Robert Jones Lecture

Total hip arthroplasty: results and consequences

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The difficulties and disagreements are mainly due to the very simple cause ...

It is traditional that in any eponymous lecture, tribute is paid to the one after whom the lecture is named, and also an attempt is made to weave into the presentation some aspect of the life and work that may be relevant. Few may be aware that Sir Robert Jones was in fact Robert Jones III. His father Robert Jones I, a native of Rhyl, North Wales, married Eleanor Humphries. They had four children. Robert (II) was born in 1836, followed by Mary, then Elizabeth (who was to feature prominently later in this story), and Susannah (Susannah died within one year of birth). Robert Jones II was expected to follow in his father's occupation but by the age of 20 married Mary Hughes and left for London to seek a career in journalism. Robert Jones III was born the following year and they were blessed with four more children. Their meagre income supported a very happy family. Robert Jones II died with typhoid fever aged 39. His final words to his wife are a reflection of their touching love for each other and for their children: 'Had I had a chance I'd buy you another ring and start our married life all over again'. (This love of family life and children comes through very strongly in the life of Sir Robert Jones.)

To link Robert Jones III to Hugh Owen Thomas we must look back to the days of Sir Francis Drake and the Spanish Armada. Following the defeat, a number of settlers found refuge, amongst other places, on Anglesey. Amongst them were the ancestors of Evan Thomas.

Evan Thomas was the last in the eight generations of bone setters. He had five sons all medically qualified. One of them Hugh Owen (1834–1891) married Elizabeth the

daughter of Robert Jones I in 1864. They had no children. They took Robert Jones III under their wing to live in Liverpool where Hugh Owen Thomas practised general medicine with leanings towards orthopaedics. 'Thomas was a man of action and probably overemphasised the importance of time and speed. He liked an opponent better than a person who agreed with him. He had many enemies and enjoyed them all,' to quote a close friend of Thomas.

Thomas guided Robert Jones, first to a medical degree and then to the Fellowship of the Royal College of Surgeons. Thomas the action man and Robert Jones the thinker and persuader, formed a team which laid the foundations of orthopaedics in the UK.

The practice could not have provided an excessive income for upon Jones's engagement to Miss Susannah Evans his bank manager sent him a terse note stating: 'Doctor Jones your income does not warrant an overdraft of £100'.

If we accept that difficulties and disagreements are mainly due to the simple cause, namely to the attempt to answer questions without first discovering precisely what question it is that you desire to answer (GE Moore *Principia Ethics*: Preface vii. Cambridge University Press, 1903), then it must follow that difficulties and disagreements can usually be avoided provided the subject of a debate, discussion or even argument, be clearly defined. For a subject to fall within the realm of science, there must be universal agreement, but we must accept that in science absolute truth does not exist: there are only approximations,

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working models and levels of significance. Scientific controversies, however, are essential in order that progress be made.

Having briefly outlined the background, I turn to the topic – total hip arthroplasty: results and consequences. In the context of total hip arthroplasty (THA), an arthritic joint can be viewed as a simple problem – a failure of surface geometry or simply ‘the joint is worn out’; it certainly is not a failure of fixation! It must, therefore, follow that failure of fixation (*i.e.* loosening of components) is a product of our attempts to address a clinical problem resulting from wear of the joint. If we achieve ‘bony ingrowth’ of the implant when attempting THA, the question that will have to be asked is which part of the skeleton will we have to tackle if the artificial joint fails because of wear? This aspect has, so far, escaped a serious debate.

What is total hip arthroplasty? May I suggest that it is best understood as a foreign body bursa, housing as neuropathic spacer, subject to fatigue and wear, fixed within a changing skeleton and imposing changes on that skeleton.

As a foreign body bursa, it will contain bursal fluid, wear and other debris and will be subject to changes in volume and pressure which will affect all the accessible areas, leading to cavitation – a natural event in any joint be it real or artificial. What are the subchondral cysts, geodes, but extensions of the joint cavity through the eroded cartilage and opening of the subchondral plate allowing the escape of synovial fluid into the network of the cancellous bone? It should, therefore, come as no surprise that similar changes may occur in THA without any obvious wear of ultrahigh molecular weight polyethylene (UHMWPE). Furthermore, such lesions may heal after a revision without any evidence that all UHMWPE particles have been removed. This has been documented with intrapelvic polytetrafluoroethylene (PTFE: Teflon) granuloma: not only did the lesions calcify but also showed new bone formation – clearly a healing process. The presence of UHMWPE wear particles may not be desirable and their presence ‘at the scene of crime’ may arouse suspicion but it cannot be taken as a proof of guilt. They are certainly not responsible for loosening of the components.

What of THA as a neuropathic spacer? Since no new connections to the sensory cortex exist, it should not come as a surprise that THA brings relief from pain of arthritis. But then what would the symptoms be if the operation fails? May it also remain asymptomatic? Clinical results may not reflect the mechanical state of the arthroplasty – a fact which has been well documented before but somehow is yet to find its way into clinical practice. Of what value is a postal or even a telephone survey without a good quality radiograph? We must clearly distinguish between a successful procedure for an individual patient and a long-term successful method of treatment. This fact clearly imposes the need for regular

follow-up with good quality radiographs and even acceptance of revision surgery for radiographic changes alone this must be conveyed to the patient before the primary procedure. Any mechanical procedure is exposed to the possibility of failure: fixation may fail or the implant (stem, cup) may fracture. Articulating surfaces will be subject to wear with shedding of the wear products into the bursal cavity and changes of the geometry and functioning of the arthroplasty. If the problem is loosening then the causes must be identified and the method of fixation improved. If it is the fracture of the stem, then the materials’ design and the technique of the implantation must be closely examined. Any perceived benefit of materials, design or of component fixation may not become apparent for a number of years and even then it may not reach ‘statistical significance’. Wear of the UHMWPE cup was suspected to be the one factor limiting the life of the arthroplasty as far back as 1985 and has been confirmed by a number of reports since.

Factors affecting wear including the level of patient activity, the effective roughness of the metal femoral head and the variations in the wear properties of UHMWPE have been studied in detail. The results have identified the need for a harder, more abrasion-resistant material for the head of the THA. Fourteen-year results of alumina ceramic 22.225 diameter head articulating with silane cross-linked polyethylene have shown the advantages with reduction of penetration rate from 0.1 mm/year with stainless steel on UHMWPE to 0.02 mm/year. Extrapolating the outcome with such a combination, the revision rate for wear and aseptic cup loosening could be reduced from 10% to about 3% at comparable follow-up times.

Total hip arthroplasty in general and the Charnley low frictional torque arthroplasty (LFA) in particular, has uncovered a hitherto unexpected demand with pressures to increase the numbers and reduce the waiting times for this form of treatment. It would appear that the long-term implications of the success of this method of treatment by THA have not been clearly thought out. Two aspects are of importance: first, in any operative procedure, nature takes over whilst the surgeon becomes redundant. The second follows Wolff’s law – ‘bone responds to function’. With a THA, the skeleton does not take over the function of the implant; on the contrary, the implant takes over the function of the skeleton with selective defunctioning being most obvious in the proximal femur. These changes have long-term implications. Initially, this was fracture of the stem. This is no longer a problem with improved materials, design and the technique of stem fixation. The process, however, strain shielding, continues. This changing pattern from stem fracture to strain shielding and endosteal cavitation of the proximal femur is clear with a follow-up past 11 years – the period at risk for stem fracture. The problem has been identified as being due to

distal stem support with resulting defunctioning of the proximal femur. Prospective studies are in place with very encouraging early results: improvement of the radiographic appearances of the bone–cement interface and maintenance of good quality femoral bone in a proportion of cases.

Any method of treatment demands regular monitoring and collection of meaningful data is essential. Collection of such data is carried out for two fundamental reasons – to satisfy our curiosity and to allow us to make a logical decision. Under such circumstances, the contributors may remain anonymous but the data may not be confidential for it would go against the second objective – decision making. Since no data are ever absolutely unequivocal, there will be a problem on how to use the incomplete evidence to make an all-binding decision. Some progress will be made if the objectives of data collecting are clearly defined and understood from the outset. Loose terms like implant/prosthesis, register/registry are at times used, interchangeably, presumably in a vain hope of conveying what is implied, rather than the clearly thought out parameters. Even with carefully collected information, care must be taken in the interpretation: large numbers alone do not imply significance and communal wisdom does not come from individual ignorance.

Demands for increasing the numbers of operations must not be at the expense of quality. 'Everybody operated and everywhere hardly a single surgeon has an opportunity to follow-up his cases, continuity of treatment – an essential desideratum, was impossible', to quote Sir Robert Jones. What has changed since then?

We must also distinguish between the desire to find out what is happening and a decision as to what should happen. Would I be so wrong as to suggest that after 39 years of hip replacement experience we may be in a position to decide what should happen? Prevention is far better than attempts at finding out what happened and who has done it.

Hip replacement is merely the beginning of the treatment. It demands surgeon's understanding of the strains imposed on this mechanical procedure, patients' appreciation of the limitations, whilst the health care system must accept its share of responsibility. The demand for the operation will remain if only because of an ageing population and increasing expectations. The demand for 'aftersales service' revision surgery will increase.

What should the response of the profession be? We must agree, set and demand support for standards. These can be strict but broadly defined: proven prosthesis, skilful surgeon, ideal environment. Hip replacement and all it entails must be accepted as a speciality within orthopaedics with the decision coming from the profession for 'order is not a pressure which is imposed on society from without, but an equilibrium which is set up from within' (Jose Ortego y Gasset 1883–1955).

'Patience is the supreme virtue of an orthopaedic surgeon. He does not expect immediate results, he knows that if he lays his foundations well, time will work for him.' This statement by Sir Robert Jones applies eminently to the practice of total hip replacement.

Tradition has it that Sir Robert Jones was 'consultant surgeon to Manchester Ship Canal' as documented in the *Provincial Medical Journal* of 1 December 1893 by which time the canal was nearly completed. Would it be more correct that which was reported by a journalist at the cutting of the first sod in 1887: 'Doctor Jones: surgeon to the Ship Canal works at a salary of about £3000/year but has no private practice – Doctor Jones refused and was appointed a kind of medical practitioner over the other practitioners engaged'. Clearly, Sir Robert Jones valued his independence, an object lesson to us all.

All that remains for me is to express my most sincere thanks to Professor Charles Galasko for putting my name forward for this lecture, for the College for accepting the suggestion and to this distinguished audience for their kind attention.

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Source of information

Watson F. *The Life of Sir Robert Jones*. London: Hodder and Staughton, London, 1934.