

Development of lung surgery in the United Kingdom

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The history of lung surgery in the United Kingdom divides conveniently into three periods—namely, the period before the 1914-18 war, the period between the wars, and the period after the 1939-45 war. These can be regarded respectively as the phases of innovation, development, and organisation. Many advances and developments were made during the world wars, but were not fully appreciated until after the wars were over. In the Lettsomian lectures delivered in 1921, Gask¹ stated “There is probably no branch of surgery which has been so much influenced by war wounds as has the surgery of the chest. It was so in the Middle Ages and it was so in the last war.”

In a short and general survey of this nature, any detailed discussion of the origins and first descriptions of operations would be out of place. This account, therefore, should not be taken as either supporting or undermining existing claims to priority in the description of surgical procedures. Morrison Davies² described these priorities in respect of surgery for pulmonary tuberculosis, and more recently Ochsner³ has given a comprehensive account of the development of lung surgery with 188 historical references to progress in surgery for carcinoma and bronchiectasis.

Other excellent historical references are available,^{4,5} as are textbooks of thoracic surgery of British authorship.⁶⁻¹⁰ O’Shaughnessy (of Nottingham) who was killed in the Dunkirk beachhead in 1940 wrote a book with Sauerbruch.¹¹ Each of these adds to the story of the development of lung surgery, although it is disarming to read in Stephen Paget’s work that thoracic surgery in 1896 “is now nearly at its zenith.” Such enthusiastic and over-confident claims are commonplace in each period and they add to the problem of the date at which a history should start, and of what should be excluded.

This article is the first of a series which is intended to document the history of thoracic medicine and surgery in the United Kingdom. Subsequent articles will deal with the history of cardiac surgery, oesophageal surgery, thoracic anaesthesia, pulmonary medicine, and tuberculosis therapy.—Ed.

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Enthusiasm and ability were vital attributes and it is plain that the personalities of a handful of surgeons played a greater part than any other factor in the development of lung surgery in Britain before the 1939-45 war.

Before the 1914-18 war

In 1822 James Carson¹² of Liverpool wrote on the subject of pulmonary tuberculosis “It has long been my opinion that, if ever this disease is cured, and it is an event of which I am by no means disposed to despair, it must be accomplished by mechanical means, or, in other words, by a surgical operation.” He urged that the lung should be allowed to collapse “and be placed in a quiescent state.” Although some 50 years ahead of its time this statement makes a starting point. Pulmonary tuberculosis and pulmonary and intrapleural sepsis were the principal diseases treated by the surgeon. Except for the Brompton and London Chest Hospitals there were few hospitals where chest surgery could be undertaken, and all the problems faced in the period between the wars were more severe and apparently more insoluble in the period before 1914. Chest radiography was not available until 1895 and surgical treatment was based on innovation and intuition, at any rate until the early part of the present century.

Sir William Macewen (of Glasgow), a Fellow of the Royal Society, carried out a thoracotomy in 1895. His account¹³ of this operation starts thus; “The patient was placed slightly under the influence of an anaesthetic, as, owing to the great embarrassment in breathing, and the general lividity, the full anaesthetic effect was not considered safe.” Two inches of the seventh and eighth ribs were removed and the pleura penetrated. “From this aperture 160 ounces of pus, along with sloughs of the lung and caseated debris were removed. The pus contained tubercle bacilli in enormous numbers.” Later the third to the tenth left ribs were resected in two stages. In 1906 the patient was examined and reported to be working normally. This operation is occasionally incorrectly described as the first pneumonectomy. The operation was not described as a pneumonectomy and apart from the piecemeal removal of lung sloughs no lung tissue was resected.

Macewen describes in detail the steps of the operation and the original description should be read. He stated, "I had hoped to be able to place before you a series of observations on the physical, physiological and pathological phenomena met with in dealing with human lungs and their pleurae, and also to have contributed a series of cases illustrative of the modern aspects of lung surgery." Limited time at his disposal prevented this, "hence it has been considered expedient to confine attention to the former." This he did with great thoroughness. He makes two points on removal of the lung, the first that "the admission of air to the pleura and its results has been and according to some authors is still considered, the greatest barrier to the surgery of the lung." The other: "In attempting removal of one lung, injury to the mediastinal contents is one of the chief dangers. . . . In attempting removal of the lung, it is better to imitate nature by leaving the hilum, as is seen in separation of the slough in gangrene of the lung, severing the tissues several inches to the outer side of the hilum, when the phrenic and vagus nerves are left uninjured." It is not absolutely clear to me what this means but it is surprising that, in 1906, he should suggest a method of lung resection other than a one-stage lobectomy.

Ochsner³ quotes four German surgeons who had performed lobectomy or partial lobectomy for bronchiectasis before 1906. Accounts of the development of thoracoplasty by the French surgeon de Cérenville in 1885, may be consulted.^{2,14} Little progress was made with these operations in Britain. At the Brompton Hospital in 1908, 49 operations were carried out, only 13 on the chest and all for empyemata.¹⁵ There was no lack of interest in tuberculosis. King Edward VII's famous and succinct observation "If curable, why not cured?" was evidence of his concern. After his death memorial trusts were set up, the funds from which later resulted in a number of sanatoria being built. A number of these had surgical units attached to them 20 or more years later.

Morrison Davies, after a visit to Berlin in 1910 used a modified Wilm's technique for thoracoplasty in 1912 and 1913.² In 1913 Sauerbruch had planned his paravertebral extrapleural thoracoplasty. Whether the operation should be staged and whether the upper or the lower ribs should be resected first remained undecided. A word must be said about Morrison Davies. He was a remarkable man who was actively involved in lung surgery from 1908 until he retired from the directorship of the Liverpool Regional Chest Surgical Unit at Broadgreen Hospital in the 1950s. No other British surgeon was active throughout all three periods into which I have divided this survey. Before 1914 he was surgeon to

University College Hospital, London, between the wars he was medical superintendent of the Vale of Clwyd sanatorium near Ruthin in North Wales and from 1940 was the emergency medical service advisor in chest surgery to the Liverpool region and later became director of the surgical unit at the time of its inception.

His surgical career was frustrated because of a severe contracture of the fingers of one hand caused by an infection acquired while draining an empyema. He did no major chest surgery between 1916 and 1922. Before this, however, he had developed his own "hyperatmospheric apparatus" designed to combat the problem of the open pneumothorax, by administering the anaesthetic (ether) at a positive pressure. He wrote¹⁶ "Many and lengthy arguments based on extensive experimentation, have been used to uphold the superiority of one form of differential pressure against the other (ie hypo- versus hyperatmospheric system). There is no doubt, in the author's opinion, that the Sauerbruch chamber, with its negative pressure, reproduces much more nearly the normal physiological conditions. Both methods, however, abolish the dangers of the uncompensated pneumothorax, and both therefore render possible (from the physiological standpoint) the performance of intrathoracic operations in which the pleural cavity has to be widely opened. The advantages that the hyperatmospheric has, are the comparative smallness of the machine and its consequent mobility."

This real attempt to solve the physiological problem took Macewen's work further and was carried out almost in isolation. In the same paper¹⁶ Morrison Davies, briefly and as if it were an event of no importance, gives his account of the first dissection lobectomy ever performed anywhere in the world for lung carcinoma. Credit is not always given for this. The account reads "When operated on the tumour was found to be confined to the lower lobe except at one point where the pleura was adherent. Access was obtained by slitting through the length of the sixth intercostal space (the patient being anaesthetised by infusion ether and the open pneumothorax compensated by the author's hyperatmospheric apparatus). The various structures at the pedicle of the lower lobe were ligated separately and the lobe containing the growth, together with a portion of the parietal pleura was removed (fig 117). The proximal end of the bronchus was stitched over and covered with an adjacent portion of lung. The patient's condition was quite good for the first six days; he then developed an empyema and died on the eighth day. At the autopsy no evidence of leakage from the bronchus could be obtained. Microscopic examination of sections from the hilum and adjacent glands failed

to show any spread of the cancer from the primary focus. The tumour was a squamous-celled carcinoma of bronchial origin and had broken down in the centre." The reproduction of the chest radiograph showed a circular peripheral shadow in the right lower lobe. He continues "Cancer of the lung is in some of its varieties, and in its earlier stages, now accessible to surgical intervention and complete removal; but until this fact is more fully recognised and all pulmonary cases are subjected to routine radiography, the growths will not be recognised until they have extended beyond the possibility of all treatment. In all doubtful cases, at least an exploratory thoracotomy should be undertaken."

It seems almost unbelievable that this was written in 1913 and increases speculation as to how great the author's contribution to British surgery might have been had his career not been so seriously hindered. He was not unfamiliar with the anatomy of the hilum of the lung. At this time the basis of the surgical treatment of bronchiectasis was "solidification" of the lung and one method of achieving this was, it was thought, by ligation of the pulmonary artery. He had carried out this operation and although the patient developed gangrene of the lobe and an empyema he was "apparently cured of his bronchiectasis." I can trace no published account of resection for bronchiectasis in Britain before 1914, but Meyer¹⁷ in 1914 was able to collect 16 reported cases treated by resection with a 50% hospital mortality rate. Lipiodol bronchography was not available until 1923 or thereabouts.

Between 1918 and 1939

It was during this period that the real technical development took place. The appointment of Tudor Edwards as visiting surgeon to the Brompton Hospital in 1922 started a new era. The four main problems at the time, which remained throughout the period, were ignorance of the anatomy and physiology of the lung, inadequate anaesthesia, fear of the open pneumothorax, and uncontrollable sepsis leading to broncho-pleural fistulae and contralateral spread of disease. Except in the chest hospitals or sanatoria where surgery was carried out, other factors compounded the difficulties. These included lack of organisation and of the proper collective or team spirit in the large voluntary or teaching hospital, prejudice, suspicion of the specialist and the absence of experimental animal work.

Fear of the open pneumothorax did not deter everyone. Gask¹ stated in 1921 that "one pleural cavity could be opened widely without any grave danger." Moynihan (Leeds), the first President of the

Royal College of Surgeons to live outside London,¹⁸ stated that the fear of collapse of the lung when pneumothorax occurred was the great inhibitory influence hindering the development of thoracic surgery.¹⁹ He wrote "There was, however, abundant evidence to show that the fear of pneumothorax was greatly exaggerated. For many years past I have been accustomed, in performing operations upon the kidney for stone or for removal of that organ to begin by excising the last rib. . . . In possibly a dozen of such cases I have wounded the pleura and have heard the air enter freely into the chest. No disability or distress followed and I looked upon the misadventure as rather a flaw in the artistry of the operation than a matter of surgical importance, a rebuke to my skill rather than a risk to the patient." He held this view possibly because each of 48 thoracotomies carried out for retained foreign bodies was on a young fit patient, and no lung tissue was removed.

His open thoracotomy technique followed the method of Duval, the brilliant French military surgeon, later elected to the honorary Fellowship of the Royal College of Surgeons, and remembered today for his eponymous lung holding forceps. In spite of occasional hopeful comments, open thoracotomy was generally avoided during the 1920s. It seems likely that the high hospital mortality rate of resection for bronchiectasis²⁰ dissuaded British surgeons from too close an involvement and until Tudor Edwards' first ever successful dissection lobectomy for tumour in 1928, surgery for carcinoma was almost non-existent.

Collapse therapy remained the best hope for the successful surgical treatment of tuberculosis. By 1923 individual cases of thoracoplasty were still being reported; some operations were staged, some not, the upper ribs usually being resected before the lower.²¹ Thoracoscopy with cauterisation of adhesions was introduced to Britain at about the same date. A satisfactory artificial pneumothorax or surgical collapse remained the best available treatment until 1948. When streptomycin became available and resection was first used routinely, Anderson (Aberdeen) reported²² 26 thoracoplasties carried out at Tor-na-dee sanatorium before 1930, and by 1933 O'Shaughnessy and Holmes Sellors collected over 3500 cases and stated,²³ to emphasise the need for improvement in treatment, that almost 70% of patients with pulmonary tuberculosis treated in 1926 by the London County Council's hospitals and clinics had died by 1932. With an infinite number of variations, the Semb mobilisation of the lung apex in 1936 being the most important, thoracoplasty remained a more popular collapse procedure in Britain than such operations as the extra-pleural pneumolysis favoured by continental surgeons.

Resection for bronchiectasis, a common and distressing disease, preceded resection for carcinoma, probably a rare disease in an operable form, in the 1920-30 period. The development of surgery for bronchiectasis began with the "strangulation" operation in which a band was tied around the hilum and the lobe exteriorised and encouraged to slough off. The cautery pneumonectomy, practised successfully by Anderson in Scotland in 1928 according to Graham,²⁴ in which "with a large soldering iron heated to a red heat an excavation is then made into the lung tissue" gave way to the tourniquet lobectomy. The tourniquet method was then preferred to the individual hilar dissection technique probably because of the need for great speed, the excessive sputum and the difficulty of dissecting the inflamed hilum.

In an important paper²⁵ Roberts and Nelson (both of London) quote Brunn's advocacy in 1929 of one-stage lobectomy (a vogue for producing adhesions between the unaffected lobe and the chest wall at a first stage operation ended with Brunn's paper) as having stimulated Shenstone and Janes (Toronto) to further work on the one-stage lobectomy. In 1931, Nelson, who died from septicaemia in 1936 in his mid-30s, visited Toronto and returned to practise Shenstone's and Janes' methods. The essential principles described by Roberts and Nelson were (1) the complete freeing of all adhesions, (2) the use of two tourniquets on the hilum, the proximal one to control bleeding and the distal one to prevent escape of infected material while the lung is amputated between the two, (3) closure of the stump, by a continuous suture rather than by separate ligation of the bronchus and the blood vessels, and (4) negative pressure drainage to remove fluid and encourage early expansion of the remaining lobe. Their average operating time was one and a half hours. They operated upon 10 patients, eight suffering from bronchiectasis. The broncho-pleural fistula rate was 50% and the hospital mortality rate was reduced from the current 50% to 20% (two deaths from sepsis out of 10 patients). The authors conclude "it appears that by this technique the mortality of lobectomy may be considerably reduced." Their paper is beautifully illustrated, is informative on instruments now outdated, and summarises changes since Young's (of the Brompton hospital) 1929 Lumleian lectures.²⁶ Shenstone's work was marked by an invitation to give the first Tudor Edwards memorial lecture in 1949.

Surgery for bronchiectasis continued apace in a few hospitals (there were no "units" or "centres" at the time) and by 1935 Scadding, who had been involved in the Brompton surgical cases since 1931, arranged an exhibition of the first 100 lobectomy

specimens of bronchiectasis from the Brompton, for a meeting of the Association of Physicians which was held that year at the Royal Society of Medicine.²⁷

Some surgery for lung carcinoma was being performed at the time of Everts Graham's description²⁸ of the first successful pneumonectomy for cancer. It is surprising how long this message took to reach some British cities, especially so if one compares it with the rush with which an operation, described in a journal from the other end of the world, is copied today. Many factors were, of course, at work but these failures of communication were soon to be corrected because of the urgent need to organise at the outbreak of the 1939-45 war.

One important influence on the development of the speciality was the formation of learned societies. In 1928 the Tuberculosis Association was founded and in 1933 the Society of Thoracic Surgeons of Great Britain and Ireland, under the presidency of H Morrision Davies. Tudor Edwards and JEH Roberts were vice-presidents and Graham Bryce (Manchester) the secretary. The first committee included W Anderson, JB Hunter (London), and WHC Romanis (London). The first meeting was in London in 1933; in 1934 the Society met in Davos-Platz and in 1937 in Berlin where Sauerbruch was still active. The Society was to play an important part in the establishment of the speciality, including an essential part, the training of surgeons. At the time, however, there were few surgeons in Britain with the capacity to train younger assistants and the specialised chest hospitals had no vacancies. Some surgeons, as yet not fully trained, travelled abroad and made use of the valuable experience obtainable in the big teaching centres in the United States of America. These included PR Allison (Leeds), NR Barrett (London), Ronald Belsey (Bristol), RC Brock (London), VC Thompson (London), and OS Tubbs (London).

From 1945 to 1981

The great improvements in organisation which were the essential features of this period occurred in this way. Plans were made for the specialist treatment of chest wounds on a regional basis and put into effect at the beginning of the war. Each region had an advisor in chest surgery and emergency medical service chest beds were available to treat a larger number of casualties than in fact occurred. Civilian chest surgery was for the first time carried out in these equipped chest units. Advances resulting from these special units were the availability of specialised anaesthetists, improved nursing and junior medical staffing, and improved radiographic and pathological diagnostic facilities. The availability of penicillin

from 1944 onwards and of the blood banks and improved positive-pressure anaesthetic equipment had by 1946 altered the prospects considerably, compared with the tentative 1939 methods.

One could justifiably claim that by 1946 Britain was further advanced than any other continental country, Sweden excepted. There was increasing collaboration between physicians, surgeons, anaesthetists, radiologists, and pathologists. The Thoracic Society under Tudor Edwards' presidency was formed in 1944 with elected members from each speciality. Its objects were "to study disease of the chest in all aspects and the publication of a journal." The first of a number of informal surgical travelling clubs, Browns club, was instituted by George Mason (Newcastle) in 1947; the other members were PR Allison, NR Barrett, R Belsey, RC Brock, G Bryce, AL d'Abreu (Birmingham), Bruce Dick (Glasgow), Andrew Logan (Edinburgh), RB Purce (Belfast), Hugh Reid (Liverpool), T Holmes Sellors (London), C Price Thomas (London), VC Thompson, and OS Tubbs. I refer to this because it was these surgeons, with one or two others, who found themselves responsible for training and organisation in their areas at or shortly before the inception of the National Health Service in 1948. The executive committee of the Society of Thoracic Surgeons was also active. They published in 1948 a small, far-sighted and important memorandum.²⁹ I quote only two from many principles put forward: "If the public is to have thoracic surgical treatment of a standard to which it is entitled, its needs can only be met by the establishment of a properly organised service and in centres which are adequately staffed and equipped." The other paragraph: "What is urgently necessary at the moment is to prevent the outcropping without reference to the general plan, of so-called centres staffed by practitioners who decide to 'take-up' chest surgery when their circumstances neither enable them to serve a proper apprenticeship nor offer them the prospect of an amount of work sufficient to make them competent."

How fortunate for later generations that these principles were expounded and adhered to. They resulted in the public being enabled by the early 1950s to receive treatment of the high standard to which it was entitled, carried out by surgeons who practised only thoracic surgery. No other country in the world could claim such a progressive achievement and it represents, in my view, the most significant development of the post-wars period. The same memorandum also stated that the society was unanimous in strongly deprecating any separation of the surgical treatment of pulmonary tuberculosis from that of other chest diseases.

Surgery for tuberculosis was then the big problem.

Beds in sanatoria were in short supply. Patients were known to have stayed as long as three years in hospital without any break and the waiting period for resection or thoracoplasty in some regions exceeded two years and the number of trained surgeons and the facilities were inadequate. Between 1948 and 1952 some 30 surgeons were appointed to consultant chest surgeons posts and they were appointed primarily to deal with pulmonary tuberculosis and yet by 1958 the advances in treatment with streptomycin rendered routine surgical treatment a thing of the past. There was less specialisation by surgeons then than now. A week's operating list in 1955 for the same surgeon might include an oesophagectomy for carcinoma, repair of an atrial septal defect under hypothermia, a thoracoplasty, and a lung resection for bronchiectasis. As an emergency he might have to repair an oesophago-tracheal fistula or an infantile diaphragmatic hernia. Such variety would, in 1981, be thought not to give the patient the best chance.

As well as technical surgical skill such considerations as the environment in which the patient is nursed and the experience of those in 24 hour control are important. Technical advances in the period were not striking. For instance, I see no striking change in the broncho-pleural fistula incidence between 1950 and 1980 and nothing has developed which makes long-term survival from resection for lung carcinoma any more likely now than it was in 1950. There have been many refinements of technique, changes in case selection for operation, and some increase in safety for the patient during and after lung resection. The relatively poor results at present from resection reflect the fact that some 95% of resections of lung are carried out for lung carcinoma. Bronchiectasis, tuberculosis, and congenital lung lesions are seldom seen and conservative methods have replaced resection for other diseases. Some progress has been made in surgery for bullae in the lung, but surgery for such conditions as asthma has achieved nothing, nor so far in Britain has lung transplantation.

The technical developments and refinements in lung surgery during and after the 1939-45 war may be summarised under headings.

PREVENTION OF BRONCHO-PLEURAL FISTULA
In 1939 the fistula incidence when the mass ligation technique was used for resection for bronchiectasis was about 30% and it was a major factor in post-operative morbidity and mortality. The change to individual hilar ligation helped, but control of infection by chemotherapy from 1944 onwards was the principal cause of the reduced incidence. In 1945 Thompson³⁰ used for the first time an intercostal graft sewn on to the bronchus to assist stump healing,

and Belsey³¹ advocated stainless steel wire sutures as the best material for stump closure. He observed that "Ninety per cent of postoperative morbidity in thoracic surgery is probably caused by two complications; the bronchial fistula and bacterial infection." Methods of closure have constantly been reviewed and added to, yet the problem remains. It is after the operation of right pneumonectomy that a fistula is especially prone to develop, explicable perhaps by the difficulty in covering the stump when clearance of the bronchus has been radical. The bronchial stapling machine is, so far, unproven as the best method of closure.

CONTROL OF SPUTUM DURING OPERATION

In part this problem has controlled itself, in the sense that patients with 20 ounces or more of sputum each day are no longer operated on. And, in part, control has been effected by the introduction of a number of ingenious methods of minimising the effect, which was devastating when flooding of the bronchi with sputum did occur. The bronchial blocker was introduced by Thompson³² in 1941 and Holmes Sellors³³ described resection with the patient in the face-down or prone position—different methods of dealing effectively with the same problem. The great contributions by British anaesthetists from the time of pioneers such as Magill and Nosworthy cannot be adequately summarised or sufficiently praised in this short account. The need for preoperative reduction in sputum was noted by Roberts and Nelson.²⁵ They advised the patient to practise postural drainage by lying face down on a tilted bed "for the greater part of the day" for two months before operation. Suction bronchoscopy, twice weekly, was added for the worst cases. Good physiotherapy intelligently applied remains fundamentally important.

EXTENT OF LUNG RESECTION

Today's view on the extent of resection for lung carcinoma has changed from that expressed by Evarts Graham²⁸ in 1933 that "It would seem, therefore, that unless some entirely new general principle in the treatment of carcinoma is devised, the only method that at present can offer any hope is the wide surgical removal of the tumour and the surrounding tissue." Now the least possible resection which can remove all macroscopic tumour is preferred, although some surgeons³⁴ ³⁵ still find pneumonectomy necessary in nearly 50% of patients recently operated upon. Allison³⁶ in 1946 described the intrapericardial approach for ligation of the pulmonary vessels, which simplified their ligation. Brock³⁷ advocated radical operation in 1955 and again in 1964.¹⁵ In Britain Belcher³⁸ (London) in

1956 was the first to point out the advantages of a policy of lobectomy whenever possible. This fresh view, expressed also in America,³⁹ is now wholly accepted. Although I shall hesitate to place much value on a comparison of the results of radical pneumonectomy with those of lobectomy, the results from the latter operation appear to be no worse and the postoperative morbidity a good deal less than after pneumonectomy. Another important development affecting the extent of resection was worked out about this time; this was sleeve resection of the main bronchus with upper lobectomy. The first sleeve resection was carried out by Price Thomas in 1952 for a tuberculous stricture of a main bronchus, the stricture being excised and the two ends sutured together. Later he described⁴⁰ his early results and today many large series of sleeve resection with lobectomy with excellent long-term results are available. It is one of few technical imaginative developments in lung surgery in the last 30 years.

To digress briefly, no history of lung surgery in Britain could be written without mentioning Price Thomas. He began his career in lung surgery in 1932 as clinical assistant to Tudor Edwards at the Brompton hospital at a time when HP Nelson was assistant to Roberts. Although sleeve resection was a considerable technical advance, many of Price Thomas's achievements went unsung. He was a great peacemaker and coordinator and well loved by his assistants. It is unlikely that it will ever be known how much chest surgery owed to him in the era of rapid development between 1938 and 1953.

Another development, equally imaginative but with a more restricted application than sleeve resection, was the description⁴¹ by the Glasgow school of a method of tracheal reconstruction and carinal resection without using prostheses. From the operation they described and using their basic principles, similar operations followed, and, in a narrow field, the results were gratifying. Their description remains the basis of a means of surgical treatment of benign and malignant tumours of the carina.

The trend towards more conservative methods was increased by the suggestion of using segmental resection for isolated cases of carcinoma. Le Roux⁴² reported his experience from Edinburgh where a small number of patients were successfully treated by segmental resection. In 1939 Churchill and Belsey⁴³ first described the technique of segmental resection, which was used then for the treatment of bronchiectasis.

Another technique intended to influence the extent of resection or a decision on operability of lung carcinoma was mediastinoscopy. This, an extension of the scalene node biopsy procedure, was

originally put forward by Carlens of Sweden and described in Britain by Nohl Oser in 1962.⁴⁴ The exact place of mediastinoscopy in the preoperative management of lung carcinoma is still uncertain in many surgeons' minds. No one would deny the great value of the method in the diagnosis of obscure mediastinal disease.

Flint in 1866 suggested⁴⁵ that sputum examination might confirm the presence of malignant cells from lung carcinoma. Gower (Aberdeen) in 1943 while working at the Brompton, emphasised the value of sputum examination before the technique was popularised in 1946 by Papanicolaou.

CHEST INJURIES

Developments in the treatment of chest injuries between 1922 and 1944 may be studied by comparing Moynihan's¹⁹ account with that of d'Abreu.^{46 47} Both of these surgeons had wide experience of acute war injuries. Civilians with severe chest injuries reaching hospital alive were rare, once the flow of air raid casualties ceased in 1945. Violence in many forms has continued, however, and a curious but inevitable outcome is that the more injuries that occur and the more severe they are, the less is the chest surgeon involved in early treatment. This regrettable event has arisen for the following reasons: injuries are multiple, moving the patient to a thoracic surgical unit when necessary is difficult, the service a chest surgeon can give is limited by the distance he may have to travel and over the last 15 years the interest of orthopaedic surgeons and anaesthetists in the first-hand treatment of the severe multiple injury has increased. The establishment of properly organised accident hospitals has been a great advance, and has ensured among other desirable consequences, that the patient will be seen immediately on arrival at hospital by an experienced surgeon.

The changes in management of the isolated flail chest injury from 1950 to the present arose from a continuing study of the disturbed physiology and a closer look at the exact cause of death in such injuries. In 1950 appropriate steps such as blood transfusion or suction bronchoscopy would be taken if death from haemorrhage or drowning seemed close. Treatment locally to the flail segment had little influence on the outcome. The segment might be held in by tight strapping or pulled out by the crude use of hook and pulley. Survival in those days was governed by the inherent vitality of the patient, so far as the local chest injury was concerned. In 1956 mechanical ventilation, the so-called internal pneumatic fixation, was introduced, but differences arose, and still exist, as to whether an endotracheal tube or early tracheostomy should be used. Doubtless this

saved lives but it also produced many problems, notably persistent infection and stenosis of the trachea. Stabilisation of the chest wall by fixing the rib ends together or using an inert prosthesis has interested the chest surgeon. Among advantages claimed are freedom from the complications of intubation, quicker convalescence, and better ultimate rib alignment. Moore⁴⁸ (London) described his methods. Fixation was originally used in the 1920s or perhaps even earlier.

NURSING CARE AND SUPPORTIVE MEASURES

Outside the chest hospital the view that if the chest surgeon is a specialist, the nurse should be also, has not always found favour. The increasing need for specialist knowledge of methods, machines and equipment has brought about an increase in all forms of specialist training for all those involved in chest patient care. In 1938 my recollection, as a surgical dresser, of a lobectomy for bronchiectasis was of the patient's return to a large general ward, where the only available help from the resident and nursing staff was that the patient's bed was screened and moved closer to a large open fire to which extra coal was added. This was done in the belief that "pneumonia" was the most feared complication and that warmth might prevent its onset. Even in 1950 science contributed very little to postoperative care. Return to full consciousness was sometimes delayed for six hours, in contrast to today when the patient is expected to wake up in the operating theatre. Respiratory failure from whatever cause was generally treated by repeated (sometimes hourly) suction bronchoscopy, sometimes with dramatic and beneficial results. Mechanical ventilation, blood gas measurement, improvements in portable chest radiography, and modifications in anaesthetic techniques were all in the future.

Today the pulmonary surgeon is involved chiefly with lung cancer. Until medical treatment of cancer becomes available and established, or as long as smoking continues, lung resection will be required. Adjuvant therapy used from about 1963, in the form of cytotoxic drugs, has failed to improve long-term results. The surgeon will more likely be hoping for developments which will avoid current postoperative failures rather than expecting any miraculous improvement in long-term results. These developments include a universally applicable method of sewing up the bronchial stump so that leakage and broncho-pneural fistula will not arise and a way of preventing thrombosis in the pelvic and leg veins so as to prevent the too frequent postoperative death from pulmonary embolus. I regard lung surgeons as having had ample time to sort out the problems and that, judged by short and long-term results, no reasons

for complacency exist. Many have spent too much time treating patients and too little in defining and solving the outstanding problems.

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