John Charnley Remembered: Regaining Our Bearings

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John Charnley, although he did not originate total hip replacement (THR), is considered its basic innovator. Total hip replacement is one of the great marvels of modern medicine. The benefit to the patient, the consistency with which it can be reproduced, its enduring longevity, and the many ideas it stimulates are amazing. John Charnley’s life and legacy speak to today’s orthopedic culture. He was an individual with remarkable dedication, outstanding originality, and endless energy.

John Charnley (1911-1982) was born in Bury, Lancashire, United Kingdom; he was trained in orthopedic surgery at the Manchester Royal Infirmary.1-4 He served in World War II with distinction. Following the war, he returned to Manchester to join his colleagues, Harry Platt and David Lloyd Griffiths. Platt said of Charnley, who first trained as a general surgeon, acquiring excellent, wide-ranging diagnostic judgment and operative skills, “His roots in the principles and the unity of surgery were deep and lasting.”3 Charnley became interested in arthritis of the hip and fully committed himself to that end.

At the suggestion of Harry Platt, Charnley developed a hip center at Wigan, near Manchester. The center became the focus of Charnley’s professional career and his subsequent contributions. His concept of an artificial joint was well studied, including numerous bench studies to determine the effects of friction, joint lubrication, and issues of biomechanics. The interplay of these various scientific disciplines created the hypothesis that a low-friction prosthetic device combining the bearing surfaces of metal and plastic would be effective.5,6 He proved that such a device could be tolerated for an extended period of time in the human body. To this day, it is the gold standard by which prosthetic innovation is measured.7,8 He identified the importance of the sterile environment regarding prosthetic infection and the contribution of the surgical team to the contamination process.9 Now, 30-year follow-up exists for patients who have undergone low friction arthroplasty. Prosthetic survival rate is approximately 90%.10,11 This is a significant accomplishment, proving that an artificial device subject to prolonged use can have remarkable durability. However, the enormity of Charnley’s contribution to process and procedure often is unrecognized. There was strict indication for surgery; the patient qualified for the procedure based on a hip scoring system. He assembled a team approach in the operating room; surgery was disciplined and organized with each phase of the operation having significant steps that were not to be violated. He maintained strong discipline controlling every element of the procedure. Charnley’s surgical skills were amazing; he had the capacity to complete an operation two to three times faster than his colleagues. He proved that it was not necessary to use prophylactic antibiotics if the environment was made ultra-clean with the use of laminar air flow.9 His postoperative care was well-structured with defined clinical pathways. Patients were encouraged to return for evaluations at regular intervals. Data

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Introduction

were collected in a rigorous manner during an era prior to the computer. The publication of these have been were a reference point for all subsequent THR development.7,8,10,11

Charnley was a strict and demanding teacher. His registrars and fellows proceeded through a program of gradual responsibilities, first observing, then assisting, and finally executing the operation. He would not release the use of his prosthesis until the surgeon practitioner had spent a period of time training under his direction. He believed that an uninformed surgeon was best taught by his fellow colleagues. Under his direction, hundreds of patients were operated on by a team of surgeons, using methods and procedures previously unknown to the orthopedic community.

Innovation

John Charnley’s passion for innovation was intense. Initially, he was full of new approaches, ideas, and attempts to resolve the surgical challenge of THR. However, as he gained experience he became more conservative. He believed that his operative technique reached its maturation point it should remain unchanged. Cost of innovation and change, Charnley believed, would create chaos and take the focus away from execution of the procedure. Innovation is the source of new technology but must be well disciplined. The progression of a new idea must be governed by the existing literature, tested in the laboratory, subjected to clinical trials, and limited in application until such time as efficacy is proven.3

Patient Care

Charnley determined that a patient should follow certain clinical pathways to meet with a successful clinical result. The health-care provider, whether a nurse, physician, or physical therapist, was subject to a discipline that produced a routine regimen of care. Changes were not implemented in the patient care protocols unless a consensus was reached in terms of efficacy. Patient follow-up was provided in clinics on a regular basis and evaluated using a hip scoring system. This contributed to data that were later used for clinical studies and subsequent publications.5,12,13

Charnley believed that patient care was a system rather than an individual event; the quality of this care followed a pathway that was predictable and manageable. Despite his emphasis on the clinical care of the patient, his primary focus was on the surgical event and its execution, as that was the essence of a successful outcome.

Boundaries

John Charnley had well-defined boundaries for THR. He thought that if these boundaries were violated it would lead to complication, disappointment, and failures. He believed that a patient anticipating THR should be aged ≥60 years. If one violated this particular precept and expanded the application of joint replacement, one would harvest a world of revision surgery. As John Charnley is remembered, we realize that the mechanical solution of THR for the biological problem of arthritis must be an ongoing evolution. Charnley believed that this surgery was an integral event in the management of end-stage arthritis of the elderly patient. His goal was to seek a pain-free sedentary existence for the patient. This concept is changing, as we are becoming a more active society and subsequently developing arthritis of the hip at an earlier age. We recognize that wear of the articulation becomes the ultimate fate of THR.

Total hip replacement is our heritage primarily because of the contributions of John Charnley. His life and legend speak to those currently practicing joint replacement. As we consider new technologies, introduce new materials and methods, explore less invasive surgery, robotics and computer-driven navigation systems, it is well to recall the wisdom of John Charnley. As I have studied his life, I am convinced he would agree that we must keep our science pure and our application true, if we are to maintain our bearings in regards to the ongoing evolution of THR.6

REFERENCES