Some Major Contributions to Health from the North West

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The symposium mainly concerned with health and the provision of medical services in the North West. In contrast, I describe the historical background of some medical advances from the North West which have been exported to the rest of the world. Many of these major advances could not have been planned as chance played an important role, and several were associated with the two World Wars.

Keyhole surgery

Churchill described the Battle of El Alamein as the turning point of the Second World War. The Germans were defeated and left much equipment behind. A young surgeon from Liverpool, James Gow, took possession of a Leitz cystoscope which was the most sophisticated equipment then available. His hobby was photography and he wanted to take pictures inside the bladder. At the end of the war he was dismayed to find that he was not able to take photographs because not enough light passed through the cystoscope. He therefore contacted Harold Hopkins, an optical physicist at Imperial College, London who was earlier involved in the development of the flexible fibre optic endoscope, and asked him to look into the problem. Hopkins, under continued pressure from Gow eventually agreed, and came up with a brilliant solution.

The cystoscope is a long rigid tube of air with a series of lenses made of glass. Hopkins turned the optics on its head. Rather than a tube of air interrupted by thin layers of glass, his endoscope consisted of a tube of glass interrupted by thin layers of air. This increased the light intensity by a factor of 80, and provided Gow with his pictures. This optical advance led directly to the development of 'keyhole surgery', which was one of the major surgical advances of the twentieth century. This has now been used for many procedures including gall bladder surgery and removal of the prostate. Keyhole surgery, with a very small

* Ronald Finn (1930 – 2004). His obituary is printed in *Medical Historian*, 15 (2003-4), 54-55.

incision involves much less trauma to the patient, and a more comfortable and rapid convalescence.

Relaxant anaesthesia

At the beginning of the Second World War it was decided to set up thoracic surgical units to manage chest injuries. The Liverpool unit was at Clatterbridge Hospital, on the Wirral peninsula, some twenty miles west from the city, under Mr Morrison Davies. He stipulated to the hospital authorities that he would only direct the unit if he could keep his own anaesthetist. This was Dr Jack Halton, who was a genius in anaesthesia, but with a love of alcohol. Nontheless he was the only anaesthetist in Liverpool at that time who was competent to deal with major thoracic surgery, which was only just being developed.

The problem was that Jack Halton was of military age and could have been called up to the Forces at any moment. An administrative plan was devised which changed the face of surgery. Halton would be called up into the RAF and made medical officer to the Balloon Battalion, a sinecure which involved only a few hours of work per week. He would be available to deal with any major thoracic surgery at Clatterbridge. However, he spent most of the war in the Officer's Mess at the large American airbase at Burtonwood, near Warrington, some twenty miles east of Liverpool, and in the opposite direction from Clatterbridge.

One day in the mess he was told by an American colleague of work in Montreal, that attempted to use a crude extract of a South American arrow poison to produce muscle relaxation in surgery. The attempt was not successful because the preparation was impure. Thus it was not possible to give a standard dose, and there was also difficulty in reversing the action of the drug at the end of the operation. Halton instantly appreciated the possibilities and said he would like to try this new material. An American pilot, also sitting at the bar overheard the conversation and offered to bring over some when he made his next trip across the Atlantic to the United States.

The crude preparation was then taken by Halton's colleague, Dr (later Professor) Cecil Gray, to Dr Rodney Gregory, then Reader (later Professor) in the Department of Physiology at the University of Liverpool who asked him to analyse the preparation and identify the

main constituent. Gregory said this was not necessary and picked a bottle of pure curare from the shelf, and said ‘This is it, we use it for the medical students to produce muscle paralysis. You can have some’.

Halton and Gray then developed relaxant anaesthesia which is now used throughout the world. The muscles are paralysed and respiration is carried out by a ventilator. Only light anaesthesia is needed. This produces a stationary field for operation, which enables microscopic surgery to be carried out, and made possible modern microvascular and transplant surgery, as well as many other techniques. This technique was subsequently modified by Dr Jackson Rees, also of Liverpool, for paediatric surgery.

Relaxant anaesthesia was one of the major discoveries of the twentieth century and was largely developed in the North West. This work was not planned, and it is interesting to speculate whether this advance would have been made if Dr Jack Halton had not spent most of his war in the bar at the Burtonwood airbase.

The Rhesus story

The next example was initiated by the First World War when there was a rumour that the Germans were going to bomb Leicester with their Zeppelins. This led the Clarke family to evacuate their two small children, one of them Cyril Astley Clarke, to a small village about six miles from Leicester. They were looked after by a girl called Fossie, whose hobby was collecting butterflies. Fossie’s enthusiasm was passed on to the boy, who developed a life long infatuation with butterflies. The young boy eventually became Professor of Medicine in Liverpool, but continued his work with butterflies.

Clarke perfected a method of hand-mating butterflies and was able to produce rare hybrids. This led to a study of the genetics of butterflies, and in particular the phenomenon of mimicry, in which the coat colour and pattern match the background and act as camouflage to protect the insect from predators. Clarke and Sheppard also studied mimicry in moths on the Wirral which were black in industrial areas and white in non - polluted areas, a dramatic example of evolution in action.

It was a natural progression to extend the genetic research into medicine, and the link was that the mode of inheritance in butterflies

was very similar to that in the Rhesus (Rh) blood groups in humans. Specifically, they both used groups of linked genes, called polygenes. This serendipitous and circuitous route led to a study of the interaction of Rhesus blood groups in the devastating haemolytic disease of the new-born. When a baby is Rh positive and the mother Rh negative, the mother may produce antibodies which destroy the baby's red blood cells, causing a severe anaemia which can be fatal. A research group was set up, of which I was fortunate to be a member, and we were able to devise a method to prevent this disease. Yet despite sophisticated treatment including exchange and intrauterine transfusion, at least 1,000 babies in the UK died each year.

The newer treatment involved immunisation against the Rh antigen and has been generally available since 1975. This means that over 25,000 people in the UK are alive today who otherwise would have died. If this figure is scaled up to include Europe and the American continent, there are probably about 350,000 people alive today who would not otherwise have survived.

Hip replacement

My final example is the last but by no means the least important. A patient of mine, visiting Los Angeles, California, in the United States of America asked his son (who lived there) to find the best surgeon who could replace his hip joint. It was suggested that he find out who had replaced Elizabeth Taylor's hip. Elizabeth Taylor's surgeon told him that he himself had gone to Wrightington Hospital, in Lancashire, some thirty miles from Liverpool, in order to learn how to do this operation. His teacher there was Mr John Charnley, a Consultant Orthopaedic Surgeon. Hip replacement surgery was pioneered by Charnley, who was initially at Manchester Royal Infirmary but who moved to Wrightington Hospital, near Wigan, to concentrate on developing hip replacements. There he was given an engineering workshop. It is of interest that Gow and Charnley both had sessions at this hospital, which at the time was mainly a hospital for the treatment of tuberculosis.

There were two parts to this discovery. Firstly, Charnley was a talented engineer who was equally at home in an engineering workshop as he was in an operating theatre. While in the army he kept an electric drill and an oxyacetylene blow lamp in his bedroom. He had no formal

training in engineering, but while stationed in Egypt, he was put in charge of an appliance workshop staffed by the Royal Electrical and Mechanical Engineers (REME). He almost certainly further developed his engineering skills in the army in Africa, (not so far geographically from, and at about the same time as Gow). This enabled him to devise the first successful artificial hip joint. It is doubtful whether any ordinary orthopaedic surgeon could have done this.

The second part of the discovery was his realisation that control of infection was vital. If infection got into the bone and cement junction it would be impossible to treat, since antibiotics would not penetrate the synthetic material. The artificial joint would have to be removed. The ordinary operating theatre is relatively sterile, but Charnley realised that he would have to significantly increase the degree of sterility. The surgeon wore a 'space suit' and the air around his body was extracted by a special exhaust system. The Charnley Module initially consisted of a small area of the theatre enclosed in polythene with its own filtered air supply.

The Charnley Module now simply consists of inlets in the ceiling above the operating table which pump in sterile air which has passed through several filters. The positive pressure blows any bacteria away from the wound. Again Charnley's engineering skills solved the problem of infection, and this alone would have ensured his place in history, even if he had not pioneered hip replacement.

Joint replacement surgery has probably done more than almost anything else to relieve chronic pain. It is therefore a tragedy that Charnley never received a Nobel Prize, but he did get something much more unique. He is, I think the only surgeon to have a public house named after him, and I can recommend a visit to the Charnley Arms just off the M6 at junction 27!

Conclusion

There are other advances from the North West that could be mentioned including the first test tube baby through the pioneering work of Steptoe and Edwards in Oldham, and the first diagnostic isotope scan of the thyroid in Liverpool by Ansell and Rotblatt. I have also shown that several of the North West contributions have been triggered by the two World Wars, and that either chance, or serendipity played an important

part in some of these advances. The historical lesson is that major innovations cannot be planned as they often arise in unusual circumstances, and too rigid planning of our health services could stifle originality and initiative.