hochdruck-Anästhesie“.
Monatsschrift für Medizinische Naturwissenschaften, 1933, Kirschner: „Der neue Hochdruck-Anästhesie-Apparat für Operationen in tieferen Lokalanästhesien“.
Kirschner: „Chirurgische Technik“ Band 1, S. 147, 148, 149.

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Gewichte: ohne Plastik ca. 91 kg, beide 100 kg — Gesamthöhe: 1850 bis 2000 mm



Fig. 4. Apparatus for "High-Pressure Local-Anesthesia," designed by Kirschner, circa 1930.⁴⁷

than any of the former methods.^{1,35} Furthermore, an anemic state was attained through the hydrostatic pressure created in the injected tissue and the vasoconstrictive effects of the suprarenin, both of which reduced bleeding tendencies.³⁶ This effect had already been pointed out by the inventor and most powerful advocate of the infiltration technique, Carl Ludwig Schleich (1859-1922).³⁷ Kirschner often combined his high pressure technique with other methods of anesthesia, general anesthesia as well as other techniques of local anesthesia.³⁵ Another advantage of the method was seen by Kirschner in the lack of postoperative pain, which was of exceptional value for the patient. He did, however, expressly warn of possible block of the autonomic nerves that could pathologically affect the blood vessels and internal organs.³⁵ The high pressure technique was later to be "considered a milestone in the history of local anesthesia."³⁵ Indeed, it had

been considered to be just as important as the discovery of the infiltration method by Schleich or the innovation with use of vasoconstrictive drugs, such as adrenalin, first used by Heinrich Braun (1862-1934).³⁶ The segmental and high pressure local anesthesia were frequently used in Kirschner's clinic.^{5,33} Nevertheless, because of the difficulty and experience required to carry out such maneuvers, both methods were not commonly practiced in other surgical departments.⁵

Intravenous Avertin Anesthesia

In the middle of the twenties, Kirschner intensively researched avertin, a then usually rectally administered hypnotic developed by the company I.G. Farben.³⁸ Kirschner discontinued the clinical use of this preparation as toxic reactions of the rectal mucosa had been reported when administered.³⁸ Moreover, severe blood pressure decreases and the risk of apnea were not uncommon during the first trials of its uses. Two years after its clinical introduction for rectal use, he was the first to report its application as an intravenous narcotic.^{39,40} Often, he applied it as an induction for major operations, which was then followed by any gas narcotic. Kirschner needed a hypnotic which could be controlled and one which had the amnestic abilities a hypnotic should have; he was convinced that avertin fulfilled these requirements. The avertin preparation he injected intravenously was in a solution of 3 percent sodium chloride, diluted with respect to the body weight of the patient with a device specially designed by Kirschner himself (Fig. 5). With his carefully chosen dose of 0.03 mg per kg body weight, Kirschner claimed to have infrequently had cases of apnea or severe decreases in blood pressure.⁴¹ He reported that care should be taken to avoid parainfusion or injections that could lead to unnecessary connective tissue damage. He reported a 3 percent incidence of thrombophlebitis at the injection site and one fatal pulmonary embolisation. All in all, this anaesthesia technique did not find widespread use in German clinics, most likely because of the

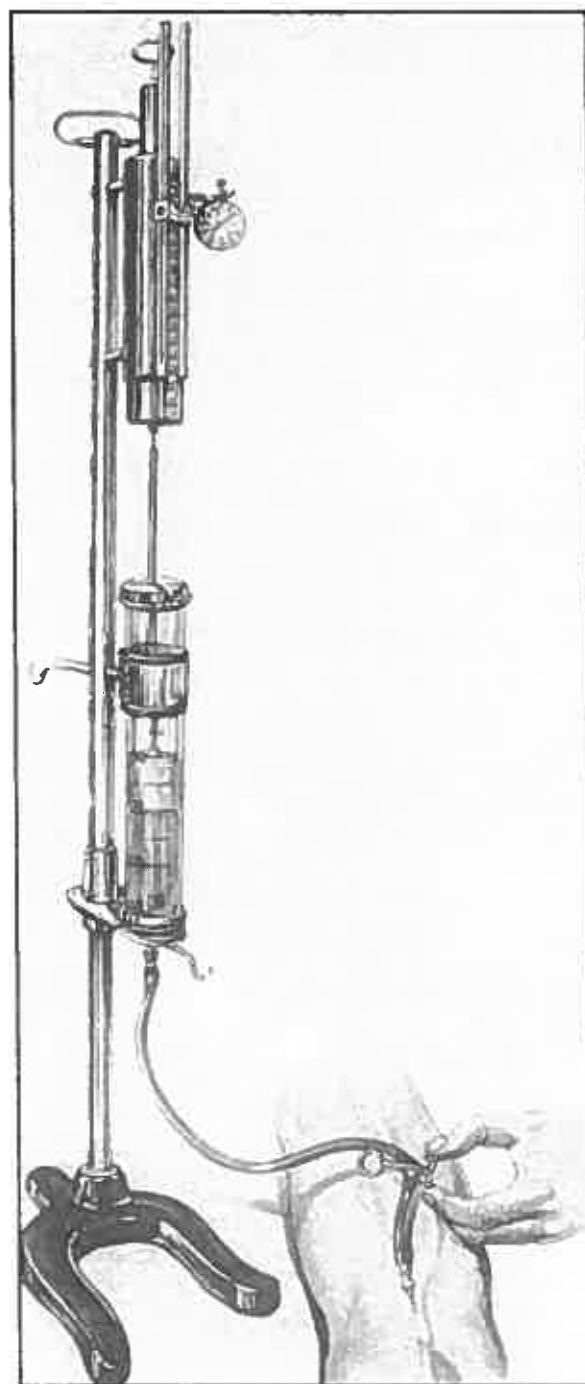


Fig. 5. Apparatus for intravenous Avertin-Anesthesia, designed by Kirschner, circa 1930.⁴¹

popularity of the intravenous barbiturates which had been introduced in 1932 and which thereafter rapidly gained general acceptance.^{5,28} Kirschner believed that his surgical colleagues had not accepted avertin because it could only be used as a highly diluted solution.

Retrospectively, the intravenous route of avertin by Kirschner is considered to be one of the first successful uses of a hypnotic for the induction of anesthesia which found its daily application in surgical practice.

Pain Therapy and the Electrocoagulation of the Ganglion Gasseri

An assessment of Kirschner's anesthesiologic contributions would be incomplete without mentioning the introduction of his electrocoagulation of the Ganglion Gasseri for the purpose of alleviating the excruciating pain of trigeminal neuralgia.⁴² With the help of a direction device, a specially prepared needle, which with the exception of the end had been coated with a layer of nonconducting material, was inserted through the foramen ovale of the cranium until the nerve complex was reached (Fig. 6a, 6b). The needle was directed with a milliamperè sensing device which displayed the conductivity of the nerve fibers as soon as the ganglion was located. The ganglion and the surrounding tissue were then electrocoagulated until a state of nonconductivity was attained, representing the total elimination of nerve fibers primarily responsible for the neuralgia.^{42,43} A similar needle had been developed by the Tübingen surgeon, Georg Perthes (1869-1927), and had been used for electrically guided localization of peripheral nerves.⁴⁴ Kirschner, who had become

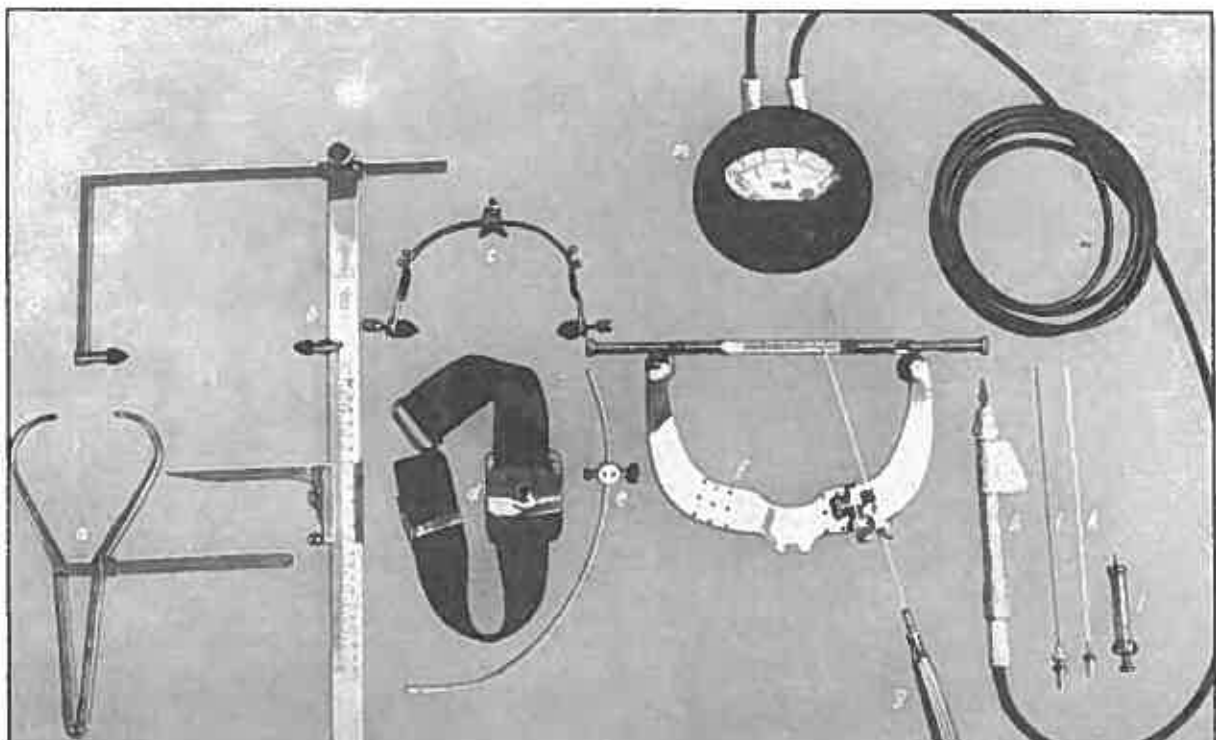


Abb. 6. Das am Kopfbild befestigte Zielapparat, a = Ständer der Vorrichtung zur Einstellung des Zielapparat; b = Halter für die Richtung des Vorrichtung des Zielapparat; c = Halter für die Einstellung des Zielapparat; d = Halter für die Einstellung des Zielapparat; e = Halter für die Einstellung des Zielapparat; f = Halter für die Einstellung des Zielapparat; g = Halter für die Einstellung des Zielapparat; h = Halter für die Einstellung des Zielapparat; i = Halter für die Einstellung des Zielapparat; j = Halter für die Einstellung des Zielapparat; k = Halter für die Einstellung des Zielapparat; l = Halter für die Einstellung des Zielapparat; m = Halter für die Einstellung des Zielapparat; n = Halter für die Einstellung des Zielapparat; o = Halter für die Einstellung des Zielapparat; p = Halter für die Einstellung des Zielapparat; q = Halter für die Einstellung des Zielapparat; r = Halter für die Einstellung des Zielapparat; s = Halter für die Einstellung des Zielapparat; t = Halter für die Einstellung des Zielapparat; u = Halter für die Einstellung des Zielapparat; v = Halter für die Einstellung des Zielapparat.

Fig. 6b. The device *in situ*.⁴²

the successor of Perthes in Tübingen, when he died in 1927, was probably inspired by this device, thus further developing it into a electrocoagulation needle as well. After extensive experimentation, the correct size of the needle was attained and could therefore easily and precisely be directed into the trigeminal ganglion. The safety and precision of this technique was a major achievement which had been almost impossible with the "blind puncture method" popularized by the German surgeon, Fritz Härtel (1877-1940?).⁴⁵ An

Fig. 6a. Kirschner's device for the electrocoagulation of the Ganglion Gasseri.⁴²



intraoperative stereoscopic X-ray control of the needle position was used in doubtful cases.⁴² Kirschner routinely carried out this procedure following a rectally administered Avertin basic-narcosis.^{42,43} An anesthesia either with avertin intravenously or chlorethyl was needed for the two otherwise extremely painful periods during the insertion and coagulation. The correctly positioned needle would lose its conduction abilities as soon as the ganglion was entirely destroyed since only non-conducting coagulated tissue was left. Sometimes, Kirschner also injected 0.2-0.5 ml of 70 percent alcohol into the tissue to insure its destruction.⁴²

In a first review of this treatment in 73 patients, an average symptom-free period of two years had been attained. Complications, occurring especially when carried out by an inexperienced operator, were lesions of the cranial nerves lying near the ganglion.⁴² Kirschner reported one entire loss of sight, an abducent palsy, and paralysis of the oculomotorius, vagus and recurrens nerve. He particularly advocated the value of such an electrocoagulation in cases of brain tumor near the trigeminus ganglion.^{5,42}

He also considered chordotomy to be of great value to the patient suffering from unbearable pain. He pleaded for such a surgical intervention in selected cases, and sometimes he performed this difficult surgical procedure himself. These and other invasive pain-alleviating operations are successfully carried out today in the so-called "Pain Clinics."

The Concept of Perioperative Medication for Patients under Local Anesthesia

Kirschner believed in practicing his patient oriented concepts. He was renowned for operating on a large percentage of his patients under any local anesthetic method, in particular with his high pressure and segmental techniques. In longer operations, he tried to alleviate the stress of the patient under local anesthesia with music played into headphones (Fig. 7).^{32,46} Later, he discussed the possibility of using a television set, a technique absolutely new at that time, nowadays more and more

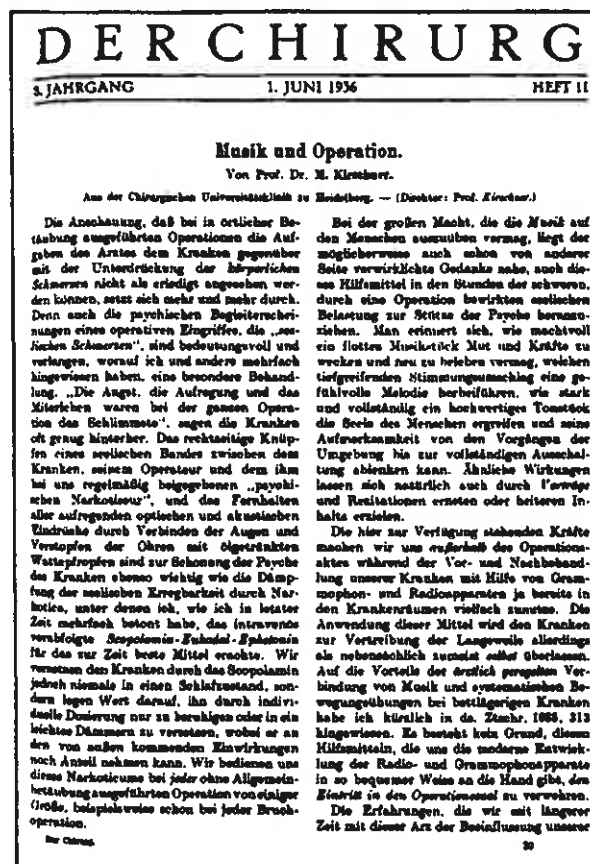


Fig. 7. Frontispiece of Kirschner's article "Musik und Operation."⁴⁶

asked for by patients, rarely realized within the operating theaters!

Synopsis

If one is to remember Kirschner's contributions to pain alleviation procedures, one must mention his segmental spinal anesthesia and the high pressure local anesthesia. A mention of his development of intravenous avertin anesthesia, which was originally intended as a suppository for basic anesthesia, is also necessary. Important were his concepts of perioperative anxiolytic and sedative procedures for patients under local anesthesia, whether they were attained pharmacologically or with the newest technical inventions such as the radio or television. Long-sighted were his recommendations concerning the avoidance of chronic contact with gas narcotics. As a pain therapist, he mastered the use of chordotomy to alleviate the pain of incurable cancer patients

and introduced the electrocoagulation of the Ganglion Gasseri in order to temporarily cure trigeminal neuralgia. Prophetic were his suggestions with respect to intensive care units and emergency care. A modern concept which he realized was the intensive care unit which he had ordered to be built in 1930. The question as

to whether Kirschner considered anesthesia a specialty or not must remain unanswered. We would not be wrong in considering him to be a passionate surgeon, but he was also a surgeon with the thoughts and actions of an anesthesiologist: "Divinum est sedare dolorem."

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