Thoralf M. Sundt, Jr., M.D., 1930–1992

Patrick J. Kelly, M.D.

Department of Neurologic Surgery, Mayo Clinic, Rochester, Minnesota

Thor Sundt died at his home on September 9, 1992, following a 7½-year battle with multiple myeloma. He was 62. He had stepped down as chairman of the Department of Neurologic Surgery at the Mayo Clinic in July when his pain had increased to a level that prevented him from doing surgery. Nonetheless, he continued to perform his duties as Editor of the Journal of Neurosurgery and, during the last week of his life, continued to review manuscripts from his bed; it had become too painful to stand or sit. This ultimate dedication to his work would surprise no one who knew this remarkable man.

Thor had been awarded enough honors and accolades to satisfy several men. He was one of the few neurosurgeons ever inducted into the Institute of Medicine of the National Academy of Science. He was awarded the Grass Prize and Medal from the Society of Neurological Surgeons in 1991, was the honored guest of the Congress of Neurological Surgeons in 1989, and was the first appointee to the Vernon F. and Earline Dale Professorship in Neurosurgery at the Mayo Clinic in 1978. The list of awards and honorary visiting professorships and lectureships goes on and on, but Thor wouldn’t have wanted them listed here.

Thor’s dedication may seem the product of a lifelong commitment to neurosurgery, but it wasn’t. His family founded, in Tucson, Arizona, the very successful M. M. Sundt Construction Company which lists the building of Los Alamos as one of their many accomplishments. Thor grew up in Tucson and, like his brothers, could have had a successful career as a contractor working in the family business. However, the Sundt family also had a strong military tradition and Thor decided to follow the examples set by his father, who had fought in France in World War I, and two of his uncles, both West Point graduates. He entered the U.S. Military Academy in 1948 at the age of 18.

Thor thrived on the discipline at West Point, but the rigors were not for everyone; of the original 800 cadets that entered the Academy with him, only 500 graduated. Upon graduation from West Point, he entered active duty as a Second Lieutenant and was assigned to Korea in 1952. He started out as a platoon leader, but was rapidly promoted to company commander in the 32nd Regimental Combat Team. Thor survived many battles, including the infamous Pork Chop Hill in which U.S. casualties for most companies were between 60% and 70%. For valor, Thor was awarded the Bronze Star with oak leaf cluster.

An exemplary officer, Thor distinguished himself in the military. In fact, the U.S. Military Academy at West Point recently honored him with their Distinguished Alumnus Award. However, his enthusiasm for a military career waned after the Korean War. He found the peacetime Army uninteresting, and it was at this time that he decided to pursue a career in medicine. Nonetheless, the legacy of West Point and the Army provided the discipline and efficiency that helped mold his character.

Thor graduated from the University of Tennessee Medical School in Memphis in 1959 and was a member of Alpha Omega Alpha. He completed his internship at John Gaston Hospital in Memphis and his neurosurgery residency under Drs. Eustace Semmes and Francis Murphey at the University of Tennessee. These men undoubtedly had a strong influence on Thor. Throughout his life, he enjoyed telling anecdotes about them and quoted them whenever the opportunity arose.

Thor’s first contact with the Mayo Clinic occurred during his residency when he came to Rochester for a 6-month rotation to study medical neurology. The impressive array and volume of neurosurgical cases and the skill of Drs. Ross Miller and Collin MacCarty convinced him to return to the Mayo Clinic upon completion of his residency.

Thor saw the utility of the operating microscope early on and, while still a resident, convinced Dr. Semmes to acquire one for the neurosurgical laboratory in 1963. In particular, he envisioned its application in the surgical treatment of aneurysms. The results of open aneurysm surgery in the early 1960’s were poor. One serious problem that Thor noted was that the aneurysm neck was occasionally ripped from the parent vessel, necessitating proximal and distal clipping of the parent vessel in order to stop the bleeding, with cerebral infarction as the unfortunate consequence. To deal with this problem, he with George Kees developed the well-known encircling clip graft which bears their names. However, Sundt saw the problem with this new device almost immediately: the clip graft not only occluded the tear in the parent vessel but could also occlude the origins of perforating vessels that exited from the in-
jured artery. This stimulated his interest in the pathogenesis and treatment of ischemic stroke.

Following completion of his residency, Thor returned to the Mayo Clinic for a research fellowship. There, he and a neurologist, Dr. A. G. Waltz, established a stroke laboratory and developed an experimental model for ischemia in cats. They made many incisive observations of evolutionary microvascular changes in stroke; in particular, they found that hemodilution could reduce neurological damage in small infarcts. The technical aspects of their experimental model were important to the development of Sundt as a superb microvascular surgeon: he employed the operating microscope to open the sylvian fissure and clip the middle cerebral artery. This exposure technique must have seemed simple to employ in humans after he had been doing it in cats! And employ it he did: he rejoined the faculty of the University of Tennessee and performed over 150 microsurgical aneurysm repairs between 1966 and 1969.

Thor was offered and accepted a staff position at the Mayo Clinic in April, 1969. His reputation as a skilled aneurysm surgeon resulted in a large referral practice. Thor had learned to perform carotid endarterectomy under the tutelage of Dr. Murphey in Memphis, but at the Mayo Clinic in 1969 carotid endarterectomy was a procedure done by general vascular surgeons. However, Thor did them better. In addition, he was not the type of individual to accept complications without critically examining their cause, and he was constantly trying to improve his results. He devised the carotid shunt in 1969, developed methods for intraoperative cerebral blood flow measurements with the aid of his friend and colleague in anesthesiology, Dr. Jack Michenfelder, and implemented a procedure for constant electroencephalographic monitoring during carotid endarterectomy with Dr. Frank Sharbrough from the Department of Neurology. All of these methods remain in regular use today at the Mayo Clinic and at other institutions. The immediate result of these contributions and Sundt's surgical skill was an impressive reduction in postoperative morbidity and a shift of carotid endarterectomies from general vascular surgery to neurosurgery. In less than 2 years, carotid endarterectomy had become firmly established as a neurosurgical procedure. Thor was very much an intuitive thinker, he would
play a hunch and usually be right. This was true not only in his research efforts but also in his clinical judgment. He accepted seemingly "impossible" aneurysms or other vascular cases and, to the amazement of his skeptical colleagues, would pull the rabbit out of the hat. Many times he was just plain lucky, but he was also good. His surgical technique reflected his demeanor: direct, no nonsense, get the job done, persist until what was intended was accomplished and then get out of there. He was not a time waster in or out of the operating room.

In the period from 1969 to 1991, Sundt performed an unprecedented number of surgical procedures, including more than 1700 carotid endarterectomies, more than 1300 intracranial aneurysm surgeries, and over 250 arterovenous malformation operations. Some of this experience is reflected in his two excellent textbooks: Surgical Techniques for Saccular and Giant Aneurysms (1990) and Occlusive Cerebrovascular Disease, Diagnosis and Management (1987). His results for aneurysm surgery published in the New England Journal of Medicine in 1978 became the "gold standard," with an overall surgical mortality rate of 5% and a 1.6% mortality rate in patients with normal preoperative neurological function. Not reflected in these statistics is the fact that many of his cases were referred by good neurosurgeons who, because of daunting technical concerns, didn't want to perform the surgeries.

In spite of this oppressively heavy clinical load, Thor remained active in his vascular laboratory, continuing his investigations on the mechanisms of cerebral ischemia in general and ultimately cerebral vasospasm in particular. His scientific output was greater than many of his colleagues who were doing research full time! When did he find the time? Nights and weekends mostly, and after rounds and before surgery and in between cases. As stated above, he was not a time waster.

All of the above would suggest that Thor was an ambitious man. He was. He was also a very honest man. He never exaggerated his surgical results and readily admitted complications and mistakes. The morality of scientific integrity aside, he was honest with himself and others for pragmatic reasons. He really wanted to know what went wrong and how things could be improved. He valued the opinions of everyone; colleagues, residents, and the nursing staff. If someone had a better idea or observation, Thor would gladly accept it regardless of the source. He was secure in his position and was not proud.

His incredible productivity in basic laboratory and clinical research is reflected in more than 270 scientific articles and book chapters written by Sundt with young associates who worked in his laboratory under his direction. He was very generous to any resident who showed even the slightest interest in a research project. The resident's name usually went first on the paper even though Thor had done the majority of the work.

Thor became chairman of the Department of Neurologic Surgery at the Mayo Clinic in 1980. He had gained the respect of colleagues for his clinical judgment, surgical skill, and self-sacrificing devotion to neurosurgery, and he was admired for his intellectual honesty and scientific curiosity.

Undoubtedly his military background must have had something to do with his success. In the military, there are two types of commanders: leaders and drivers. Thor was unquestionably a leader. As a company commander in Korea, he did not ask his troops to do anything that he wouldn't do himself; the same held true with Thor as chairman of the Department of Neurologic Surgery. He continued to do more surgical cases than most of his neurosurgical colleagues, in spite of the fact that he now had administrative duties for the department and for one of the largest neurosurgical residency programs in the world. Curiously, he did not find it necessary to delegate administrative responsibilities. In addition, he did not "dump" uninteresting clinical cases on junior colleagues. He would do his share of subdural, back, and shunt procedures as well as giant aneurysms and arterovenous malformations.

Thor took his job as chairman and program director very seriously. But he honestly cared about everyone associated with his department, staff, residents, nurses, and secretaries, and could always be depended upon to give help and guidance when required. He had a special fondness for his residents and was always concerned about resident teaching and the quality of their operative experience. Thor was someone to whom a resident could turn for help, and he enjoyed this role.

His office was at all times accessible to everyone; he was never too busy. In fact, Thor seemed to enjoy being in a position in which he was able to give advice and aid to others. However, one rarely went to Thor's office to chat; one came to the point quickly. It was not unusual for him to pick up a telephone to deal with a problem before the person who had brought it to his attention had finished his/her sentence. But he had a short attention span for small and petty concerns. He avoided minor political squabbles, usually by giving in or retreating; to him, they were a waste of time. Because of this, some erroneously thought him a "push-over" until they eventually pushed an issue that Thor considered important; then, they had a tiger by the tail and they lost. When dealing with a problem, Thor's persistence was legendary. It didn't matter how long it took or whose heads he had to go over, he never quit until he got what he wanted.

Anyone could trust Thor. He meant what he said and did as he promised. Similarly, he trusted people and would always accept them at face value. He did not speculate on ulterior motives even when it was clear to all around him that he was being led down the primrose path. He always saw the best in people and would ignore many faults in people he liked. Thor would not resent or hold grudges for those who proved themselves dishonest, untrustworthy, or vindictive; he would honestly forget not only the incident but usually the individual's name as well. But he never forgot a kindness or a favor, and remained fiercely loyal to friends. And he had many of them.

Thor was also uncompromisingly loyal to any institution with which he had ever been associated. He honestly believed that they were the best. He was proud

J. Neurosurg. / Volume 78 / January, 1993

3
of West Point, the Army, his department, and, of course, the Mayo Clinic. His loyalty usually expanded to anything associated with these institutions, sometimes to far-fetched extremes such as to Northwest Airlines because they provided air service to Rochester, Minnesota.

Thor was unpretentious and uncomplicated, endearingly kind, and had a peculiar self-deprecating humor that put everyone at ease. There was nothing in his manner or conversation that would ever have indicated that Thor was a consummate surgeon and world class scientist with an international reputation and referral base. As his reputation grew and more honors were bestowed upon him, he remained humble and at times even a little embarrassed at the attention. Thor's reaction to each honor was curious: he was usually surprised when selected for any award and genuinely touched by the thoughtfulness of the parties responsible that they had ever considered him.

Thor could be direct and abrupt at times, but was deeply troubled if he found that he had hurt someone's feelings. It then became a major priority with him to set things right. He was never mean-spirited or vindictive, and his sincere kindness and caring for others was always apparent. He had no enemies. Even those who disagreed with him respected and liked him.

Thor was not a politician, and he had little time or patience for small talk and committee work. However, his concern for quality neurosurgical education prompted his involvement with the Residency Review Committee of the American Medical Association and the American Board of Neurological Surgery, in which he served on the Examination Committee (1984-1990), as chairman of the Credentials Committee (1986-1990), and as vice-chairman of the Board (1989-1990).

Thor served on the editorial board of the Journal of Neurosurgery starting in 1981, was chairman of the board in 1986 and 1987 and book review editor from 1988 to 1989, and became Editor in 1989. He was very proud of the Journal, the selectivity and quality of its papers, and he considered it the best neuroscience journal in the world. His personal discipline, efficiency, scientific integrity, and verbal ability made him a very effective editor. Submitted manuscripts were processed quickly. He did not believe in the form rejection letter, but usually offered very specific advice to authors on how to improve papers that he was unable to publish.

Thor had a fondness for military history and aphorisms. In his professional dealings he would frequently draw comparisons to battlefield scenarios. In fact, he thrived on battles. But he chose his battles wisely, understood his opponent (be it a difficult aneurysm, hospital administrator, or another department), mobilized his allies, waited for the right moment, and attacked with a superior force. He did not let up on the attack until he had won. When he won, he did not gloat and was merciful to the vanquished. "Patrick," he told me once. "You have to kill them with kindness."

However, there was one battle that Thor could not win, the one against the disease that eventually claimed his life, but he put up one hell of a fight. Diffuse skeletal involvement was already present at the time multiple myeloma was first diagnosed in 1985. He was given a prognosis of 6 months to 2 years. Bone pain, at times severe, slowed and stiffened his movements but did not stop him from operating, administering his department, seeing his patients, or serving as editor of the Journal. He authored or co-authored 82 papers and book chapters during this time, completed his book on occlusive vascular disease, and wrote another on giant aneurysms. All of this is remarkable considering the fact that he was in almost constant pain. This affected him when he sat, when he walked, and when recumbent. It interrupted his sleep. Chemotherapy helped some and he went through several courses of it, sometimes over the objections of his oncologist. But Thor rarely complained. When asked how he was doing, he would invariably say that he was better, even when it was clear that he was not.

Thor didn't want anyone to feel sorry for him and even joked about his disease and impending death. Once, when pushed to attend a congress in which he had little interest, he stated, "Dead or alive, I won't be there." He preferred work, and from his work, his patients, and his coworkers, he derived the strength to continue. Some said it was courage. Perhaps it was. But I don't think Thor really thought of it as courage. I believe that in his mind little had changed from when he took "the oath on the plain at West Point." He, as Douglas MacArthur had said years before, "continued to do his duty for as long as God gave him the light to see that duty." Nonetheless, his devotion, dedication, and grace under pressure inspired not only his colleagues but many others outside medicine as well. In September, 1991, Dr. Sundt was profiled on the CBS television series 60 Minutes. To their credit, the feature presented Thor accurately and with sensitivity. His dedication to his work and his kindness to patients and staff were readily apparent. By coincidence, CBS repeated this program only 3 days before Thor died.

Thor is survived by Lois, his wife of 40 years; his two sons, Thor III, a cardiac surgeon, and John Howard, an attorney; his daughter Laura, who is vice president and treasurer of ASR Investments in Tucson; and a grandson.

Thor Sundt's career was extraordinary because his character was extraordinary. His legacy is immense: the many thousands of patients he helped directly and through his research, scientific writings, and technical advances; the residents and fellows that he trained; his department at the Mayo Clinic; and the colleagues and friends whose lives have been touched by him and who will miss him deeply.

Address reprint requests to: Patrick J. Kelly, M.D., Department of Neurologic Surgery, Mayo Clinic, Rochester, Minnesota 55905.