

Ralph Bingham Cloward: A Historical Vignette

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Dr Ralph Bingham Cloward was an American neurosurgeon who revolutionized spinal surgery with his bold and innovative techniques (Fig. 1). He described posterior lumbar interbody fusion (PLIF), which became a vital and landmark technique in the treatment of ruptured lumbar intervertebral discs. He also described anterior cervical discectomy and fusion for the treatment of cervical disc degenerative disease.

Dr Cloward was born on September 24, 1908, in Salt Lake City, Utah.¹ He attended medical school in Utah and finished his degree in medicine at Rush Medical School, Chicago in 1934. He stayed in Chicago after this and completed his residency in neurosurgery at the University of Chicago. After finishing this, Dr. Cloward moved to Hawaii and became the first practicing neurosurgeon in those Islands, in 1938.

He was working in Hawaii, when the attack on Pearl Harbour occurred and gained a lot of experience from this time, later publishing "War Injuries to the Head" in the *Journal of the American Medical Association* in 1942.² He was assigned to stay in Hawaii for the remainder of the war. His surgeries there earned him mentions in many top tier magazines and went on to receive a commendation from Franklin D. Roosevelt.

During this time there was great controversy on what was the best treatment for sciatica, due to a ruptured lumbar intervertebral disc. Dandy, a very famous neurosurgeon in America, believed that the best treatment was a complete discectomy.³ Dr Cloward believed the complete opposite. He proposed an entirely new idea—posterior lumbar interbody fusion. "The procedure is three operations in one: removal of the bone grafts,



Fig. 1: Portrait of Dr Ralph Bingham Cloward

laminectomy, and removal of the intervertebral disc and lastly, the spinal fusion."⁴

This was met with great controversy and criticism and in one of his articles, Dr Dandy said, "fusions by autogenous grafts to the lumbar spine will not accomplish the same result." He believed that Dr Cloward's technique was flawed and that the protruding disc in question is only covered up by Cloward's technique and so this does not solve the symptomatic problems. Another neurosurgeon Dr Burton M. Shinnars said: "Spinal fusion done after the removal of disc protrusions does not prevent postoperative backache."⁵

In his published article in the *Journal of Neurosurgery*; "The Treatment of Ruptured Lumbar Intervertebral Discs by Vertebral Body fusion", Cloward mentioned Dandy and Shinnars by name and proceeded to say why they were both wrong.⁴ Cloward believed that "once a ruptured disc, always a ruptured disc"⁴ (Cloward, 1953). This battle between Dandy and Cloward can be compared to that of Muhammad Ali vs. Joe Frazier—two giants in their field competing to see who was better. Cloward performed his first PLIF in 1943,⁶ and continued to do so once he was happy with the results of the technique. The procedure of fusing the vertebral bodies through the spinal canal was considered too dangerous at the time, to be performed on a continual basis. The main difficulty was finding a way to expose the lesion by retraction. This would often be done by the surgeon using a narrow nerve retractor. The surgeon would have to hold this retractor throughout the operation, reducing the surgeon to use of only one hand. This was the source of great difficulty in

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this procedure. However, Cloward solved this problem by creating a new surgical instrument, which he called the self-retaining dura retractor.⁷ The instrument retracted the area of interest without requiring the surgeon to hold it and thus freeing their hand.

Many years later in 1985, he published an update⁸ and said that based on his 45 years of experience; simple discectomy, decompressive laminectomy, and chemonucleolysis should be abolished and that PLIF “is the answer to the treatment of diseases of the lumbar spine and may be the operation of the future.”⁸

Cloward did not stop there. He started to explore another area which was troubling neurosurgeons - treatment of disease of intervertebral discs in the cervical region. In the process, he created another surgical technique which would later be named the “Cloward procedure”. In 1958 he published an article about this in the *Journal of Neurosurgery*.⁹ He stated that in theory the same method of PLIF could be employed in the cervical spine. However, he later realized that due to anatomical differences, this provided far greater technical difficulties. He then thought about using an anterior approach instead of a posterior one—anterior cervical discectomy and fusion.

In the same 1958 article, he presented a 47-patient study, to illustrate the effectiveness of his method. He found that 42 out of the 47 patients were completely relieved of pain, and in the other 5 patients, the pain had improved.

However, Cloward was again mired in controversy. During this time two other neurosurgeons Smith and Robinson created another technique named the “Smith-Robinson” method, which was also an anterior cervical discectomy and fusion. The main difference between these techniques was the need for complete removal of discal structures. Cloward preferred the complete removal of the disc and osteophytes, while Smith-Robinson did not remove the whole disc and did not remove the osteophytes. They believed the osteophytes would disappear upon spinal fusion. Despite the differences, both methods were groundbreaking. Conservative management for cervical disc herniation is often

ineffective and thus a surgical solution is indicated. Anatomical visualization is superior in the anterior methods to posterior ones and allows safer removal of the intervertebral discs and osteophytes which is what made Cloward’s procedure revolutionary. In an article he published regarding the operative results of his procedure, he found that the fusion rate was 97–98% and that out of the 2000 patients included in his report, there was a symptomatic improvement in 94%.¹⁰ This illustrates the success of his method.

Ralph Cloward was a thinker, innovator, and an inventor. In addition to his surgical techniques, he also created intricate instruments to help improve his techniques. His inventive thinking laid the foundation of what is spinal surgery today, and his many contributions form the bedrock of modern neurosurgery.

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