A HISTORICAL REVIEW OF THE CAMERA'S USE IN MEDICINE

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The title of this paper is "A Historical Review of the camera's use in medicine". However I think it important to say something initially about the work of early medical illustrators if only to show the progression from ancient times to the present electronic methods of recording medical conditions.

The practice of medical illustration has been with us a long time. The ancient Egyptians produced the world's first surgical textbook at about the time of Tutankhamen 1700 BC. They also produced many stone carvings portraying human ailments. The interest of the Greeks in medical illustration emerges from their pottery. The Renaissance too provides ample evidence of the involvement of artists in anatomy, Leonardo Da Vinci being one of many artists who contributed to this field. Vesalius's great book *The Fabrica* was the first complete systematic description of the human body. The author himself said of this work that the text was of secondary importance to the illustrations. The first printed book to contain illustrations of medical interest was printed by Peter Schoeffer at Mainz in 1484. Today skilled artists are still required by the medical professions to provide detailed drawings for lecture and publication purposes.

Intermediary between the skill of the artist and photography is the *camera obscura*, the principle of which was known to Aristotle and Leonardo Da Vinci. The person responsible for bringing it to the attention of the public as a medical practitioner Giovvani Battista Dellaporta, a Neopolitan Physician, in his book *Natural Magic* in 1588. A surgeon to St. Thomas's Hospital, William Cheselden, became the first to use the *camera obscura* in medicine to provide greater accuracy in drawing for his book *Osteographia* or *The Anatomy of Bones* in 1733.

The first medical photographs of patients were probably taken by Dr. Hugh Welch Diamond. Dr. Diamond read a paper to the Royal Society in May 1856 in which he directed attention to the function of photography in psychiatry, recording the appearance of mental disorder and also the importance of identifying the patient in case of re-admission. The doctor became a founder member of the Photographic Society (now the Royal Photographic Society) in 1853 and did much to promote the use of photography in medicine. What is probably the first published photograph of a medical subject showed Duchenne of Boulogne, a pioneer of electro-therapy, with a patient in 1862.

In 1864 Alexander Squire, a pupil of Sir William Jenner, published a book, dedicated to Sir William, entitled *Photographs coloured from life of the disorders of the skin.* The book contained 12 hand tinted albumen prints illustrating some of the common skin conditions. Also in 1864, a strange case was reported of a woman who had her portrait taken with a camera; when the photograph was processed it was seen that the face was covered in blemishes (not a photographic error). A few days later, the woman died of smallpox. The camera had picked up the rash, before it had become visible to the eye. (Unlike modern black and white film (which is panchromatic), old plates were not sensitive to red. Therefore a faint rash on the skin would be seen on the negative as white spots which, when printed, would show up as dark specks).

The style of nineteenth century medical photography was far removed from the present day clinical approach. The casual way early medical photography was undertaken sometimes bordered on the bizarre, as is illustrated by a photograph taken at the medical school of Columbus, Ohio in 1905 of a dissected head on a dinner plate. Medical photography had advanced and was by now used in many centres of medical study. However it was a slow and messy process and many years were to elapse before medical photography moved away from having a certain novelty value to become a medium respected in the study, practice and research of medical science.

It is virtually impossible to write about the progress of medical photography without saying something about the development of camera

design, medical photography running a parallel course to improvements in the equipment and chemistry of photography. Setting aside early plate cameras without shutters and using wet plates, plate cameras have not changed much in the past 70 years. Although they are excellent for studio, architecture and landscape work, from a medical photographic viewpoint they are considered by some to be cumbersome, time-consuming and expensive in use. I have personal experience of this. When I was appointed Medical Photographer to the University Department of Child Health in 1955, the only camera in the department was a plate camera without flash synchronism and a lens with a maximum aperture of f7.7. The subjects, sick children, were required to keep still. The camera would be focused and a dark slide inserted in the back; by this time, most of the children to be photographed would have moved or run away and so the whole process had to be repeated. At the present time the cost of sheet film for such an enterprise would be prohibitive.

The man who changed all that and made modern medical photography so much easier (although I am sure his research and design was not undertaken with clinical photography in mind) was Oskar Barnack, born in 1879 in Germany and the inventor of the Leica camera. Whilst working for the Leitz company in Wetzlar, early in 1914 he designed two prototype cameras, the forerunners of the 'Leica'. He chose a format made up of two standard motion picture frames, thus the now classic 24 mm x 36 mm format was born, in other words the 35 mm camera. Ernst Leitz gave Barnack his complete backing with this project. The Leitz Company manufactured microscopes and other scientific instruments and this type of camera was an entirely new departure from their normal work. The 'Leica' went into production in 1924. The development of the so-called 'miniature camera' market grew, until just before the 1939 - 45 war there were 13 German firms, 5 American and 2 French marketing between them 30 different models, followed in the sixties by a flood of Japanese cameras.

A word also must be said about the lens, which had to be of excellent quality, a ten-fold linear enlargement being a basic requirement. This became the task of Dr. Max Berek, who designed a 50 mm f3.5 lens, that was at least equal to the very best lens then in existence.

The concept of medical photographic departments within hospitals were still a long way off when the Leica went into production. Individual departments within a University Medical Faculty were the most likely places to find medical photographs being produced for teaching and publication purposes, this being one of the tasks of technicians within the various departments. Such work however was for the most part concerned with photomicroscopy and gross pathological specimens.

Freelance photographers specialising in medical work were frequently used by the medical profession to provide photographs for publication and teaching. A distinguished photographer, working in Liverpool in the 1940s was Mr. Wilfred Lee. Well-known in University circles at this time, he did not confine his work to medicine and was often asked to undertake work for other faculties within the university. In 1948 Mr. Lee was appointed head of the newly-created Central Photographic Unit within Liverpool University. Another well-known freelance medical photographer in the Merseyside area for many years was the late Rodney Green. Having served as a pilot during the war, he moved north and began his professional career in photography. He became involved in medical photography when a doctor friend asking him if he would photograph a coeliac patient in 1946. These photographs were seen by a consultant at the Royal Liverpool Children's Hospital and from then on his career in medical photography began. Green's work in this field as a freelance took him to Alder Hey, the Royal Southern and Whiston Hospitals. He was also closely involved with the late John Furness, an expert in forensic odontology in the early stages of establishing the now recognised evidence from victim bite marks.

Health Service and University financed medical photographic units within hospitals began to form in the 1950s. Being hospital-based meant speedy access to patients in theatre, clinics and wards. The photographs were of value not only for teaching and publication purposes but also as a record of a patient's progress. The photograph within case notes helping and enhancing the medical officer's written description of the patient's symptoms, the value of such photographs to doctors seeing patients for the first time, or at clinics, weeks or months between visits, was fully

appreciated by medical staff. The work in such units is not confined to patients but also includes the photography of X Rays, scans, charts and diagrams, all to be transformed into teaching slides or prints for journals and books.

Older members working in this field had been trained in radiography or, as in my own case, had been trained as Laboratory Technicians. The basic medical groundwork had therefore been studied. With medical photography now a recognised profession within the health service, the training of staff direct from school became an important task, because the student had to master not only camera and photographic skills but also elements of medicine and, even more important, how to deal with patients. Both adults and children view a white-coated figure with a camera with apprehension and some suspicion. With the training of staff and other professional requirements in mind, the Institute of Medical and Biological Illustration was formed in 1967, followed twenty years later in 1987 with the formation of a Chair in Medical Illustration at the University of Wales College of Medicine, Cardiff. This position was occupied by Professor Marshall. Medical Illustration has in the last twenty years attained degree status.

There are numerous characters from the field of medical photography who have worked tirelessly to improve the professional standing of medical photographers; I would like to mention two. The late Robert Ollerenshaw (Manchester born) who died October 1986, qualified in medicine from Oxford in 1938; he then specialised in radiology. A keen photographer, he formed a research funded medical photographic service at the Manchester Royal Infirmary in the late 1940s. This effort was in time translated into the full-scale department it is today. Secondly there was the late Patricia Turnbull who died in 1980, a true professional and again a person who had migrated from radiography into the sphere of medical photography (in 1947). Her early days were spent at Guy's and the Royal Marsden but in 1953 she was appointed head of the Department of Medical Illustration at Charring Cross Hospital in the Strand. She was Honorary Secretary and founder Council member of the London School of Medical Photography.

Photomicroscopy has been practised with varying degrees of success since the turn of the century. However the old horizontal equipment has largely been replaced by vertical 35 mm and 5 x 4 photomicroscopes. This equipment with auto-exposure control and optional television is much more convenient in use; the 35 mm camera head in particular produces results in colour at a fraction of the cost of the old equipment. Medical photomicroscopy requires a working knowledge of histology, haematology and bacteriology.

Other specialities in the field are fundus and endoscopic photography. Fundus photography, first practised from the early 1900s, has developed over the years to prove an invaluable diagnostic tool. Endoscopic photography with still and cine cameras remained more or less static in application until the arrival of fibre optics and television. Since then there is virtually no cavity in the body that cannot be examined and photographed. One can also take still and video pictures within certain joints.

Motion picture medical photography commenced about the time of the arrival on the market of Kodachrome colour film in 1935. The limiting factor with cine film has always been cost; producing a correctly edited and sound tracked programme requires the use of a sound and processing laboratory, plus sound recording equipment. Producing optical sound tracks by this method was a very expensive business, therefore most medical 16 mm films were silent. The format of choice remains 16 mm, although 9.5 mm and 8 mm have been used. In the early sixties magnetic tracked film became available. Once the film had been edited, a sound commentary could be dubbed on to the film. Super 8 equipment with sound recording systems built into the camera arrived in 1976. This enabled lip synchronism to be used, the magnetic and track being unaffected by processing. It had two drawbacks however. The first was that the sound track was not in the same position on film as the image, being displaced by a number of frames; this did not matter on a continuous run of film with general sound or music because the sound heads in the projector matched the camera configuration and sound therefore matched the scene. Problems occurred however when editing with lip synchronism was required. The second and fatal drawback,

from a manufacturer's point of view, was that sound super 8 arrived on the scene almost at the same time as portable colour video cameras. This has completely wiped super 8 off the market for medical use and seriously detracted from the use of 16 mm. A medical photographic department that made use of 16 mm film now had the advantage of perfect lip synchronism, instant replay, no processing and minor running costs even when using the sub-broadcast Umatic format.

With the arrival on the market in the mid-seventies of the small (by studio standards) colour T.V. camera a whole new vista opened up for medical motion picture recording. Medical photographers who wished to move into this field had to learn new techniques, including electronics if they hoped to cope with the various problems that can and do occur. The Institute of Medical and Biological Illustration arranged with the B.B.C. for courses in T.V. engineering, editing, sound, lighting and camera operation etc at the B.B.C. Engineering College, Wood Norton, for Institute members wishing to use this medium to their best advantage.

The choice of equipment at the commencement of this era, approximately 12 years ago, was quite extensive: single tube cameras, three tube cameras with or without prism optics, Umatic, V.H.S., and Betamax recorders, monitors and editing equipment. When I look back at what was then state of the art equipment I think how crude it all was compared with today. Advances in this field move at lightning speed.

I read a paper in this lecture theatre in 1983 entitled 'The Medical Application of Television'. At the end of the lecture I spoke of charged coupled devices and how in the future silicon chip technology would replace the picture tubes within television cameras. The future I spoke of then is with us now. C.C.D. cameras have been on the market for approximately a year. Such cameras require less power, less light, have fewer faults and are much more robust than tube cameras. One such camera manufactured by a famous company received its initiation in Afghanistan. The major London hospitals have developed medical television to the point whereby they are linked by cable, enabling a televised grand round to be

viewed simultaneously at other hospitals and medical schools within the network.

So who knows what the future holds in the field? As I remarked earlier, the progress of medical photography marches side by side with developments in camera and now electronic design - but finding the funds for such equipment is an art in itself.

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