

PUERPERAL SEPSIS 1800—1957

JOHN A. STALLWORTHY, F.R.C.S., F.R.C.O.G., F.A.C.S. (HON.)

Regional Director (Obstetrics and Gynaecology, Oxford; 1957 Guest Professor, University of Cape Town

There are many people who find the study of history dull. 'It is the wise man who profits by his own mistakes', but it is common sense that he is a wiser man who profits from the mistakes of others. I crave your forbearance, therefore, if occasionally I wander from the strict path of my subject in order to catch a wider view so that we may learn something from the mistakes of the past. The story of puerperal sepsis from 1800 to 1957 is a most exciting one. In terms of the title of my address it must commence with the beginning of the 19th century but I trust you will pardon a very brief prologue so that we may the better see the events of the years in their true focus.

PROLOGUE

Denham and Boer

In the year 1784 the Lying-In Hospital at Vienna was founded and in 1789 Boer was appointed as its director. He worked faithfully and well for 33 years, during which time the institution delivered 65,000 mothers, 850 of whom died—a mortality of 1.3%. Before taking over his appointment Boer had come under the influence in Great Britain of Denham, who 20 years previously, in the year 1768, had stated that childbed fever was contagious and could be transmitted by physicians and by nurses from one mother to another. Based on this belief he taught the principles of cleanliness and patience and maintained that these were the weapons with which to fight the contagion. It is interesting to note that in the year 1770 Levret had questioned whether the forceps used by Smellie might not carry the contagion on the leather with which they were coated. During the years of his work at Vienna Boer had maintained the tradition taught him by Denham and had persistently refused to allow teaching from the cadaver in his maternity institution. It was being progressively more widely accepted that instruction from the cadaver was evidence of scientific progress, and because of his refusal to submit to the pressure brought to bear upon him by the University authorities Boer was ultimately dismissed from his post for insubordination. He was followed by a man called Klein who in the first year of his appointment raised the maternal mortality from 1.3% to 7.8%. He agreed with those who wished for cadaver instruction and employed this method in the hospital. He was followed by Semmelweiss and our story really commences with the years during which Semmelweiss occupied the post of Director of this big institution.

SEMMELEWEISS, CEDERSCHORD AND WENDELL HOLMES

Semmelweiss divided the institution into two divisions. In the first of these he delivered 20,042 women with 1,989 deaths—a mortality of 9.9%. In the second division he delivered 17,791 women with 691 deaths a mortality of 3.3%. The essential point

of difference between the two divisions was that the first was used for the instruction of medical students whereas in the second the deliveries were conducted by midwives. It follows, therefore, that in the first division were assembled those who were also receiving instruction from the cadaver. There appears to have been no other major point of difference between the work done in the two divisions nor was there evidence of selection of cases for one or other group. It became an established fact, which of course soon became known to the citizens of Vienna, that women whose labours were prolonged were very liable to perish. Scenes of anguish occurred from time to time when women who believed they were being admitted to the second division found that because of shortage of beds or for some other reason they were to enter into the dreaded first division. They would plead at the door of the wards that they should be sent to the second division. Women distended with peritonitis, with bright eyes, high temperatures, rapid pulses and a great fear would lie in the wards protesting that they were not ill because they dreaded receiving the medical assistance which seemed to them to be but a herald of approaching death. It was the custom of the priest as he went around the ward administering the Last Sacrament to toll a little bell, but when nearly one woman in every ten admitted to the first division died as a result of her labour the furtive visits of the priest with his tolling bell had such a detrimental effect on the morale of the patients in the ward, and probably of the staff, that Semmelweiss found it necessary to suggest that the bell was not an essential to the Last Sacrament.

While these terrible happenings were a daily occurrence in the lovely city of Vienna, opinion elsewhere in the world was more progressive. In Stockholm Cederschord in 1839 had stated quite definitely that puerperal fever was carried by nurses and doctors from both the sick and the dead. He therefore ordered that every patient in his wards should have her own sponge and towel and he added chlorine to the water for washing to lessen the danger of transmitting the contagion. The result was that he reduced the epidemics of childbed fever to zero, although sporadic cases still occurred. In the United States of America the poet and essayist, Oliver Wendell Holmes, born at Cambridge, Massachusetts, and a graduate of Harvard, was becoming interested in the problem of puerperal fever. He had studied medicine for 2 years at Paris. His attention was drawn to the tragic case of a physician whose hand was pricked at a post-mortem examination and who subsequently died. Between the time of receiving his injury and his death he had examined a labouring mother, who also died of infection. Holmes considered these tragic events, and in 1843 published a paper on *The Contagiousness of Puerperal Fever*. He proclaimed his belief that this was transmitted from the corpse and from the living when there was associated erysipelas, and laid down 3 clear rules of prophylaxis:

1. That no obstetrician should perform a post-mortem on a patient who had died of puerperal fever.
2. That if an obstetrician was present at such a post-mortem he must thoroughly cleanse himself, change his clothes completely, and not go near a labouring woman for 24 hours.
3. That it was incumbent on obstetricians to avoid all post-mortems but if by any chance or mischance they were present at one of these they should carry out the instructions given in Rule 2.

Two of the leading obstetricians in America at that time were Hodge and Meigs. When Holmes published his paper a battle royal commenced. Hodge retaliated by publishing an article entitled *The Non-Contagiousness of Puerperal Fever*. In this he 'begs students to divest their minds of the dread that they could carry this horrible virus'. Meigs also entered into the fray and in his attack on the teachings of Holmes stated, 'I prefer to attribute deaths to accident or to Providence of which I can form some conception, rather than to a contagion of which I cannot form any idea'. To these attacks Holmes replied, 'No man makes a quarrel with me over the counterpane covering a mother with her newborn infant at her breast,' but while he waved this olive branch in one hand he wielded a scathing pen in the other and now referred to puerperal fever as a 'private pestilence'. In 1855 he published the second edition of his paper, in which he said, 'The time has come when the existence of a private pestilence should no longer be looked on as a misfortune but as a crime'. This was in 1855, and it will be remembered that in Great Britain Denham nearly a hundred years before had laid down his principles of good practice in obstetrics, namely patience and cleanliness.

We must now return to Vienna and the year is 1847. Semmelweiss had a friend who was the Professor of Medical Jurisprudence; his name was Kolletscha. This professor had the misfortune to have his hand pricked by a student during a post-mortem examination and shortly afterwards died. Semmelweiss was present at his post-mortem and as in sorrow he studied the findings, the light dawned. To quote his own words: 'In the excited condition in which I then was, it rushed into my mind with irresistible clearness that the disease from which Kolletscha had died was identical with that from which I had seen so many hundreds of puerpera die.' He asked himself whether the cause of death could have been the injury received by the prick and he decided that this could not be so, for after all so many people had wounds or pricks which caused no difficulty. He then asked could it be as a result of material transmitted from the corpse at the time of the injury, and the answer came to him that it must certainly be 'yes'. The immediate result of this tragic experience was that in May 1847, just 110 years ago, Semmelweiss re-introduced cleanliness into the wards of the Vienna Lying-In Hospital and instituted the use of the chlorine wash. In the first 7 months following these innovations the mortality of the first division was reduced from 11.4% to 3% and by the end of the first year it was down to 1.2%, while for the first time in the history of the two divisions the mortality of the second division was higher than that of the first, being 1.3%. It should be noted, however, that these were the identical results which Boer had achieved 50 years before by applying the principles he had learnt in Great Britain from Denham.

In the same year, 1847, another tragic event happened in the Vienna Lying-In Hospital. A pregnant woman with a fungating carcinoma of the cervix was admitted to a ward in which were 12 mothers; 11 of them died. The truth then dawned on Semmelweiss with its full force, namely that not only was the cadaver dangerous as a source of infection but even the living could be the primary focus from which this terrible disease could spread. Like the prodigal son Semmelweiss uttered his confession from the heart: 'I must confess that God only knows how many I have assigned to the grave. I have occupied myself with the cadaver to an extent reached by few other obstetricians.' He now taught that puerperal fever was a resorption fever brought about by the introduction of decomposed animal matter to the genitalia of a parturient woman. He stated further that this 'decomposed animal matter' could be transmitted from a corpse or from the wounds of the living. It could be carried on the hands, on linen, on instruments, on bedpans and even by the air. He stated further that it was but one form of pyaemia and that the surgeons should take heed of what was happening. This was in the year 1847, and today, when events of moment are flashed across the earth in a matter of seconds, it is sad to recall that it was 2 years before the views of Semmelweiss reached London.

In 1849 they were proclaimed in that city and were generally accepted as being true. That same year Semmelweiss was dismissed from his post and, to complete the tragedy of his life, was later admitted to a mental asylum, where he himself died of pyaemia.

PASTEUR AND LISTER

The scene now changes as we leave the realm of medicine for a few moments and return to Great Britain and to the years referred to in the prologue. In 1774 a young Scot, James Watt, left Glasgow for Birmingham to join an industrialist and engineer called Matthew Boulton. Watt took with him great hopes and great ideas. In association with Boulton and with other scientists and engineers of the time he transformed these ideas into an invention of steam and steel and the first steam engine was created. This was the beginning of the Industrial Revolution. One result of this was that cities grew larger, accidents became commoner and hospitals for dealing with the trauma of industry were necessary on an ever-increasing scale. The days of frock-coated surgeons with blood and pus as the hall-marks of their skill had dawned. The Quaker surgeon, Joseph Lister, born in 1829, was appointed to the Chair of Surgery at Glasgow in 1860. The post-operative mortality from fever and gangrene following amputations was at times as high as 45%, and at one stage Lister was concerned lest surgery in institutions would have to cease. He knew of the Hippocratic concept of healing by first intention and realized that this occurred only when there was no putrefaction, but the problem to solve was how this putrefaction could be avoided. Meanwhile in France Louis Pasteur, who had been born 7 years before Lister, in 1822, was now a chemist and scientist particularly interested in the processes of fermentation of beers and wines. In 1854 he was Professor of Chemistry at Lille, where he was able to refute the growing theory of 'spontaneous generation' by showing that micro-organisms were in the atmosphere and were responsible for the fermentative processes in the production of wine and beer. It is interesting to note that among other substances he referred to *Penicillium glaucum*. In 1876 he published his paper '*Etude de la Bière*', and by this time Pasteur had realized and was teaching that the healing of living matter occurred by first intention when the body was protected from the micro-organisms to which he had drawn attention. He later studied cholera in chickens and reduced the mortality from 10% to less than 1%. The anthrax bacillus was then discovered and he investigated the production of immunity by means of attenuated strains.

The scene changes once more to Scotland, where Lister heard of the work of Pasteur and saw in it the answer to the problem which was giving him such grave concern. In 5 years the era of modern surgery had begun as Lister introduced his antiseptic techniques. He was appointed Professor at Edinburgh in 1877 and later went to King's College, London, where Cheate was his house-surgeon. He had effected a surgical revolution, but not without opposition, and some of the great men of his time were bitterly opposed to his new ideas. Men like Fothergill, who at times smoked a pipe when performing the operation which has made him famous, believed that 'kitchen cleanliness' was all that was necessary and one must pay tribute to the excellent results these men achieved. Others, like Lawson Tait, were more actively hostile, but it is recorded that Lister was more saddened than angered by the failure of colleagues to see the evidence which, as he said to Cheate, was so clearly displayed before their eyes. It will be appreciated that the history of puerperal fever cannot be fairly reviewed without paying tribute to those great men who, in fields other than obstetrics, made the contributions which have meant so much to mankind, just as in the first instance early obstetrical pioneers were the ones who showed the road to the surgeons by which the great enemy to surgery could be overcome.

Droplet Infection

The next page in the history of the conquest of infection was again written by a surgeon in the early years of the 20th century, when Halstead conceived, practised and taught his new ideas of aseptic surgery. His clinic in America was visited by young surgeons from many parts of the world, including men like Sargent from St. Thomas's Hospital, London. When these men returned to their own units their newfangled ideas were not always received favourably by their more senior colleagues, but the results achieved

proved their worth and more and more surgeons sought to understand the methods involved. In the 1930s the teachings of Denham and of Oliver Wendell Holmes so many years before were given a new emphasis by the work of Colebrook and his associates, when they demonstrated the importance in obstetrics of the haemolytic streptococcus and of the need to wear masks, and to wear them intelligently, and of the dangers of droplet infection. There are unfortunately still some who either, do not wear masks at all or, even worse, wear them dangerously. There has recently been made available in England a film for teaching purposes demonstrating a normal delivery. It is perhaps relevant to our topic to make the comment that the obstetrician as he delivers the baby is not wearing a mask but the nurse who comes in later to bring a cup of tea to the happy mother with the baby in her arms is properly gowned and masked. This film was made in a South African hospital.

CHEMOTHERAPY AND ANTIBIOTICS

At the time that Colebrook and his colleagues were working with the haemolytic streptococcus, the first of the sulpha drugs—red sulpha—became available. There is no need to enlarge on the tremendous developments which followed in the field of chemotherapy but it is of interest to note that in England and Wales the Registrar-General's figures show that the maternal mortality from puerperal sepsis fell within a relatively few years to one-thirteenth of what it had previously been.

The next chapter in the history of the battle against infection was opened when a lady who was herself a doctor and the wife of a professor of pathology requested permission of the authorities at Oxford to test in the wards of the Radcliffe Infirmary a new preparation which had been isolated and prepared by her husband in the laboratories of that city. This early trial of penicillin restored to life patients desperately ill with infections of many types, including some with gas gangrene. In spite of the miracles which happened before the eyes of those of us who were privileged to see some of these early trials it is doubtful whether Lady Florey, as she later became, or any one of those associated with her, realized at that early stage just how significant the contribution was which they were making to the field of medicine and to mankind. In those early flasks and in the preparations which were soon developed Man was not only given the cure for the pyogenic infections but he was handed the weapons with which he could overcome the plagues and the pestilences which had ravaged the earth since the beginning of history. It is only a few years since these remarkable discoveries were made, but already we have seen a revolution in obstetrics as well as in other branches of medicine. Many fever hospitals are being closed and others are used for purposes for which they were not originally designed. We must remember, however, that the old dangers of puerperal fever have not been entirely removed and new ones have been developed with the advent of resistant strains of organisms. This provides us with a challenge to use the new weapons intelligently, to retain our clinical sense, to be constantly on our guard.

CONCLUSION AND EPILOGUE

There are many of you present who will live to write the date January 1st, the year 2000, on your notepaper. You will see great changes in many walks of life, and in medicine many of the modern techniques of which we now are proud will then seem obsolete. I trust, however, that there will be some who will pause from time to time in the rush of everyday living to look once more at the milestones of the past, to realize the lessons that were learned and the price that was paid for their learning. I trust that all of you will keep open, critical minds, constantly searching for truth itself and remaining free from personal antagonisms against those who have contrary views.

When there is a prologue there should be an epilogue and mine will be very brief. In the very early days of chemotherapeutic trials at Oxford a young and lovely woman was admitted to one of my beds desperately ill with a septic abortion. She had been taken to an abortionist in London and within 12 hours of her visit to him she was admitted to hospital apparently moribund. She had a triple septicaemia due to *Staphylococci*, *Bacillus coli* and *Clostridium welchii*. One million units of penicillin, which at that time was a dose of astronomical proportions, was given intravenously as the initial line of treatment, combined with drugs to combat her adrenal and renal failure. We knew that the coliform infection would not be touched by the penicillin and because of the anuria were unwilling to give sulpha drugs. We endeavoured to obtain some of the new preparation, streptomycin, which was then on the secret list and was being used by the Medical Research Council for a clinical trial in the treatment of tuberculous meningitis. We failed, but one of my registrars, seeing my concern, promised that if I would not ask where he got it from I should have a supply of the drug within a very short time. His promise was fulfilled and this patient was probably one of the first in the world to receive streptomycin for a condition other than tuberculous meningitis. Her condition improved and the kidneys started to function. Unfortunately she developed a huge subphrenic abscess caused by a penicillin-resistant staphylococcus, and even when this was drained she failed to rally. By this time, after weeks of suffering, her condition was desperate and even the most devoted nursing failed to prevent the skin from breaking over areas of pressure. Death seemed imminent. It was early Spring and one morning as I went into the ward to see if the lassie was still alive the sun was shining outside, the crocuses were appearing in the grass and the birds were singing. I said to the Sister, 'Let us take Hazel's bed out in the sun for a few minutes; the beauty of the morning may bring her some comfort'. This was done. Her courage was renewed and from that morning her progress was rapid and uneventful. Some years later she was happily married and after a year or two was safely delivered of a babe which has helped her to forget the tragedy of the past. The purpose of this epilogue is to remind us that the strength of the spirit cannot be measured by material standards, and that above all in medicine in the midst of scientific progress we must not lose the art of living nor an appreciation of things we cannot understand.