

## ArtiFacts: Gerhard Küntscher's Marrow Nail

Alan J. Hawk BA

**D**uring the first half of the 20th century, surgeons generally treated fractures with external

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*A note from the Editor-in-Chief: We are pleased to present the next installment of ArtiFacts. In each column, the Collections Manager of the Historical Collections Division of the National Museum of Health and Medicine (NMHM) will present a photograph of a visually or historically interesting artifact from the museum's collection and provide the story behind the picture. The NMHM, whose collection was recognized as a National Historic Landmark, was originally developed from the Army Medical Museum established during the Civil War to collect "specimens of morbid anatomy together with projectiles and foreign bodies removed." Its mission today is to inspire interest in, and promote the understanding of, medicine to the public.*

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Alan J. Hawk BA (✉), National Museum of Health and Medicine, Defense Health Agency, 2460 Linden Lane, Silver Spring, MD 20910 USA, Email: alan.j.hawk.civ@mail.mil

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splints, plaster casts, or by painstakingly assembling the bone fragments at surgery, and holding them together with screws, plates, or wires.

But at the Surgical Congress in Berlin, Germany in 1940, German surgeon Gerhard Küntscher (1900-1972) proposed inserting a stainless steel, hollow rod into the intramedullary cavity to stabilize the damaged limb (Fig. 1), an approach he based on his preliminary results while experimenting with animals [1, 5, 6].

The attendees of the congress soundly dismissed and ridiculed Küntscher and his surgical concept [1, 4, 6], suggesting he stood as an outsider among the German surgeons inside the Nazi regime [7].

While his German colleagues rejected the technique, one surgeon attending the conference, Lorenz Böhler (1885-1973) managed to smuggle an example of the nail back into his native Vienna [1, 4, 6], a dangerous endeavor considering the heavy restrictions Germany placed on information flow in times of war [4]. Böhler performed the technique in Vienna, where it eventually was accepted; it later spread throughout Nazi-annexed and neutral Europe [2].

During World War II, the German military, perhaps as a way to reinforce their rejection of his novel surgical

procedure, sidelined Küntscher, stationing him at an isolated general hospital in Lapland, Finland, far from any impactful battles or fighting during World War II [4]. While in Finland, he operated on a 33-year-old Finnish national, Walter Pape, who fractured his leg in a traffic accident the previous year. The operation saved Pape's leg from an amputation. Küntscher continued to collaborate closely with Finnish colleagues and performed his technique on civilians as well as injured soldiers on both sides of the war [4].

"When some Allied prisoners of war returned from Europe with such rod implantations, they were giving surgeons in the US and elsewhere a first exposure to the method," author Jean-Pierre Jeannet MD, wrote in his book, *Leading a Surgical Revolution, The AO Foundation – Social Entrepreneurs in the Treatment of Bone Trauma* [4].

Ultimately, there were two variants of the technique. With closed intramedullary nailing, the surgeon drove a hollow nail into the greater trochanter down through the medullary cavity of the shaft, guiding the nail using a fluoroscope. Open nailing required the surgeon to cut an opening near the fracture and drive a guide pin proximally through the trochanter. After that guide pin was removed, another was inserted down through the trochanter into the shaft and into the distal portion of the fracture. The nail was driven

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A. J. Hawk, Collections Manager, Historical Collections, National Museum of Health and Medicine, Defense Health Agency, Silver Spring, MD, USA

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**Fig. 1** Plaster femur models demonstrating insertion of the Küntscher nail from an exhibit by Col. August W. Spittler MC, USA are shown. On the top model, the guide pin inserted through the trochanter is used to channel the intramedullary nail into the broken femur. The lower model shows the intramedullary nail in place. The exhibit was made by the Medical Illustration Service of the Armed Forces Institute of Pathology [M-550.10473 & M-550.10474]. (Disclosure: This image has been cropped to emphasize the subject.) (Department of Defense photo by Matthew Breitbart).

along the guide pin as the surgeon brought the fracture ends together, following which the guide pin was removed. Küntscher nails could also be used for tibial and humeral fractures [1].

Küntscher went on to describe what was then a daunting procedure in his book, *The Marrow Nailing Method*:

“The surgeon, who for the first time is confronted with the problem of marrow nailing, is quite concerned when he sees how big the nail appears in the X-ray picture as it lies in the bone ... If the surgeon does not have the opportunity to observe the patient, the X-ray picture will give rise to considerable apprehension with respect to this method. Marrow-nailing judged under these circumstances will appear the most barbaric approach so far practiced in the treatment of bone fractures” [6].

Küntscher's procedure could no longer be ignored by the Germans. It

greatly accelerated the rehabilitation process for German soldiers; patients who previously were immobilized or bedbound for weeks, could begin instead to walk in mere days. Healing often occurred within 5 to 7 weeks of the procedure. Once the patient's fracture healed, Küntscher removed the nail [3].

Although the technique spread quickly throughout Europe, there were problems, and surgeons' initial experiences with intramedullary nailing varied widely. On the Italian front, surgeons used the procedure at the Cernobbio Hospital with disastrous results; many patients developed osteomyelitis, and several died from shock [8]. By contrast, Carl Habler (1894-1956), consulting surgeon at Luftwaffe Hospital in Braunschweig, Germany, achieved healing in 162 of the 171 patients whose fractured legs were treated by nailing. Approximately 149 of the 162 recovered without any shortening or malalignment. His use of the procedure reduced patient recovery time by more than a year [3].

Küntscher's technique attracted the attention of American and British surgeons examining repatriated prisoners of war. Commander Harry Alvis (1910-2001) of the Technical Section (Medical) of European Command Headquarters was one of the people responsible for evaluating Nazi-era medical technology. After investigating the Küntscher nail, Commander Alvis encouraged Küntscher to write his first book about the technique in 1948, and had it translated into English [4].

American military medical journals were among the earliest to publish the technique. In 1947, the *Medical Bulletin of the U.S. Army Forces European Theater*, published an abstract based on a translation of Küntscher's animal experiments back in 1941. In 1949, the *U.S. Navy Medical Bulletin* published an editorial describing the advantages of the technique, followed by a three-part translation detailing several surgeons' clinical experiences with the technique [3].

Two years later, the marrow nailing technique was accepted in military hospitals. Colonel August W. Spittler MC, USA noted: “Army hospitals in the Zone of the Interior have the same needs for this treatment as civilian hospitals, as hospital bed and hospital time must be conserved” [9].

Küntscher ultimately was embraced by the postwar American military surgeons who saw the potential of his surgical technique, which remains a mainstay of fracture care to this day.

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