STALWARTS IN ORTHOPAEDICS

Sir John Charnley

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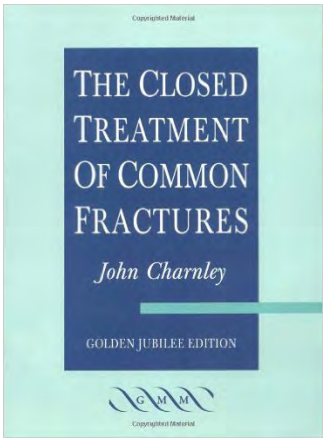
Picture Courtesy John Charnley Trust Web Page.

He was 39 when he published his book on closed treatment of fractures, 66 years ago. Even today, well into the 21st century, when a great majority of fractures are treated surgically, that book remains an absolute essential read for all orthopaedic trainees and practitioners, if not for the basic grasp of fracture mechanics, for sheer reading delight. And a man who advocated conservative management so scientifically, imaginatively and eloquently, then moved on, at that age and in that era, to two areas of contrasting surgical innovation – compression arthrodesis and arthroplasty – and set the gold standards and principles for these surgeries which stand to this day. Yes, it is quite a paradox that the father of joint arthroplasty, which restores mobility, initially studied and successfully elaborated on surgically bringing rigidity to joints. If one man has ever single handedly influenced the work atmosphere of a surgical speciality, it has to be almost certainly Sir John Charnley.

John Charnley was born on the 29th August, 1911, to a chemist father and a nurse mother. He took his basic medical degree from the Victoria University Manchester in 1935, and interned at the Manchester Royal Infirmary, but it is more significant that he became a Fellow of the Royal College of Surgeons a year later, in 1936, at the age of 25, the youngest permissible age for the college. Even though a very young FRCS, he was all of 46 when he courted and married his wife Jill, 20 years his junior, whom he met while on a skiing holiday in Zurs, Austria.

Charnley wanted to do cancer research but was discouraged by his seniors who thought that the prospects were not very good in that field. He spent his time juggling between general surgical work and orthopaedic fracture work till the Second World War, when he enrolled into the army and served in important expeditions like the Evacuation of Dunkirk. However, it was his posting in Cairo that brought him into close association with Dudley Buxton, an orthopaedic surgeon. This experience probably encouraged him to take up orthopaedic surgery. He showed early signs of his engineering acumen and orthopaedic common sense during this time when he modified the Thomas splint and introduced

Figure 1. Picture Courtesy Manchester Evening News, 19.04.2010, Report Salute to surgeon of cement op, Amanda Crook.



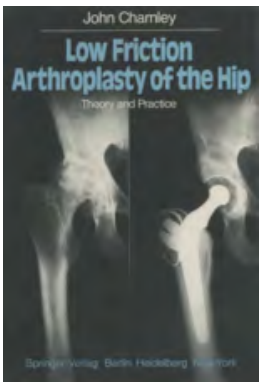


Figure 2. Sir John's Great Works.

the Charnley Walking Caliper. He ended his military service in May 1944 and joined the orthopaedic staff at Shaftesbury Hospital. After the war, he had a short stint at the Robert Jones and Agnes Hunt Orthopaedic Hospital as a resident in orthopaedics when he developed his curiosity and interest in bone grafts. There is an interesting episode of how Charnley coaxed his junior colleague to operate on his leg to study the behaviour of a bone graft. This got infected, went in for osteomyelitis, and needed some more surgeries to cure. (He would later, in his Wrightington days, inject finely divided PTFE particles in his own thigh to study the inflammatory reaction it incited in the body, in an attempt to find the ideal material for arthroplasty!) Suffice to say, he was eager to find out how the cancellous bone behaved when grafted, and his research in this area made him propose that it is compression which aids in union at cancellous areas, and thus came forth the idea of compression arthrodesis. Although no longer popular, what with the unacceptability of fusion these days, it goes without saying that even today, if ever an arthrodesis is indicated and performed, it is the compression of the site that is crucial to achieving decent fusion.

He returned to Manchester to work as chief assistant, and became consultant five years later in 1952. His first independent job was at Park's Hospital, but his burning desire to solve the diseased hip finally made him sacrifice these jobs for a full fledged responsibility at the Wrightington centre where he dedicated his time and energies towards the diseased hip and alternative replacement. There are anecdotal mentions of how this decision was precipitated by his close associate having been made Head of Services, which Charnley probably could not digest, considering he was made to be a leader. Whether ego or otherwise, this decision benefited generations of hip diseased patients by virtue of what it resulted in. Wrightington had initially been a Tuberculosis centre, but with the decline in number of TB patients, it was looking for newer areas of medical research and Charnley's proposal to set up a biomechanical lab here was well received. Here, he experimented diligently on joint surface friction concluding that congruity of the joint surfaces was more important than the fluid lubrication. This concept led to the development of low friction arthroplasty.

"The cart has been put before the horse; the artificial joint has been made and used, and now we are trying to find out how and why it fails."

Through various unsuccessful attempts, including serious failure and setbacks with polytetrafluoroethylene (PTFE), by sheer persistence and perseverance, he came forth with the trinity of stainless steel 22 mm head, the HMWPE liner, and the bone cement; which became the gold standards despite the various options available, even to this day.

Charnley dedicated his entire time to all aspects of this surgery. Realising the hazard of infection, he developed the clean air enclosure, total body exhaust suits and even the instrument tray system which are essential to reduce deep infection in arthroplasty. Looking towards constant improvement, he established the Centre for Hip Surgery, maintained prospective documentation, and also maintained a collection of post-mortem specimens, which many of his patients generously bequeathed him.

A keen rock climber in his early days, and a devotee of fast cars, especially Aston Martins, John Charnley was the least pompous of men. His rising stature did nothing to change his open nature, which many of his colleagues experienced sometimes in the form of his anger in the face of callousness or incompetence. At no point did he take his success for granted and continuously sought to improve the techniques of arthroplasty. He was a perfectionist and was supposedly preparing material for a meeting of the

British Orthopaedic Association in Manchester when he died on 5 August 1982. He is survived by Lady Charnley and their two children, Henrietta, an actress, and Tristram, who produces medical and scientific films.

Some of his relevant books include "The closed treatment of common fractures. Edinburgh: E & S Livingstone, 1950", "Compression arthrodesis. Edinburgh: E & S Livingstone, 1953"; "Low friction arthroplasty of the hip. Theory & practice. London: Springer, 1979."

The relation between Charnley and the industry is worth remembering in our times. His collaboration with the Thackrays to constantly evolve the ideal prosthesis was always peppered by his constant insistence to them to keep costs at the lowest. Moreover, in his idealism, Charnley insisted that they would not patent their design. And he willingly shared his laboratory and techniques with Muller and the likes. This lead to changes not only in the Charnley technique but also in prosthesis design, and also lead to the erosion into the potential market of the Thackrays by the North American and other companies. But the important lesson from Charnley's association with the industry is that orthopaedic surgeons must stand as firm checkpoints to critically evaluate the developments in the specialty, especially when economic interests are directly linked to patient care, medical education and design development. The industry significantly shapes the practice in our speciality. And the orthopaedic surgeon must be able to harness from them for the betterment of the science rather than be swept away by their market requirements.

Charnley never compromised on the tenacity of his efforts, be it in describing the maneouvres of a closed reduction technique, or in elaborating upon the behavior of cancellous bone under compression. And when he finally settled upon his life's calling, he continued the same to give us the still valid cornerstone principles of hip arthroplasty. In the uncompromising search for better principles and more refined knowledge lies the greatness of this man.

In his own words: *"The Orthopaedic Surgeon's faculties must be adaptable to a wide compass; the delicacy of a neurosurgeon, required in nerve and tendon surgery; the power and accuracy of a sculptor wielding the osteotome and heavy mallet; the engineering skill of a fitter, in using precision tools in bone grafting and internal fixation; the indefinable art of closed reduction in manipulating a fracture with the touch and craft of a bonesetter; pleasure in perfect dissection under a tourniquet, and satisfaction in the carnage of hindquarter amputation"*.

The legacy of Sir John Charnley should inspire orthopaedic surgeons for a long time and will definitely benefit sufferers of arthritic joints for generations to come.

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