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The Nail in the Bone: The History of Diaphyseal Femoral Fracture Repair (Part I of II)

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Editor's Note: This second-year student paper was given the top award in 2005 for a history of medicine paper at the University of Nevada School of Medicine. The editor has made a few deletions and corrections appropriate to the publication of Greasewood Tablettes. Other than the history of the treatment of femoral fractures, this paper demonstrates the humane treatment of American soldiers regardless of race, color, or religion by German doctors during World War II (WW II). There were certainly exceptions to this rule, but this philosophy was verified by Dr. Adolph Rosenauer, who was a member of the German Armed Forces during World War II and who later practiced neurosurgery in Reno. We regret to inform our readers that Dr. Rosenauer died May 30, 2006.

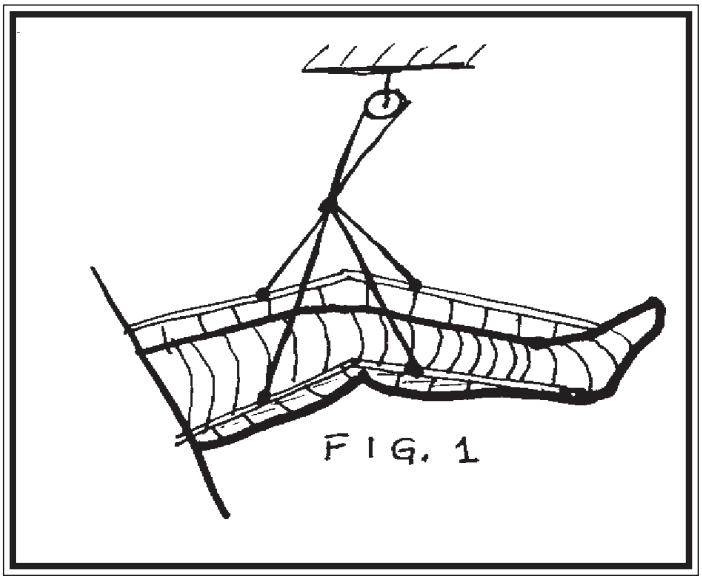
"The traumatic surgery of this war has constituted a tremendous vivisection experimental laboratory in which not mice, nor rabbits, nor guinea pigs, nor dogs have been the subjects of experiments, but human beings, the choicest young men of the civilized world."

-Lewis S. Pilcher, MD (First editor of the Annals of Surgery) 1919

The treatment of mid-shaft femoral fractures has significantly evolved in the last 150 years. This paper will provide the timeline and evaluate the treatment of these morbid injuries, which evolved from amputation during the Civil War, to the development and propagation of the Kuntscher nail previous to World War II, and later to the interlocking nail of Russell-Taylor. This article will look at the historical reasons for the different techniques and how they have improved patient outcome.

During the Civil War, there was little concern about the protection of upper extremity fractures because these patients could sit upright in an ambulance and adjust themselves to prevent pain and misalignment. This was not the case with lower limb fractures, particularly those of the femur. These fractures were considered among the gravest of all wounds: the patients suffered terribly, not only on the battlefield but following attempts at manipulation. Stabilization brought about a dilemma—amputation vs. non-surgery. Despite the fact that nearly 60,000 amputations were performed during the Civil War, this was a great surgical controversy. Conservative surgeons elected to save the leg without surgery whereas a more radical viewpoint opted for amputation. Civil War surgeons basically had only two treatment modalities.

At the beginning of the Civil War, the U.S. Army Medical Department furnished a Smith's anterior splint as an aid in the treatment of leg fractures. However, the splint was clumsy and not well received because incorrect application could result in ulceration and malunion of bone.



This splint was a wire susupension device (traction) intended for the treatment of middle or lower femoral fracture.

Suspension of the splint was from the ceiling, and traction of the limb was obtained by moving the bed backward or forward from the ceiling attachment. For proximal fractures of the femur, surgeons were told to suspend the weight farther from the body whereas in distal fractures, the suspension was more vertically placed. These patients were condemned to months in traction.

The next forward step was the Hodgen cradle splint, which has been called "one of the greatest contributions to orthopedics during the Civil War." It evolved from a combination of the Smith's anterior splint and the Buck's strip bandage support, which was for acute treatment. This splint was a wire suspension device (traction) intended for the treatment of middle or lower femoral fractures (Fig. 1). The use of this splint was said to ensure complete extension of the limb while preventing contraction. The Hodgen's cradle splint was the forerunner of the well know Thomas splint, used in WW I.

Without the knowledge of antisepsis, soldiers with open (compound) fractures were treated in unsanitary conditions. It was only natural that the conservative treatment of splinting and debridement would lead to infection, gangrene, and death. Ironically, the source of the infection was often from the surgeon's own hands rummaging through the wound.

In June 1861, the U.S. Sanitary Commission, a civilian organized solders' relief society, authorized the printing of *Directions to Army Surgeons on the Field of Battle*, which was distributed to battlefield surgeons in the North. The publication took a conservative viewpoint in terms of amputation; however, it was followed by a second directive from the U.S. Sanitary Commission stating that when the limb's soft tissue was badly lacerated or the bone had been badly shattered and was penetrating the skin, it was best to amputate immediately (especially if the joints were involved). Even though amputation often solved the complications of limb deformation and gangrene, dirty instruments and unsanitary water used during the procedure caused a multitude of infections. Hence neither splinting nor amputation was superior. Unfortunately for the victims, complete femoral fractures had a death rate of about 32%.

Between the Civil War and World War I, the most significant advances concerning femoral fractures probably can be split between Pasteur's discovery in 1865 of asepsis and Roentgen's discovery of X-Rays in 1895. The discovery of asepsis contributed to a diminution of surgical infections whereas the discovery of X-Rays allowed for the closed reduction of fractures.

Even with the knowledge of asepsis on World War I battlefields, infection was inevitable. Because the European WW I battlefields had been fertilized by every known farm animal for hundreds of years, every trench warfare soldier was a potential carrier for infection. Thus, treatment of femoral fractures in the first two years of WW I was disastrous with a reported mortality rate of nearly 80%, which was much higher than the 32% of the Civil War. If this is true, one must ask how high really was Civil War mortality. Finally, there was a revival of Listerism, which was treatment of wounds by using antiseptic technique, and survival rates increased.

The Thomas splint was made famous during WW I for the treatment of acute femoral fracture injuries, but it was not a good long-term treatment solution. Hence, even though more than 50 years had elapsed since the end of the Civil War, the basic treatment modalities for femoral fractures—other than aseptic technique on the battlefield—had not significantly improved.

A large technological advance in orthopedic surgery (and in medicine) between WW I and II and was the discovery of penicillin by Alexander Fleming in 1928. This antibiotic, in combination with antiseptic technique, contributed to a massive reduction in diaphyseal femoral fracture morbidity and mortality by greatly reducing infection.

Part II will deal with Kuntscher's nail (The Naile in the Bone) and subsequent advances.

EXECUTIVE ORDER 9066 AND THE MASS EVACUATION OF JAPANESE FROM WEST COAST STATES

Part II of III

Editor's note: The first article (Fall 2005) in this series was erroneously listed as the second article in the series. The present article is the second, and the series will end with the description of the medical conditions.

"Population of North Portland assembly center rose from 1707 to 1708 Thursday with birth of the first baby there—a son, 7 pounds and 10 ounces to Mr. and Mrs. Yoshio Maehara." (Oregonian Newspaper, Portland, Oregon, May 8, 1942) This is the caption found in the Oregonian after my mother gave birth to me at the makeshift hospital in the Center, rather than choosing to have the birth in the Portland Hospital. This decision was made by her because …there was a Japanese doctor in the Center and I didn't trust anyone else." Why did she and many other pregnant women even have to make this decision?

On December 8, 1942, the day after the bombing of Pearl Harbor, the United States declared war on Japan. The very day of the bombing, over 1300 Issei (first generation Japanese) who were prominent members of the Japanese community were arrested by the Department of Justice. Many of these individuals were eventually sent to internment camps which were under the jurisdiction of the Justice Department and separate from those established by the military. Assets of Japanese (bank accounts, businesses, homes, etc) were almost immediately frozen by the Department of Treasury. The long established resentment toward the Japanese now had a rallying point, to which all Americans could relate. Prominent politicians, including Earl Warren who was the California State Attorney General, along with special-interest groups including the Native Sons of the Golden West, the California Grange Association, and the American Legion, well-known journalists (Walter Lippmann, Edward R. Murrow, and Henry McLemore), as well as the Hearst and McClatchy newspapers called for the mass removal of Japanese from the West Coast.

Lieutenant General John L. DeWitt, the Military Commander of the Western Defense Command, who supported the mass evacuation of Japanese living in the coastal states, wrote that "The evacuation was impelled by military necessity." (*Final Report: Japanese Evacuation From The West Coast 1942*, United States Printing Office, Washington: 1943, p. vii). His thinking which was not the most logical is indicated by this statement: …."the very fact that no sabotage has taken place to date is disturbing and confirming indication that such action will be taken" (*Manzanar: Commentary by John Hersey*, 1988, Times Books, New York, p. 44). Syndicated columnist Henry McLemore wrote: I am for the immediate removal of every Japanese on the West Coast to a point deep in the interior. I don't mean a nice part of the interior either. Herd'em up, pack'em off and give'em the inside room in the badlands. Let'em be pinched, hurt, hungry and dead up against it…. (tenBroek, J., Barnhart, E.N., and Mason, F., *Prejudice, War, and the Constitution*, 1954, University of California Press, Berkeley).

Despite opposition by several of the administration's top officials, including U.S. Attorney General Francis Biddle, President Roosevelt signed Executive Order 9066 on February 19, 1942. This order provided for the forced evacuation of over 110,000 Japanese living in designated exclusion areas in Washington, Oregon, California, Arizona, and the territory of Alaska. "Some 2,000 children under 5 years of age, 15,500 children under 10 years of age, 2,000 persons over 65 years of age, and 1,000 seriously handicapped or bedridden persons were all shipped off to detention camps" (*Americans of Japanese Ancestry and the United States Constitution 1787-1987*, National Japanese American Historical Society, San Francisco, 1987).

Six days after the signing of Executive order 9066, DeWitt ordered the removal of 3,000 Japanese from the fishing village of Terminal Island, which was also known as East San Pedro in Los Angeles County. The order gave the residents 24 hours to finalize all of their affairs, which included selling their homes, businesses, and other material possessions. On March 2, 1942, General DeWitt identified the western half of Washington, Oregon, and California and the southern portion of Arizona as the military exclusion area and on March 24 ordered the removal of all people of Japanese ancestry from these areas. The Wartime Civilian Control Administration (WCCA), which was administered by the military, was in charge of the evacuation of the Japanese, and the War Relocation Authority (WRA), a civilian agency, was responsible for the administration of the internment camps. Printed exclusion orders were displayed publicly in Japanese communities

early in April, 1942 ordering a responsible member of each family and all single persons to report to a specified area where they would register the family, be given a number, and told when and where to report.

Initially, evacuees were placed in temporary assembly centers which were county fairgrounds, racehorse tracks, and other facilities which could accommodate large numbers of people. My parents were informed that they had two weeks before they were to be evicted and were allowed to take one carry-on item per person. My father packed as much as he could into a big box that he could barely lift resulting in a back injury. To this day he has chronic back pain. My mother was almost nine months pregnant with me when they were taken to the temporary assembly center at the Pacific International Livestock Exposition Pavilion. This was one of 15 similar facilities and encompassed an 11 acre area, which housed "over 3,600 evacuees under one roof in the pavilion, which was subdivided into apartments, a kitchen, and dining hall (J.F. Burton and Farrell, M.M., *This is Minidoka*, Western Archeological and Conservation Center, National Park Service, U.S. Department of Interior, Publications in Archeology 80, 2001, p. 7). This assembly center was one of the smaller ones, with Santa Anita and its 18,000 plus evacuees housing the most number of Japanese. Because these facilities were pressed into service within such a short period of time between the signing of Executive Order 9066 and the mass evacuation, the assembly centers were generally inadequate for housing the evacuees. The facilities resembled prisoner of war camps, as they were surrounded by barbed wire fences and patrolled by armed military guards. Emi Somekawa stated that "The Portland Assembly Center was terrible……..We were put into a cubicle that just had plywood walls and it was a horse stall with planks on the floor with about an inch of space between them. You'd find grass growing through the planks…….and the stench that came from the ground….. was just terrible……. (J. Tateichi, *And Justice for All*, University of Washington Press, Seattle and London, 1984, pp. 147-148).

The next article in this series will focus on life in the assembly centers.

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