Commentary

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Commentary: Evolution of the Hoffmann Fixators

David Seligson*

Chief of Orthopedics, University of Louisville Hospital, Louisville, KY, United States

***Corresponding author:** David Seligson, Chief of Orthopedics, University of Louisville Hospital, Louisville, KY, United States; E-mail: david.seligson@louisville.edu

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Why research Raoul Hoffmann and the evolution of external skeletal fixation? [1] As a young surgeon assigned to duty on the Hospital Ship Sanctuary during the Vietnam War, I was flown in and reported to the Commanding Officer. The Captain said my assignment was in Orthopedics. I replied 'my main interest is in Neurosurgery.' He said there were no neurosurgeons on the hospital ship so he could send me in-country to do Pediatrics since "Pediatrics is like orthopedics," or I could take the orthopedic assignment. I decided to stay on board.

My job consisted in treating survivors of skeletal injuries–vigorous young Marines cut down by land mines–"toe poppers." Reduced to bed rest these previously active young combatants were brought each morning to the clinic for dressing changes without anesthesia. These guys had lost their mobility and their freedom. When asked what they wanted most to do when they got over their injury, the answer invariably was to "get back on a motorcycle." There was no external skeletal fixation in the Vietnam theatre of operations.

Back in the States, after orthopedic residency, my first job was at the University of Vermont as a trauma orthopedist. An equipment company sent me to Baltimore for an International Symposium about Hoffmann External Fixation. The idea of mobility in a fixateur despite an unhealed fracture caught my attention. In those days, use of a frame for a closed fracture was not accepted. Nonetheless I started doing just that- treating a closed fresh fracture in an external fixateur and mobilizing the patient. Success and many symposiums more introduced me to the work of Raoul Hoffmann of Geneva and his successors in the promotion of the ambulatory care of simple and complex fractures using external skeletal fixation.

As my use of fixateurs increased, I was invited to courses and symposia in Europe. At one meeting in Lausanne, there was a tribute to Raoul Hoffmann. One slide showed Hoffmann on a bicycle with an external fixateur on his leg! The story was that Hoffmann fractured his tibia in Geneva during the war, had his assistant reduce the fracture with a fixateur, and then Hoffmann resumed his usual routine of bicycling to work until the fracture healed. This example of functional fracture healing with restoration of the integrity and capacity of the individual is one I recall frequently. I wanted that picture for the article about the history of Raoul Hoffmann and his external fixateur, but have been unable to get a copy of the photograph.

Hoffmann was "double boarded:" he had a Doctorate not only in Medicine from the University of Geneva, but also in Divinity. For his military service with the Swiss Alpine Patrol he insisted on a role as a line officer, not a medical officer. It was in this service that he became preoccupied with the treatment of fractures and looked for a method to improve the quality of fracture reduction without the risks of open surgery. In contrast, the treatment of broken bones with plates usually requires an incision- the fracture is exposed (à ciel ouvert,) the bone is realigned and a bone plate placed. Sometimes a plate can be slid along the bone from a small incision, but then the alignment may not be as precise. Hoffmann had the idea of 'bone handles' or pin groups for the closed reduction of fractures. Two or three metal pins screwed into bone can be held in a pin clamp outside the body and then used for fracture manipulation. These concepts created a method of functional fracture healing based on external fixation. There are only small wounds from the pins to heal and the soft tissues are not separated from the skeleton. External fixation is a less disturbing treatment for the body. Return to function is faster since the tissue damage is less. The pins can be simply removed. Taking out a bone plate requires another operation.

The Geneva-based external fixation manufacturers promoted a series of courses in Freudenstadt in the Black Forest in Germany. Here not only were there courses, but also during breaks one could walk around the great square in the center of Freudenstadt. There the patients of the course director – Dr. Gernot Asche could be seen out on the streets and in the snow walking around, smoking, and talking perhaps resting their limbs with the external fixateurs on a crutch. Asche treated so many fractures with frames that an external fixateur was a normal sight on the streets of Freudenstadt. Dr. Asche emphasized creating simple, modular exoskeletons and encouraged his patients to return to as much normal activity as possible. In one video his patient is swimming in the town pool with a fixateur on his leg. So it is troublesome still today to see patients with fixateurs in wheelchairs not utilizing the full potential of the fixation appliance. As discussed in the article about the evolution of external fixation, the concept of modular, functional, simple appliances was an important part of the concept promoted by the external fixation design team of which Asche was a member.

In the story about fixateurs, old Dr. Hoffmann never really retired. He travelled across Switzerland to Thurgau where he continued to work with a younger colleague to apply external fixation for fresh fractures. Finally in his 84th year the hospital director in Thurgau changed and the new chief was a supporter of the manufacturers of bone plates. These German Swiss plate proponents had their revenge and sent all of Hoffmann's fixateurs back to Geneva substituting their own much less versatile equipment. Today the movement for bone plating surgery still has the upper hand. Plating equipment has become more elaborate and in some respects more destructive. Fixateurs are used for mass casualties, for compound fractures, for fractures which cannot possibly be plated, and for deformities [2,3]. A famous fracture orthopedist told me recently at a meeting that the x-ray of his fractured bone looked perfect with several plates and many screws, but it hurt and he hadn't been able to enjoy his life for the past six months because he could not really put his foot on the ground without discomfort.

In sum, we underestimate the life changes caused by skeletal trauma. Simple acts like getting out of a chair, eating, and washing can become burdensome. Many resort to the euphoria of opioids in order to cope and thereby permanently and negatively alter their internal chemistry. These patients have a high risk for acquiring antisocial coping skills in order to maintain their drug-altered homeostasis [4].

The last time I met the famous traumatologist Jorg Böhler was on a train platform in Vienna. "David" he said, "we ought to write a book called Percutaneous Osteosynthesis–important operations through small holes." Thinking about how better to care for the injured led to my study of the history and the themes of fracture treatment proposed by Raoul Hoffmann and his school.

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