1.23.25

Dr. John E. Hall. What the SRS Archives Can Teach Us About Spine Surgery and the Scoliosis Research Society

Richard M. Schwend MD and Richard E. McCarthy MD

Introduction

The study of biography is important to better understand the principles of our profession and the intersections of the lives of the key figures in our spine deformity history. The surgeons who came before us understood the importance of developing close professional and respectful relationships, the value of travel, and the power of collaboration. We hope that by telling these stories this history will come alive. The SRS Archives and the Harrington Archives at the KU Clendening library are outstanding sources of information, such as for this biography.

Dr. John Emmett Hall was a pioneering figure in orthopaedic surgery who trained and influenced future generations of spine surgeons. His career spanned over five decades, during which he made many contributions to orthopedic surgery, particularly in the treatment of spinal deformities. He was a pivotal figure in establishing principles of spine surgery, development of the Boston Brace, the Scoliosis Research Society, and the Pediatric Orthopaedic Society of North America. His influence extended globally through his mentorship and the dissemination of his innovative techniques. He left behind a legacy of grateful patients, families, and disciples. During retirement, he insisted that his trainees call him John, although he affectionately went by BJ (Big John).

Early Life and Family

John's grandfather emigrated from Ireland to Quebec. When John's father, Emmett Hall, was 12 years old the family moved to Saskatoon, a town of 35,000 where they were building a university and had four high schools, to give his children a better chance. John was born April 23, 1925, in Wadena, Saskatchewan, and grew up in Saskatoon. His only sibling was his sister, two years older and a "perfect student" who he attempted to keep up with academically. John's father

started his career as a country lawyer, then a judge in the provincial court, eventually became the Chief Justice of Saskatchewan, and later served on the Supreme Court of Canada. His mother was the disciplinarian at home and his father was more of an easy mark. Emmet Hall played a significant role in devising the medical scheme in Canada, which according to John worked very well until the government realized the high cost, so managed to wear it down. Growing up in Saskatoon, by then a vibrant college town, John enjoyed an active and free childhood, participating in high school sports and other typical activities. He was full grown by grade 9, skipped a few years of high school and earned a position on the varsity football team as a lineman.

Royal Canadian Air Force

John relates that when he was growing up in Saskatoon, all he ever wanted to be a pilot. At the age of seventeen, with the consent of his parents, and the start of World War II he joined the Royal Canadian Air Force. Everyone started their service on the air crew, but there was no guarantee of becoming a pilot. Once selected to become a pilot he learned to fly on older planes such as the de Havilland "Tiger Moth" biplane and the low-wing Fairchild PT-19 "Cornell". Because there were not enough Canadian planes to fly, he switched to the British Air Corps. As the war heated up, he served as a bomber pilot with missions over the English Channel and Asia, accumulating 500 hours of combat flight time in various aircraft, including the North American B25 "Michell" and later the larger Consolidated B24 heavy bomber, "Liberator". He started flying in England with Coastal Command, but most of his flying was in the tropics because the radial engines of the B24 did better there than other aircraft.

When he was recovering from a bout of malaria in Bombay, a fellow from the Royal Canadian Air Force asked him what he planned to do now that the war was over. Out of the blue he said, "I would like to be a surgeon". The officer said, "that's great, we have lots of people wanting to go to medical school, but nobody has mentioned wanting to go to surgical school". Dr. Hall commented that the 12 pilots in his class all went into surgery, due to their having a similar personality and the ability to manage the occupational hazards and risks. Hall attributes this experience with malaria as the beginning of his interest in Orthopaedics.

Education and Training

Following his military service, he pursued a Bachelor of Arts at the University of Saskatchewan, (his education as he called it) a prerequisite for his medical training (as he called it), at McGill University. An application to McGill, even for a veteran with a BA and an A average, there was

no guarantee for acceptance. After completing medical school in 1952, he married, Frankie, a nurse he met at McGill, and moved to Toronto, where he continued his surgical training. His two-year general surgery residency was at St. Joseph's Hospital under his chief, George Pennell, who introduced him to orthopaedics. Pennel was one of the finest people Hall ever met and his influence helped him decide that his career would be in orthopaedics. This was an important lesson, that his career would be significantly shaped by influential mentors and collaborations with leading orthopaedic surgeons worldwide. George Pennell's mentorship further ignited his interest in orthopaedics.

John turned down the prestigious McLaughlin Traveling fellowship offered by the University of Toronto to travel to England to become a house surgeon and then a registrar. Pennel had arranged for Hall to spend these two years of training (1954-1956) at the Royal National Orthopaedic Hospital. With Frankie he took the boat to England, leading him to work under the prominent figures of J.I.P. James, Herbert J Seddon and Jackson Burrows. JIP James was the guru of scoliosis surgery then and the National Health Service was a well-functioning system. The Royal National had a country branch with 480 beds and a town branch of 100 beds. At the country branch 200 beds were for polio, 100 for skeletal TB, 50 for scoliosis (they stayed for one year in a cast), 20 for osteomyelitis, and the rest were for miscellaneous conditions. The country branch was in Brockley Hill, Stanmore, had two operating rooms, and their moto was “Sunshine, fresh air and a cure for crippled children”. Hall believed that he got more experience the two years in England than he would have had in five years in Toronto. Their time in England was great for the family, with the arrival of their second child and a Moris Minor convertible to drive around the countryside.

According to Hall, the British surgeons were far superior to the average American or Canadian surgeon. They were fast in the operating theater. He related the story of one of his chiefs leaving for an extended three-month cruise. Hall took all the cases of drop and flail foot from the wait list and began doing Lambrinudi type triple arthrodesis for them(1). As a registrar he was in control of the operating list and scheduled many of these cases until he perfected his freehand chisel technique. He did these cases very quickly, which worked well, if you had a system. The chisel techniques perfected on the foot would later come in handy for using the chisel for spine osteotomies. When his chief returned, the cases had all been done. By researching and publishing an outcome study of SCFE, he learned the importance of honest reporting of bad results(2). Hall realized that when he returned to Toronto he was “streets ahead of everybody”.

His experiences in England, particularly with severe scoliosis cases, motivated him to seek better methods. Their traditional method for treatment was the Cobb turnbuckle jacket. A patient

endured three weeks in hospital getting gradual correction through the adjustable cast, then surgery through a hole in the cast. During the operation the dissection used a “flame thrower” (electrocautery), the graft was from thoracoplasties of TB patients, and results “were really dreadful”. Most cases were considered very severe at over 100 degrees, because JIP James believed that you should wait and not operate until the end of growth. It was JIP James who taught him how *not* to properly and thoroughly expose the spine. These poor results (50% pseudarthrosis, 35% deep surgical site infection, 0% maintained correction) turned him off so much that on the boat back home he said to Franke “I don’t know what I will do when I grow up, but I know what I’m *not* going to do. It certainly won’t be scoliosis”.

The Toronto Years

When they returned to Toronto in 1956, there was more orthopaedic residency at Toronto General and Sunnybrook hospitals. In 1958 Bob Salter offered Hall a job as Chief Resident. George Pennel had also offered him a job at St. Joseph Hospital but encouraged Hall to take the better job with Salter. Hall was grateful to Pennel, who was more interested in what was best for Hall than just filling his job. Upon arrival at the Hospital for Sick Children (HSK), his boss Robert Salter “changed my mind for me” about scoliosis surgery. When Hall took the full-time staff position at HSK, the story goes that Salter told Hall that they would share the clinical responsibilities. Salter would take care of all the DDH and Hall would manage the scoliosis, which at the time was difficult and had terrible results.

The method of treating scoliosis in Toronto was popularized by Arthur B LeMesurier, combining non-operative and operative principles(3). The patient was suspended from the ceiling in a fishnet with the convex side up and was plastered from the head to toe into a cast. Through a window the surgery was with an electrocautery “flamethrower”. The bone graft was taken from the tibia because it was the only part of the patient that was showing. Because it was autologous bone, the spine fused. The results were not that bad for mild idiopathic scoliosis where fusion was from the two parallel end vertebrae. The patient then spent six months in bed in a cast, and then six months in an ambulatory jacket. For larger curves they used a Cobb turnbuckle cast. One can readily understand why Dr. Hall became so receptive to Paul Harrington’s method.

According to Dr. Hall, it was very clear to him that he needed help after it was decided for him that he would be responsible for the spine surgery. So, he sought out famous pioneer surgeons at

that time and visited them. These interactions were pivotal in refining his surgical techniques and advancing his expertise in spinal surgery. He visited Joe Risser in Pasadena California, who showed Hall the ambulatory jacket that he had developed (4). Risser made a tremendous contribution with his plaster jacket, applied while the patient was on the special frame he designed for moderate and smaller curves, then got them on their feet. This was the first freedom that the patient really had. It allowed them to get out of bed without confinement in the heavy cast. However, it did not work as well for the severe curves. Besides the Risser cast and Risser sign(5). Risser was also an advocate for treatment of scoliosis, at an early age, rather than waiting for a large deformity to develop, as JIP James had advocated. After surgery in the ambulatory jacket, they could even get back to school.

Hall visited Walter Blount. They discussed bracing and where it fit into the treatment of scoliosis. He visited Dr. William H. von Lackum in Iowa City, who had a special spine table where you put the cast on with the patient in the prone position(6). When Hall visited von Lackum, he was 72 years old, but very fit. He would leap onto the patient with stocking feet and push the rib hump down while the cast was applied. Dr. Hall was very interested in the front of the spine, so much so that he brought Arthur Hodgson from Hong Kong in 1963 (7). Hodgson taught him the anterior approach and wedge resections for congenital scoliosis. Hall gave a paper at a neurosurgical meeting called “The Front of the Spine”, which was not well received. Through this he learned how important it was to have cooperative relationships with neurosurgeons who eventually became more accepting.

Dr. Hall first met John Moe when Moe first visited England in 1955 and gave an address. Once in Toronto, Hall visited Moe, who helped him with just about everything, especially the facetectomy fusion technique and clinic organization. Although he first learned to use the Capner gauge in England, it was Moe who taught him to properly remove the entire inferior articular process for exposure, correction and fusion. It was Moe who convinced Paul Harrington to add fusion to rod correction. Moe used Risser localizers to allow early ambulation after Harrington Rod instrumentation when most surgeons kept patients in bed for three months. Moe also advocated halo femoral traction to correct severe curves and for subcutaneous rods with no fusion for “malignant” EOS curves (8). Moe was the first president of the SRS 1966-1969.

Toronto had several surgeons across town who also influenced Dr. Hall, including Ted Dewar, RI Harris, and his contemporary Ed Simmons Sr. One other spine surgeon who greatly influenced him was Dr. Eduardo Luque (9). He appreciated Luque's system for its stability and reduced complications. Hall used the Luque system for patients with spine bifida and even for AIS (wired in Harrington rod) to avoid post operative casting. Hall believed that he had minimal complications with this technique.

Special Relationship with Paul Harrington

Paul Harrington's (1911-1980) early idea was non-fusion, using the rods as internal corrective struts. His concept was to go in and notch the rod a little bit farther each time, straighten the child up internally, keep them straight while they finish growing and then take it out. But the hooks would erode through the bone unless you did a fusion. An early problem in the 1950s that he experienced with fusionless surgery was failure due to hook cutout. The few early cases that were successful were because the spine had developed spontaneous fusion. Moe became interested in Harrington instrumentation in the late 1950s and persuaded Paul to use his instruments as a method of correcting and holding correction while fusion for maintenance took place. Thus began the modern era of scoliosis surgery.

Early on Hall heard Harrington talk and was impressed with the mechanics of it. Dr Hall was one of the earliest to visit Dr. Harrington in Houston, as did Dr. John H. Moe and other early observers such as Robert Keiser of Coral Gables FL, Gordon Townsend of Calgary, Alberta, and Ed Simmons of Toronto, observing his results with poliomyelitis. In 1959 during Dr. Hall's second year in practice he (with Jack Kennedy of London Ontario who became famous for knee surgery) visited Dr. Harrington in Houston. During that first visit to Houston, Dr. Hall was to be Dr. Harrington's only assistant at the Texas Institute of Rehabilitation and Research, since according to Dr Harrington, the residents were not allowed to work with this "madman". Hall was impressed by Harringtons innate courtesy and friendliness, (he was met at the airport, taken to the motel, and picked up next morning). With time Dr. Harrington started treating many more patients with AIS.

Hall did his first Harrington instrumentation in Toronto in 1960. Influence by Dr. Moe, Dr. Hall's cases with the Harrington rod involved an autologous fusion with the iliac crest. In 1961 he returned to Houston for a second visit and brought Ed Simmons with him. In 1964 Dr. Hall invited Harrington to Toronto, and they efficiently did two cases of 50 AIS, Hall commenting what a fine surgeon Harrington was. Harrington was using allograft bone, but because of the known prevalence of pseudarthrosis Hall made sure that for these two cases they used iliac crest autologous bone. However, the early cases still used post op casts, so the Risser jacket was a great advancement because it allowed the patient out of bed. It was not until years later with the strength of the two rod systems, and to avoid the additional pain of the crest graft, that Hall converted to using allograft bone with crest marrow aspiration. Hall noticed that the original Harrington rod system provided distraction and compression but tended to flatten the lumbar lordosis. Therefore, he modified the instrumentation with Luque wires and a contoured rod, and with greater than 100 patients in Hall's series, it yielded the lowest complication rate of any system that he ever used.

In June 1971 Dr. Harrington and Jesse Dickson visited Dr. Hall in Toronto. This was while Dr. Hall was considering the move to Boston to be Professor of Orthopaedics. Dr. Harrington was supportive and even encouraging of him to take this prestigious position(10). During this visit they watched Hall perform an anterior resection of a congenital hemivertebra, a Dwyer anterior instrumentation for an adult patient, spine surgery for a child with cerebral palsy, and joined him in a visit to the amputee clinic at the Crippled Children's Centre. In 1971 there was correspondence with Dr. Harrington about Dr. Hall's 10-year experience with spina bifida patients in Ontario Canada. In January 1973 Dr. Hall agreed to publish Dr. Harrington and Dr. Dickson paper "Eleven Year Clinical Investigation of Harrington Instrumentation. A Preliminary Report of 578 Cases, in Clinical Orthopedics and Related Research". Dr. Harrington had been trying for 2 years and several revisions to get this published into JBJS, and Dr. Hall expedited publication in the special scoliosis symposium he was editing (11).

Dr. Hall continued to correspond with Dr. Harrington over the years. The two were especially interested in the intervertebral disc(12). Having read Dr. Bourne's publication using electron microscopy on the collagen arrangement of bone, Dr. Harrington was curious about the cellular content of the disc(13). Hall had been performing anterior Dwyer instrumentation for thoracolumbar and lumbar scoliosis after Dr. Dwyer introduced him to his technique(14, 15). In letters between them about the excised discs, Dr. Hall related to Dr. Harrington that the amount of cellularity depends on the age of the child. There were lots of cells in the annulus and few in the nucleus. During the active growing stage, the amount of cellularity and rapid growth seemed to be at the periphery of the annulus. The area of resorption was occurring in the transition zone between the annulus and the nucleus. They also asked Melvin Glimcher at Boston Children's Hospital to perform electron microscopy to evaluate the fiber arrangement, cross linking, and abnormality of collagen formation. In the nucleus, what appeared to be cells, was probably cellular debris(12). In September 1976 after the 1976 SRS annual meeting, Dr. Hall wrote a note to Harrington, since Dr. Harrington was not able to attend, and indicated that it was the largest meeting ever, with 350 people registered and the "caliber of the papers were unusually good".

The Scoliosis Research Society SRS

In 1964 Dr. Hall received an invitation from David Levine to attend a meeting in Chicago at the Palmer House Hotel. There were 12 surgeons who were invited, and they decided to start a group on scoliosis. According to Dr. Hall, after debate, they decided to call it the Scoliosis Research Society, hoping to encourage only members (US and Canada) who would actively contribute to the research mission of the society. It would someday become a true research society. By 1966 the first meeting of the Scoliosis Research Society was scheduled for Minneapolis. Virtually everyone who had been invited attended, a grand total of 37 founding members, with 35 at the meeting and in the original photo. The first several years only clinical papers were presented.

As a founding member and second president of the Scoliosis Research Society (SRS), Hall was instrumental in shaping the organization's direction. The group created bylaws and agreed on classification and nomenclature and discussed the need for a data base of scoliosis cases. Influenced by the Europeans they agreed that scoliosis would be defined as a lateral curve > 10º. He was a strong advocate for school screening programs and the use of Moire photography for non-invasive monitoring of spinal curvature. While the effectiveness and necessity of school screening has been debated and general screening is now recommended to be done by the pediatrician, Dr. Hall's efforts in this area underscore his commitment to early detection and preventive care. Hall was the president elect for the second annual meeting in Minneapolis, as well as the third annual meeting in Houston. At the 2nd meeting, the group photo had 80 active members, including Cotrel, Ponseti, Moe, Harrington, and Blount. At this second meeting Vernon Nickel and Jacquelin Perry presented their results of 174 halo cases from Rancho Los Amigos Hospital. Hall presented 170 follow-up cases of scoliosis and Moe presented 230 end-result cases of Harrington rod fusions for scoliosis. In 1969 the fourth annual meeting was in Anaheim and by this time Hall was SRS President (1968-1970), with Jacqueline Perry the local host. By the fourth meeting there were very active Morbidity & Mortality and Classification Committees, besides the Executive Committee. In 1970 the 5th SRS meeting was in Toronto with Hall still president. By this meeting there were 147 registered active members attending. At this meeting Hall discussed their experience with surgery for shunt related hyper lordosis in spina bifida, as well as their results of 33 patients with spina bifida. Transcripts of these early meetings are available in the SRS archives.

In 1997 at the 32 Annual meeting Dr. Hall gave the Harrington Lecture "Spine Surgery Before and After Paul Harrington". According to Dr. Hall, one of the highlights of his experience with the SRS was when he was the godfather to the second group of travelling fellows- Larry Lenke, Howard Ann, and Hubert Labelle. Hall learned much from them and according to Dr. Hall these three traveling fellows have become "top of the tree".

The Boston Years

Dr. Hall moved to Harvard's Boston Children's Hospital in 1971 to become Chief of Orthopaedics and Professor at Harvard Medical School. When he arrived, the hospital had a long-standing history of non-operative orthopaedic care. He found that compared to HSK, the orthopaedic department was in dire need for surgical modernization. Surgical procedures such as Salter osteotomy, open hip reduction, or Harrington rod instrumentation were not being done. He soon changed that. Fortunately, the retired chief, Bill Green stepped aside and allowed Dr. Hall to thrive. He was a strong leader and realized the importance of hiring the best. He told the story of when he was on a search committee for the Chair of Radiology for Children's Hospital and vetoed the committee's recommendation. He then managed to become the Chair of the committee and that is when they hired John Kirkpatrick from Childrens Hospital of Philadelphia (CHOP), who was an outstanding choice. Butting heads, at one point the administration fired Dr. Hall as Chief, but soon asked him to resume this position because nobody would come to look at the job, since everyone who was well qualified for the job were his friends.

John believed in hiring outstanding people, support them, but also leave them alone to excel. He hired Mike Millis, John Emans and Lyle Micheli. Mike wanted to develop a hip program, so Hall sent Millis Nuremberg Germany to visit Heinz Wagner for 3 months, despite a few protests of the expense of it. He firmly believed in developing the talents of his people, despite the expense.

His work with Yves Cotrel and Jean Dubousset on innovative methods further demonstrated his dedication to incorporating and refining new techniques. Hall had known Jean Dubousset because he worked with Hall in Toronto for a while as a fellow, and he knew Henri Carlioz who had visited him in Toronto. In 1965 Hall went to the Normandy coast to spend a day with Cotrel at his hospital in Berkck Plage. Cotrel showed Hall how he put his cast on. Hall also bought a Cotrel frame and brought it back on the airplane after disassembling it and putting it into a canvas bag. Years later in 1983, Dr. Hall was asked by Henri Carlioz to be visiting professor at Trousseau, one of the big hospitals at the east end of Paris. By then Hall had heard about what Cotrell and Dubussett were doing. These "madmen" were putting a lot of metal into the spine, but they were also getting great corrections and results. He met them and their results indeed looked very good. He saw Dubousset doing the surgery with Cotrel at the back table, handing him the metal and bending it into shape. Appropriate rod bending allowed control of the sagittal contour. The next year, in 1984, Mike Millis, Paul Griffin and Hall visited for a week and saw several more CD cases. Hall invited them to come and do a case in 1985, and from then on that became their system of choice in Boston. Tony Herring had been a previous resident of Dr. Hall and helped develop the TSRH system that Hall also adopted.

Dr. Hall had a significant influence on the Physical Therapy Department at Boston Children's Hospital. This collaborative interaction with physical therapists began when he was in Toronto. When he arrived in Boston, the Physical Therapy Department was under Bill Green. Hall advocated for their independence, which happened, under Claire McCarthy's and then later Mickey Cassell's leadership. These two leaders were ahead of their time, encouraging their therapists to engage in research and publish papers, the beginnings of doctorate level training and practice. Hall started weekly conferences with therapists, fostering open communication and collaboration. According to Dr. Hall "They had some weird, wonderful problems that we tried to

figure out some solutions for. I got as much from them as they ever got from me". Hall believed in independence and empowerment of his colleagues.

Innovations in Spinal Surgery

Development of the Boston Brace

In Boston, Edward Bradford started his first scoliosis clinic in 1897. In his writings, he recognized the loss of the normal kyphosis in thoracic scoliosis. He advocated correcting both the lateral curve but also the rotation, while paying attention to the sagittal plane. His corrective casts used side pressure and flexion. In the archives of the Children's Hospital Boston, there is a description of a course in pediatric orthopedics that included the treatment of spinal deformities. The $30 course lasted one month and covered almost everything one could think of for bracing. The method of treating scoliosis was with distraction and casts. Bradford and Robert Lovett wrote a treatise in the early part of the last century advocating correction and casting using a three-point technique which was like the localizer type of casts used later in the 20th century(16).

In the 1950s, Walter Blount and Albert Schmidt of Milwaukee introduced the Milwaukee brace for post operative immobilization (Blount 1958). It was John Moe who encouraged them to use it for non-operative treatment of scoliosis. Hall got Bill Miller to come to Boston and start the "National Orthotics and Prosthetics Company" (NOPCO). Dr. Hall's work on the Boston brace revolutionized non-surgical scoliosis treatment, but he gave all the credit to Bill. "Miller was the best brace maker I think, that ever lived." Together, they developed a system of six different size plastic modules that provided effective correction without the need for neck braces. It was Hall's idea to start with a straight shape blank, but it was Miller's ability to make the six different size modules with pads that straightened the child. Initially an adaptation of the Milwaukee brace, this innovation evolved into the widely used thoraco-lumbo-sacral orthosis (TLSO). The modular brace started out as a base for a Milwaukee brace, until a patient refused to wear her neck piece, and thus was born the Boston Brace. The blanks were all the same shape, just different sizes, eventually 19 in total. According to Hall "You put them on a crooked patient and used the pads to straighten them up. And that was the Boston Brace". John Emans published the first series documenting the brace's success(17). The Boston brace story highlights Dr. Hall's ability to translate clinical needs into practical solutions.

Development of Anterior Surgery and Short Segment Anterior Surgery

Anterior spine surgery was suggested by Luigi Codivilla in 1903 and performed by DeForest Smith in 1924 for Potts disease (18, 19). When Hall was training in England he heard a paper on anterior spine surgery from a fellow from the Midlands. He then visited and watched him do a few thoracic cases, and then Hall started to do the procedure at the Royal National in London. While he was working in Toronto he was also influenced by Albert Hodgson(7) of Hong Kong and Kenton Letherman of Louisville(20-22) for the resection of vertebral bodies in congenital scoliosis, using a two-stage procedure. However, it was Allen Dwyer from Australia, a meticulous surgeon, who showed him the proper thoraco-abdominal approach with peripheral detachment of the diaphragm while he was in Toronto(14, 15). In the 1960s Allen Dwyer did for anterior instrumentation what Paul Harrington had done for the posterior. His system had a screw that crossed the vertebral body. Dwyer had worked with a general surgeon and an engineer in the development of his system. Later Ed Simmons added a mechanical crimper. While still working in Toronto, Hall and Simmons got the money together to bring Allen Dwyer from Australia to show them his anterior technique. In 1973 Hall visited Klaus Zielke, in Tubingen Germany at the French Military Hospital, who replaced the cable with a semirigid rod to prevent kyphosis and described ventral derotation spondylodesis (VDS) (23). This system was ideal for patients with myelomeningocele, lordotic idiopathic thoracic scoliosis, and later, for short segment TL fusion.

When Hall first arrived in Boston in 1971 the chief of surgery at Childrens told him to have a general surgeon work with him for an anterior spine case. So, when the general surgeon arrived, Dr. Hall told him to expose the front of the spine. According to Hall, the general surgeon said, “How do you do that?” Dr. Hall said, “you’re here to teach me how to do that”. The general surgery chief was also not able to it, so that was the end of the general surgeons routinely assisting him. Hall was not happy with the kyphosis induced with long posterior fusions into the thoraco-lumbar and lumbar spine. Short segment anterior fusion of these thoraco-lumbar curves seemed to address this problem nicely. By 1978 he had developed a series of principles for short segment anterior surgery. By focusing on bending films and identifying which disks opened, that disc could be left intact. He devised a method of overcorrecting at the apex to align the entire spine, while paying attention to maintenance of lumbar lordosis(24). If the thoracic curve bent to less than 20 deg, it could be ignored in the fusion and instrumentation. This innovative

approach minimized complications and improved outcomes. This allowed the surgeon to do full scoliosis correction at the thoraco-lumbar junction for smaller structural curves of about 50 degrees and the apex was overcorrected by about 10 deg. A brace was recommended if the child was still growing or if overcorrection of the apex was not achieved.

Other Innovations

Despite great improvements with the implants, Hall advocated that a solid spinal fusion was the first principle. If the fusion failed, the implants would also fail. For marked rib deformity he advocated thoracoplasty of the medial aspect of the rib and securing the remainder of the rib to the transverse process. Cobb had advocated use of banked allograft bone for fusion as being equal to autograft (25). As instrumentation improved, Hall standardized using freeze-dried allograft bone with aspirated bone marrow to avoid the morbidity of iliac crest autograft. He developed the simultaneous anterior and posterior approach for hemivertebra resection in infants as young as 6 months of age. At first, he did this as a staged procedure, but after two cases he realized he could do the case with the patient on their side, make anterior and posterior incisions, and remove the hemivertebra(26). With improved anesthesia he could do it under the same anesthetic, saving several weeks of hospitalization. For very large deformities he believed that the simultaneous approach gave the surgeon better control of the correction. He used a small posterior lamina claw developed by Luque, but also a post op jacket with one arm contained so the cast would not slide up or down. During his time in Toronto, he worked with an anesthesiologist, John Relton to solve the problem of excessive bleeding seen in all posterior cases. Concerned about excessive blood loss from abdominal pressure and blood returning to the heart via Batson's plexus, they developed a four-post frame, which today is used in virtually all scoliosis surgery(27). He hated the "flame thrower", first developed by William T Bovie and Harvey Cushing in Boston the 1920s, because it killed the osteogenic potential cells. Hall lamented "Anyone using it that way should be a welder and not a surgeon". He developed the "Luque box" for safe and partial correction of severe spondylolisthesis(28).

His Legacy

Mentorship and Influence of others

As he progressed through his career, Dr. Hall was a mentor to many prominent orthopaedic surgeons, including Bob Gillespie, Jean Dubousset, John Emans, Mike Millis, Erwin Morscher, Andre Kaelin, John Kostuik, Kiyoshi Kaneda, Rick McCarthy, Tony Herring, Paul Sponseller, Jack Flynn and Ray Morrissey. His influence extended to numerous trainees, colleagues and their trainees who have made important contributions to the field of orthopaedics, spine surgery and the SRS. Besides the SRS, his leadership included being president of the Pediatric Orthopaedic Society, just before it evolved into the POSNA. When he identified exceptional fellows such as Bob Gillespie or Mercer Rang, he encouraged them to stay on as staff. He wanted people who questioned him and not "yes men". This philosophy not only advanced his department but also left a lasting impact on the careers of those he mentored. He traveled to share his knowledge. He visited India, Bombay, Calcutta, New Delhi, and Madras on five separate occasions, bringing his donated Harrington instrument sets with him. He also visited East Africa and Jamaica, and never had a spine infection in these places. He preferred the Harrington rods in these environments over the CD due to the expense and that poor countries would not be able to afford for some time.

Balancing Risk and Reward in Surgery

His approach to balancing risk and reward in spinal surgery was pragmatic and patient centered. He emphasized thorough evaluation and careful consideration of surgical indications. His experience with procedures like hemivertebra excision, which he found manageable in younger patients but riskier in older ones, illustrates his nuanced understanding of surgical risks and benefits. Dr. Hall's ability to assess and navigate these complexities was a hallmark of his surgical practice. Yet experience was the great teacher. When asked how does he know that an operation is too risky? "By getting into trouble. That's usually the way I find out I shouldn't be doing something."

tAt the 43rd Annual meeting 2008 Salt Lake City, SRS treasurer, Richard McCarthy presented Dr. Hall the Lifetime Achievement Award. McCarthy introduced him. “He may have been wrong at imes but there was no question that he was never in doubt. He was a giant in his field who believed that you lead by example. He worked diligently to develop a rational and thoughtful approach to spinal care. He abhorred cookbook approaches. He disdained the response from a resident because Hall had done something a certain way, ‘Because that is the way you do it’. Dr. Hall responded that if the resident was still doing that in practice, in 5 years Dr. Hall would no longer be doing it that way. He worked with Dwyer, with Luque, and with Dubousset. With Harrington, Hall advocated for spinal fusion. He was always among the first to go to these centers, learn their new techniques and then bring them back for all of us to learn from him. There was a constant flow of international fellows.”

Advice to New Surgeons

His criterion for bringing new people on staff was always to hire somebody that could do everything well. With that foundation, a surgeon could then start to specialize in their area of expertise. To aspiring surgeons, Dr. Hall offered timeless advice: “Prioritize patient safety, pursue lifelong learning, and seek mentorship opportunities”. His own career was a testament to these principles, characterized by a relentless pursuit of knowledge and collaboration. He encouraged young surgeons to gain diverse experiences, whether through formal fellowships or informal visits to other experts, to broaden their skills and perspectives. Get excellent training. Go visit people. Get a travelling fellowship. However, a lot of techniques are no longer relevant and should be abandoned. Dr. Hall also emphasized the importance of choosing associates well, delegating effectively, and adhering to core principles in surgical practice.

“Hallisms” and Stories

- The patient comes first! Pervasive in everything that you do. Every patient is an individual with a unique problem that required a unique solution, not some cookbook approach. Openness to new ideas came through.
- “Everything I have done has been because of other people.”
- “Think about the problem the patient presents with. The solution may be outside the box.”
- “Strive for Perfection. How perfect should it be? Perfect will do!”
- Surgical score “In surgery, you either would get a 100% or a 0%.” But sometimes you could get a strong 0. It was either right or wrong. Why would you want your surgeon to be happy with 75%?”
- In discussing with the family surgical consent- “Tell them the natural history of the condition untreated, the natural history if you use a conservative approach such as a brace, and what surgery will do for the natural history”.
- Malgaigne wrote, "It is important to know what to do but no less important to know what *not* to do" still rather good advice according to Dr. Hall.

- “Principles really work, nothing has survived except principles.”
- “The spine has a front and a back. Know the reasons for being there.”
- “Nothing destroys confidence as good follow-up.” Used by Hall, attributed to Ian McNab
- Learn to delegate but you need to have good people to delegate to.
- Dr. Hall once told his wife Frankie “I *have* to go to go to this meeting”. She responded “you do not *have* to go. You have *chosen* to go.”
- His advice on work-life balance "When at work really be at work. When at home really be at home." This is similar advice that William Osler provided “Live your life in day tight compartments.”
- “Choose your associates well.”
- “Retirement is the one thing that really works”

Vision for the Future of Spinal Surgery

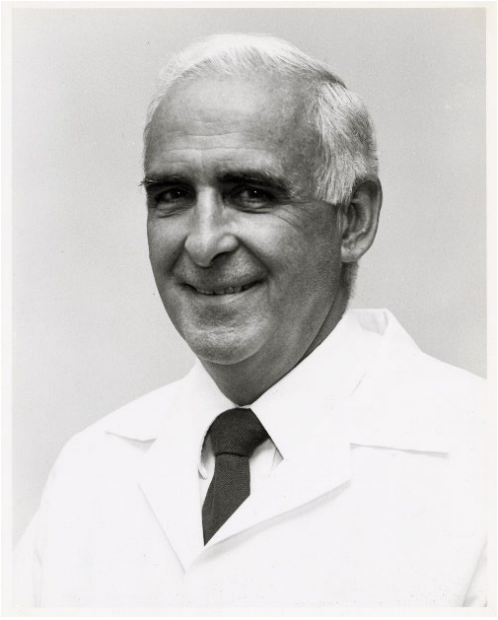
He was most proud of the people he trained. “It’s about the only thing you can pass on, besides your family.” Dr. Hall often pondered the future of spinal surgery, particularly the use of rods. He believed that advances in prevention, genetic screening, and less invasive techniques could eventually eliminate the need for rods. His cautious optimism was tempered by a pragmatic understanding of the risk-reward balance in spinal surgery. He emphasized the importance of patient safety and the need for continuous evaluation of surgical methods. He hoped for innovations like memory metals and absorbable rods, and advances in genetic research to reduce the need for extensive surgical interventions. He believed that surgical techniques would evolve, but the underlying principles would endure.

Later years

Dr. Hall continued to operate on his own patients until age 75 years but didn’t fully retire until he was 80 years of age, assisting his staff in surgery. He enjoyed spending time with his family, particularly his grandchildren, and his seven children at his country home. He continued to mentor young surgeons, sharing his wealth of knowledge and experience. His enduring passion for pediatric orthopaedics and commitment to service ensured that his legacy continued to inspire and influence the field. John’s retirement was marked by a balance of relaxation, family time, and ongoing contributions to the medical community, reflecting his lifelong dedication to both professional excellence and personal fulfillment. Even in retirement, he continued to inspire and mentor the next generation of surgeons, ensuring that his legacy of patient-centered care and innovation endures.

Dr. Hall passed away peacefully in his sleep in Toronto on March 22, 2018, at the age of 92. His loving marriage of 65 years to Frankie, who predeceased him by only six weeks, and his family, including seven children, seven grandchildren, and two great-grandchildren, were central to his life. Dr. Hall's legacy is one of compassion, respect, excellence, and a profound impact on the field of orthopedic surgery and the lives of those he touched.

SRS 3rd Annual Meeting. Montreal, Quebec, Canada, 1968



Courtesy of the SRS Archives.

References

1. Lambrinudi G. Use of arthrodesis for stabilizing the foot in cases of infantile paralysis. Proceedings of the Royal Society of Medicine. 1933;26(6):625-31`.

2. Hall JE. The results of treatment of slipped upper femoral epiphysis. The Journal of bone and joint surgery American volume. 1957;39B.

3. LeMesurier AB. A new method of treating scoliosis. The Journal of Bone and Joint Surgery British Volume. 1948;30B(2):305-7.

4. Risser JC. The application of body casts for the corrrection of scoliosis. The Journal of Bone and Joint Surgery American. 1950;32(3):763-85.

5. Risser JC. The iliac apophysis: An invaluable signb in the manbagement of scoliosis. Clinical Orthoaedics and Related Research. 1958;11:111-9.

6. von Lachum WH. The treatemnt of scoliosis by casting and bracing techniques. J of the Iowa State Medical Society. 1941;31(7):240-6.

7. Hodgson AR, Yau ACMC. Anterior surgical approaches to the spine in the treatment of tuberculosis. The Journal of Bone and Joint Surgery American. 1967;49A(4):618-33.

8. Moe JH, Kettleson DN, . Scoliosis: Progress in orthopedic surgery: Springer-Verlag; 1970.

9. Luque ER. Segmental spinal instrumentation for correction of scoliosis. Clinical orthopaedics and related research. 1982;163:192-8.

10. JE H. Letter to Dr. Harrington about upcoming his and Jess Dickson visit to Toronto June 1,2,3, 1971. In: Harrington P, editor. SRS Archives ed. SRS Archives May 10, 19711971.

11. P.R. H, Dickson JH. Eleven-year clinical investigation of Harrington instrumentation. A preliminary report of 578 cases. Clinical orthopaedics and related research. 1973;93(113-119).

12. JE H. Letter to Paul R Harrington about disc cellularity. In: JE H, editor. SRS Archives. October 23, 19751975.

13. Burne G. Ultrastructure of collagen and the mineralization of bone studied by electron microscopy. Clinical orthopaedics and related research. 1975;112:227-47.

14. Dwyer AF, Newton NC, Sherwood JE. Anterior Approach to scoliosis: Ten years' experience. Acta Orthopaedica Scandinavica. 1973;44(6):625-36.

15. Dwyer AF, Newton NC. An anterior approach to scoliosis: A preliminary report. Clinical orthopaedics and related research. 1969;62:192-202.

16. Bradford EH, Lovette RW. Orthopaedic Surgery: WB Sanderrs & Company; 1905.

17. Emans JB. The Boston brace system for the treatment of low thoracic and lumbar scoliosis by the use of a girdle without superstructure. The Journal of bone and joint surgery American volume. 1976;58(4):476-82.

18. Codivilla L. Ricerche anatomiche e cliniche sulla scoliosis [Anatomical and clinical research on scoliosis]. Archivio di Ortopedia. 1903;20:1-44.

19. Smith DE. Treatment of Pott's disease of the spine by an anterior operation. Annals of Surgery. 19244;79(6):643-6.

20. Leatherman KD, Diskson RA. Two-stage corrective sugery for congenital deformities of the spine. J Bone Joint Surg British. 1973;57B(4):456-63.

21. Leatherman KD, Disckson RA. The management of spinal deformities in neurofibromatosis. The Journal of Bone and Joint Surgery British Volume. 1975;57B(4):456-63.

22. Leatherman KD, Dickson RA. Anterior surgery for spinal deformity. The Orthopedic clinics of North America. 1979;10(4):797-807.

23. Zielke K, Stunka R, Mumme.T. Ventral derotation spondyloedesis (VDS) in scoliosis: Indication, technique and first results. Archiv fur Orthopadische und Unfall-Chirurgie. 1982;99(1):1-7.

24. Bernstein RM, Hall JE. Solid rod short segment anterior fusion in thoracolumbar scoliosis. J Pediatr Orthop B. 1998;7(2):124-31.

25. Cobb JR. Use of allograft in spinal fusion. The Journal of Bone and Joint Surgery American. 1948;30(3):651-7.

26. Hall JE, Phipps T. Resection of hemivertebra in young chidren. The Journal of Bone and Joint Surgery British Volume. 1973;55B(1):165-76.

27. Relton RES, Hall JE. An operation frame for spinal fusion. J Bone Joint Surg British. 1967;49B.

28. Schwend RM, Waters PM, Hey LE, Hall JE, Emans JB. Treatment of severe spondylolisthesis in children by reduction and L4-S4 posterio segmental hyperextension fixation. J Pediatric Orthopaedics. 1992;12(6):703-11.