

## CLINICAL MEDICINE AND SURGERY IN ANAESTHETIC PRACTICE\*

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THE CIRCUMSTANCES of the foundation of the Shields Lecture have gratified anaesthetists far beyond Toronto and Canada and particularly those among us who have been privileged to know the man whose work will now be commemorated in perpetuity. Such signal appraisal rarely comes in a man's lifetime, but surely, to one so self-effacing and so worthy of the homage of his colleagues and of generations of patients as Harry Shields, the gesture was both timely and appropriate. It has crowned a dignified career of outstanding merit which has contributed notably to the recognition of anaesthetic practice as a distinctive speciality, not only within the profession but also in the minds of a grateful laity.

It was a considerable act of faith on the part of the leaders in the speciality of anaesthetics in Toronto and of the Dean and Faculty of its world-famed medical school to invite me to deliver the second Shields Lecture. As the first non-Canadian so honoured, I became at once deeply aware of the responsibility that would devolve upon me and I must confess frankly that sentimentality overruled cold reasoning in prompting my decision to accept. That is perhaps excusable in one who, nearing the end of his professional life, cannot proffer the scientific pabulum for which present-day anaesthetists appear to have a considerable craving, but thinks, possibly naïvely, that he may still have something to pass on.

After five days of listening to or participating in the academic discussions at the Second World Congress of Anaesthesiologists, most of you may be more than ready to descend with me from the Olympian heights and tolerate or even find relaxation in mental anti-climax. On this occasion, therefore, I trust there is no need to apologize for speaking on workaday matters which must forever be of importance to all who practise the most critical and most responsible form of applied pharmacology in the whole field of medicine.

Within the limits purposely implied in the title of this paper, I feel committed mainly to a discussion of certain surgical and medical conditions concerning which anaesthetists should have more than a cursory knowledge if they aspire to completeness in their work and to the respect of their colleagues in other branches of medicine. Concurrently, consideration will be given to the professional relationships involved in the broadening of the range of anaesthetic practice.

### EVOLUTION OF MODERN PRINCIPLES

Thirty or more years ago little was expected of the anaesthetist beyond doing his best to keep the patient immobile, to provide a modicum of relaxation—a

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little more was tacitly but doubtless gratefully acknowledged—and to get the patient off the operating table alive. Effecting such a compromise was not easy, particularly in respect to the increasingly ambitious upper abdominal surgery of that time when, apart from nitrous oxide which was worse than useless, the general anaesthetics available were powerful depressants of vital functions if given in the toxic concentrations necessary to produce reasonable operating conditions. The price paid for the latter was an almost prohibitory incidence of respiratory and circulatory complications and no kudos for the anaesthetist. It is no wonder, therefore, that in the period between the first and second world wars many surgeons, particularly in the clinics of continental Europe, were loath to exchange non-toxic nerve blocks for general anaesthesia when the former were serving so well on account of their safety and anti-shock qualities, and apparently facilitating rather than hindering surgical progress. But for the timely introduction of muscle-relaxants I believe that the use of local and regional analgesia would have become universal. Anaesthetists, however, having meantime made themselves indispensable through their skill in tracheal and bronchial intubation and controlled respiration would not have lost their jobs because such valuable procedures would continue to be necessary, even if nerve blocks came into fashion again. As one who has seen many advances in surgical and anaesthetic practice, I venture at this point to prophesy that good as present-day anaesthetic methods are for patient and surgeon, and, challenging and titillating as they may be for many anaesthetists, the trend in the not too distant future will be towards an increasing use of local and regional nerve blocks accompanied by controlled depression of consciousness and efficient mechanical ventilation of the lungs. I am all for automation and no intoxication.

More than a generation ago Crile demonstrated the merits of a non-toxic combination of local analgesia and unconsciousness. His principle of "Anoci-association" can be applied with even greater effect to-day because of the better equipment available for maintaining a uniform light level of unconsciousness and satisfactory pulmonary ventilation. In my experience patients undergoing extensive and stress-inducing surgery are best served by some form of nerve block plus light anaesthesia as exemplified by the operation record (Fig. 1) in the case of a girl of 18 years in whom a hindquarter amputation was performed for sarcoma.<sup>1</sup> Protection against stress-producing trauma at the site of operation was provided by spinal blockade. The accompanying complete sympathetic paralysis prevented circulatory reflex activity, ensured stability of the blood pressure at the intended hypotensive level, and obviated loss of blood. No transfusion was given because none was necessary and, as may be noted, no time was wasted by the surgeon, Sir Gordon Gordon-Taylor, whose tragic death in London is deplored by the entire medical world.

The period of technical development, adorned by virtuosi such as Ralph Waters and Ivan Magill, brought initially hesitant but significant recognition to the speciality of anaesthetics, at first strictly limited to individuals but later to many who followed the leaders and similarly impressed their surgical colleagues with their dexterity. It was natural that surgical craftsmen should appreciate craftsmanship in others, but physicians who only got occasional glimpses of us at

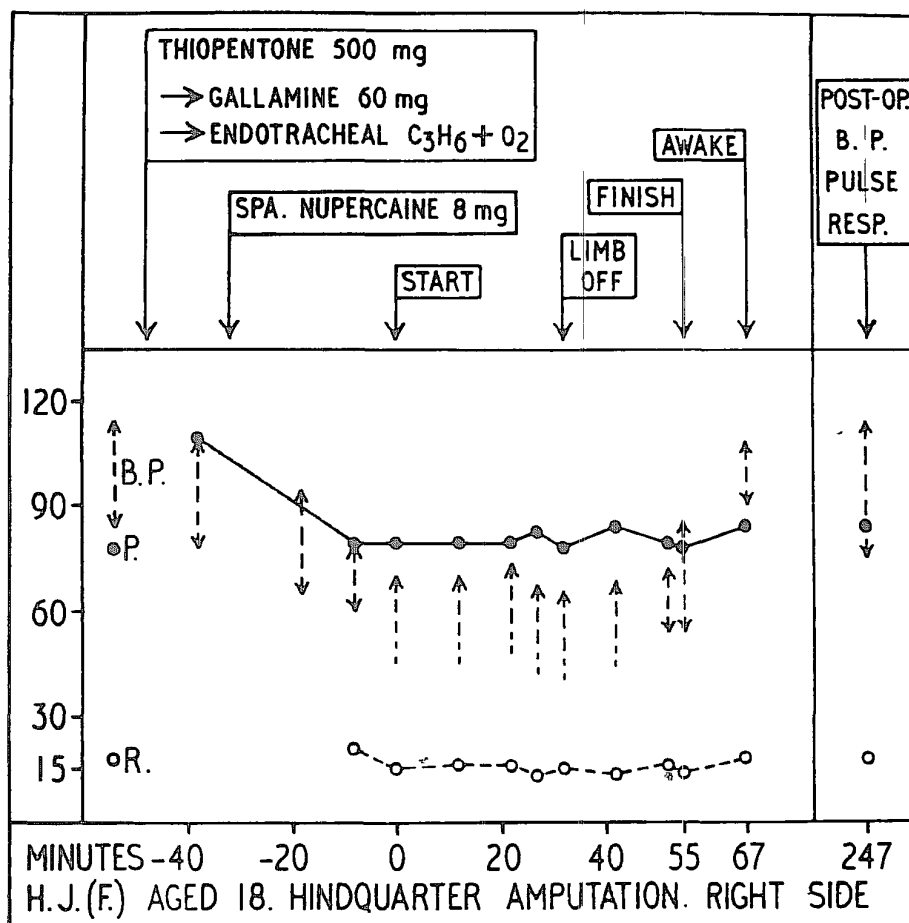


FIGURE 1

work perhaps thought that we were merely being crafty. With commendable liberality of mind, doubtless in token of benefits received and possibly in anticipation of more to come, many of our surgical colleagues of that time entrusted us with an increasing responsibility in the care of their patients and thus hastened the era of "physiological trespass."<sup>2</sup> This progressive three-stage concept comprising curarization, induced hypotension, and hypothermia introduced successively over a few years was found difficult to swallow, particularly its second component, by many surgeons and some anaesthetists who sided with them. As so often happens, however, having once tasted, their appetites became excessive and for a time the usual trail of teething troubles ensued, but on a scale almost big enough and serious enough to halt progress. It is extraordinary how enthusiasm can obliterate common sense!

Now, at long last, despite setbacks sometimes generated by anaesthetists themselves, the practice of anaesthetics, at least in its technological aspects, was able to provide conditions that would enable surgeons to explore any region of the body with reasonable safety and have adequate time to carry out remedial and reconstructive procedures particularly on the heart and great vessels. And it all turned out to be so simple in the end—dangerously simple indeed, so that even

FEMALE AGE 16: PULMONARY STENOSIS: LOW CARDIAC OUTPUT:  
PERIPHERAL CYANOSIS: GIANT RIGHT AURICLE: R.A.P. 25 mm. Hg:  
OPERATION—PULMONARY VALVULOTOMY

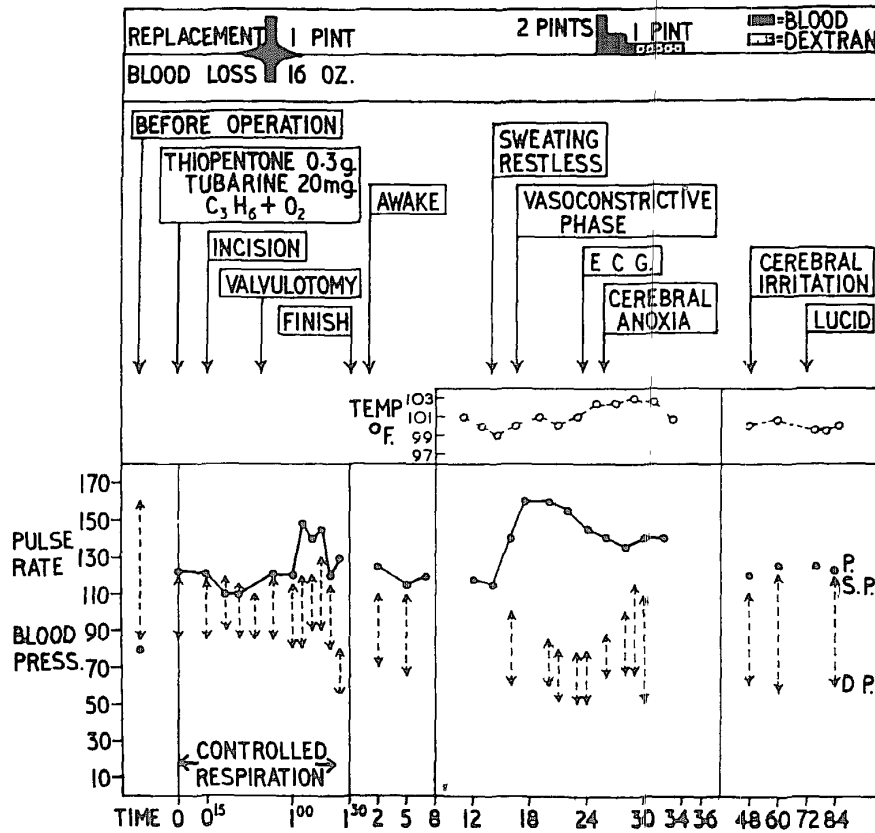


FIGURE 2

the novice produced as acceptable results as his seniors. Could this be enough Surely not! The complexity of certain operations on the cardiovascular system and on the brain required from anaesthetists, as indeed it did from surgeons, something more than skilled technology. If they had not found it particularly necessary before, anaesthetists now had to acquire a physician's knowledge of circulatory, respiratory, and endocrinal pathology. But further than that they had to learn *de novo* the physiological readjustments that take place during and after surgical correction of congenital and acquired diseases and after the extirpation of organs on which homeostasis and life itself depends. The need for such study and preparedness is illustrated in the anaesthetic record (Fig. 2) of a girl of 16 years undergoing pulmonary valvotomy for pulmonary stenosis associated with a giant right auricle in which the preoperative pressure was 25 mm. Hg. This compensatory increase had enabled the heart to maintain an adequate basic output for some years. Blood lost during operation was fully replaced at the time but some hours later the patient became hypotensive although there was no evidence of further blood loss. An electrocardiogram showed sinus tachycardia,

not ventricular tachycardia as at first diagnosed. The blood pressure continued to fall probably as a result of the decrease in right auricular pressure and in cardiac output which followed relief of the stenosis and a sudden, but significant, alteration in haemodynamics. Progressive circulatory failure was checked by infusion of blood and dextran and the hypotension became reversed, presumably because the blood volume, the intra-auricular pressure, and the cardiac output had all been augmented.<sup>1</sup> Here was a situation in which over-transfusion could be justified as a means of tiding a patient over a period of cardiovascular adjustment. As anaesthetist-physicians we must, therefore, be alert to the hazardous unstable circulatory states which may follow surgical correction of cardiac anomalies, particularly those associated with pulmonary hypertension, and keep in mind that adaptation of the heart to altered circumstances may be relatively slow and that circulatory collapse is liable to develop meantime.

### EMERGENCY SURGERY

It is in the field of emergency surgery that anaesthetists find most scope for a sound knowledge of pathology. The importance of emergency cases being examined and, wherever possible, anaesthetized by experienced staff members cannot be over-emphasized. Through familiarity with surgical conditions and the varying impact of operative procedures, an understanding of intercurrent pulmonary, cardiovascular, and endocrinal diseases in relation to anaesthesia and, by no means least, acquaintance with the methods and capabilities of their operating colleagues, anaesthetists should be better equipped than most physicians to assess the fitness of patients for operation and the attendant over-all risk, and to advise on appropriate preparation. In brief, without aspiring to be fully expert in internal medicine, or usurping the place of the physician, anaesthetists ought to maintain a studious interest in medical conditions, particularly those commonly occurring intercurrently in surgical cases.

#### *Urgency*

Of the various general aspects of emergency surgical treatment, I propose to deal only with the question of urgency since it is in this matter that the views of surgeons and anaesthetists may clash, although, with a sensible understanding of each other's problems, there should rarely be any disagreement. Urgency varies with the extent and the rate at which physiological function and homeostasis are deranged by the surgical lesion or by intercurrent disease. Thus, there is extreme urgency when pulmonary ventilation is failing rapidly from various causes, particularly thoracic trauma and raised intracranial tension. Urgency is immediate if, on account of continuing haemorrhage, circulatory collapse is imminent, or, in a somewhat different clinical field, when a foetus is in distress and hysterotomy or forceps delivery becomes suddenly necessary.

Common conditions such as gastrointestinal obstruction, visceral inflammation and perforation, and acute urinary retention are relatively less urgent and time is usually available for more adequate preoperative preparation of patients in this category. Time, however, must not be wasted and the anaesthetist should

always consider carefully his wider clinical responsibility when advising or causing any delay and have sound reasons for whatever course of action he may suggest or pursue.

### *Trauma*

The treatment of traumatic conditions forms the major part of urgent or semi-urgent surgery at the present time. Rapid transportation on overcrowded highways and airways contributes increasingly to this sinister state of affairs. Even more so than in the acute surgical diseases, the seriousness of trauma is related to the degree of discontinuity of vital functions, particularly circulation and respiration. In the urgent circumstances which frequently prevail, all the highly developed skills of the anaesthetist and his knowledge of surgery and medicine are put to the test.

### *Crush Injury of Chest*

Apart from vascular disruption leading quickly to death, the most serious injuries are multiple fractures of ribs accompanied by respiratory paradox. This condition may be rapidly fatal even after the patient is supposedly under control. It is simple enough to recognize and deal with paradox associated with an open wound of the thorax but, if the opening is valvular in character, or, more insidiously, when an unsuspected traumatic bronchopleural fistula is present with the thoracic wall remaining intact, an immediate appreciation of the general situation is essential to obviate disaster. The resultant fulminating tension pneumothorax may be unwittingly aggravated by controlled respiration. Diagnosis of such a grave development in an anaesthetized patient depends on recognition of increasing difficulty in inflating the lungs, uncorrectable cyanosis, rising blood pressure and pulse rate, and displacement of the apex beat, following one another in dramatic crescendo.

Dr. Griffiths, a member of my department, has devoted much time during recent years to investigating the apparently unnecessarily high mortality and morbidity associated with multiple injuries including crushed chest and his detailed study of the problems associated with such accidents will be published soon.<sup>3</sup> In our departmental discussion on the subject we are agreed that the essential preliminary is an immediate assessment of priorities in respect to the order of treatment of the several injuries and we consider that, in the first instance, this should be entrusted to a general surgeon along with an anaesthetist. All too often, attention to the commonest and most grave complication, namely, respiratory insufficiency, is left until too late while measures less urgent in respect to the saving of life are being instituted. Whenever possible the treatment of a severe chest injury should begin at the scene of the accident because traumatic pulmonary and haemodynamic dysfunction kills quickly.

Figure 3 illustrates a case of multiple injuries in which persistent treatment of circulatory depression was given priority over treatment of pulmonary dysfunction and was unsuccessful until effective ventilation was established.<sup>3</sup> Three phases in management may be noted.

(1) In spite of "wet" lungs, deviation of the trachea, and laboured respiration

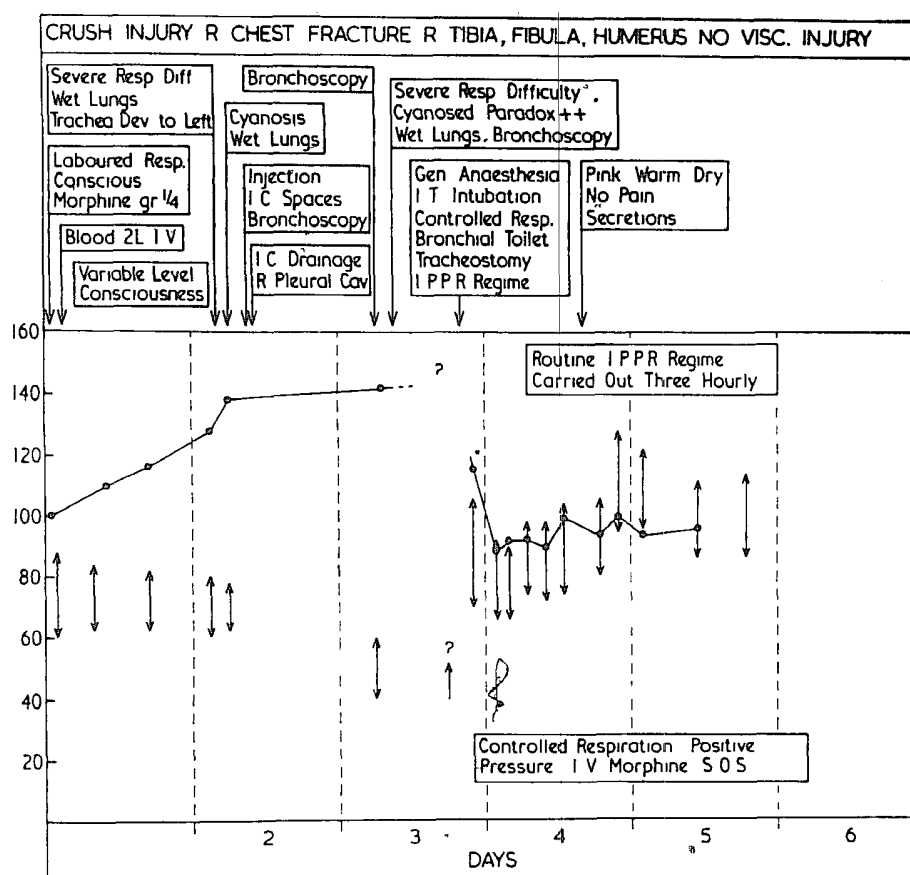


FIGURE 3 (By courtesy of Editor, Jour. Roy. Coll. Surg. Edin.)

doubtless aggravated by morphia, treatment in the first phase was concentrated on improving the blood pressure by direct means. This was unsuccessful and the patient's condition deteriorated as indicated by a continuous rise in pulse rate and no improvement in blood pressure.

(2) Measures to deal with pulmonary dysfunction were instituted, namely, pleural drainage and bronchoscopic aspiration, but by this time these were not sufficient to arrest a dangerous decline towards circulatory failure.

(3) An active régime of intermittent positive pressure respiration through a tracheostomy to restore and maintain full ventilation of the lungs was established just in time to save the patient's life.

In his review,<sup>3</sup> Griffiths has shown that in cases of multiple injuries to thorax, head, limbs, and abdominal viscera the commonest cause of death is respiratory insufficiency and that frequently this is avoidable. The immediate correction of respiratory dysfunction, when acute or when sub-acute and insidious, should, therefore, have the top priority, sharing this if need be with the arrest of continuing haemorrhage. Treatment of fractures, even mechanical fixation of the ribs, which is not commonly necessary, can wait and quite often circulatory depression and unconsciousness along with other neurological signs caused by hypoxia and carbon dioxide retention will disappear once respiratory function is normal.

If respiratory insufficiency is not effectively treated, hypoxia, retention of carbon dioxide, and dyspnoea lead to a shift of blood from the periphery to the pulmonary circulation which may be augmented if the patient has been too zealously transfused. The resulting pulmonary hypertension and congestion will be aggravated by absorption collapse of segments of the lungs and grave pathological changes will ensue, namely, raised capillary pressure, oedema, turgidity, and reduced compliance of the lungs. This will be followed by increased respiratory effort and negative endopleural pressure, more transudation from pulmonary capillaries, and still more oedema to continue the vicious spiral leading to death. In primarily surgical conditions of this kind, there is plenty of scope for the anaesthetist to exercise his skill as an interpreter and assessor of physical signs and symptoms.

### *Haemorrhage*

Another common and often critical problem for anaesthetists and surgeons is impending circulatory failure due to a marked reduction in circulating blood volume, especially when this is the result of massive bleeding. Anaesthetists are much concerned with the management of this condition and particularly with the decision as to how soon surgery should be undertaken.

A clinical record (Fig. 4) of a case of uncontrollable haemorrhage illustrates the factor of urgency in a situation which brooked no delay whatsoever in surgical intervention and in the acceptance of a calculated risk in respect to the anaesthetic procedure.<sup>1</sup> A young man, exsanguinated as a result of a gunshot wound of the liver, arrived in hospital forty minutes after the accident. He was conscious but showed signs of cerebral hypoxia; his pulses were impalpable, his blood pressure was unrecordable, and he was gasping. The patient was taken directly to the operating theatre where a rapid blood transfusion was started and, simultaneously, anaesthesia was induced with cyclopropane and oxygen. Fifteen minutes after admission laparotomy was being performed and the disrupted liver sutured. Not until completion of the operation did the blood pressure become recordable. This remained at about 60 mm. Hg for over one hour after which blood replacement appeared to be effective. The patient became conscious and lucid and ultimately his blood pressure attained a level of 120-70 mm. Hg with a fall in pulse rate from 150 to 110 per minute. Ominously, however, the pulse quickened and the blood pressure fell as a result of inevitable further bleeding. The circulation was improved again by increasing the speed of transfusion but the improvement was more apparent than real; the pulse rate remained fast and the patient died five hours later. Such an outcome had seemed likely when the grave nature of the visceral and vascular damage was fully revealed by laparotomy. Immediate operation to stop severe continuous bleeding, although only transiently effective in this case because it could not be otherwise, gave the patient his one remote chance of survival.

### *Immediate Diagnosis*

In contrast to elective surgery where preoperative investigations can be as complete as need be, truly urgent surgery does not permit time for the use of



MALE AGE 20. G.S.W. ABDOMEN: GROSS HAEMORRHAGE FROM DISRUPTED LIVER

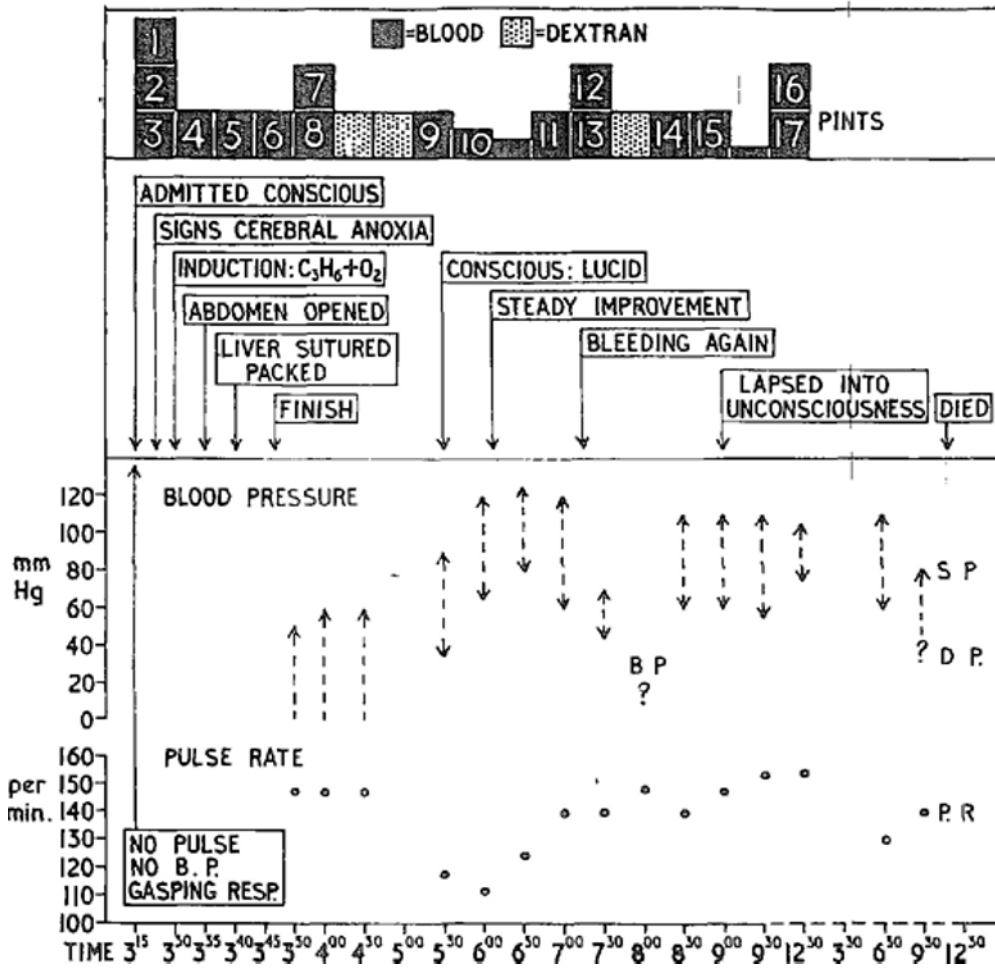


FIGURE 4

modern aids, diagnostic and otherwise; and in such circumstances clinical acumen is all important and anaesthetists bear a heavy responsibility in respect to the survival of ill, unprepared patients. In immediate clinical diagnoses they must be acutely aware of the possibilities of mistaking coronary thrombosis for perforated peptic ulcer, biliary colic, or acute pancreatitis, or adrenal apoplexy for internal haemorrhage. Their knowledge of acute and chronic pathological conditions should be such as will enable them to make an intelligent and tactful contribution in discussing with surgical colleagues problems in differential diagnosis, resuscitation, and management, without straining personal relations. The anaesthetist's outlook must be as wide-angled as possible and not focussed solely on anaesthetic matters. With the non-toxic drugs and procedures available nowadays, he can make the patient much safer for operation than could his predecessors and so raise the operability rate in dangerously ill patients. Where competent he may offer help in certain aspects of the care of the patient and often this may be appropriate when the surgical partner is a junior with less general clinical experience than himself.



FIGURE 5 (By courtesy of Editor, Brit Jour Anaesth)

### *Surgical Diseases*

Some other acute conditions in which problems arise requiring frank discussion and co ordination of action by surgeon and anaesthetist merit consideration

(1) Relatively minor inflammatory conditions are sometimes serious anaesthetic risks but are not always recognized as such. Examples of this are Ludwig's angina, retropharyngeal abscess, and infective swellings in the neck. If there is much oedema within the oral pharynx and difficulty in opening the mouth, the anaesthetist must not delude himself or yield to the suggestion of a well-meaning surgeon that a muscle relaxant might solve the problem. This way, and particularly if an intravenous barbiturate is given about the same time, there will almost certainly be a point of no return for the patient. In an age of easy anaesthesia it must be emphasized that one must never get a patient into a state which is irreversible or can only be reversed with so much difficulty and lapse of time that life or well-being remains in jeopardy.

The patent airway is a hackneyed subject but here I should like to mention a particular cause of respiratory obstruction that may be rare but certainly is seldom diagnosed. I refer to narrowing of the glottis as a result of rheumatoid arthritis involving the arytenoids. For the microscopic section (Fig 5) I am indebted to my colleagues D L Gardner and Frank Holmes who have been investigating this interesting pathological condition.<sup>4</sup> The characteristic histological features are lymphocytic infiltration of the cartilages and synovial membrane with obliteration of the joint space. Realizing the potential danger of this condition and of some more obvious ones such as trauma of the bones and soft tissues of the face accompanied by oedema, serious consideration should be given to tracheostomy as a justifiable life-preserving precaution before induction of anaesthesia.

Concerning tracheostomy in general, anaesthetists have so far been more zealous than their colleagues in advocating this measure not only in certain surgical cases but also for medical conditions involving respiratory insufficiency and the circulatory and cerebral depression associated with progressive sub-acute asphyxia. In this connection there is still a considerable field in medical units for exploiting ancillary skills of anaesthetic practice such as bronchoscopic aspiration and the use of mechanical respirators.

(2) A major surgical emergency seen relatively often in hospital practice although surprisingly rarely by individual general medical practitioners is perforated peptic ulcer. The typical clinical features of this condition are familiar to experienced anaesthetists but there are two problematical points of peculiar interest which merit discussion.

The first concerns the differential diagnosis of myocardial infarction which may be mistaken for perforated peptic ulcer, acute pancreatitis, dissecting aneurysm of the thoracic aorta, pneumonia, or pulmonary embolism. Occasionally a case of myocardial infarction is admitted to hospital as an abdominal emergency, probably as a perforated viscus, and in such circumstances the anaesthetist, as physician to the surgical unit, may, quite properly, be expected to indicate the alternative non-surgical diagnosis.

The misleading symptom is pain, or, perhaps more correctly, its interpretation. When it occurs in association with acute myocardial infarction, pain is sudden in onset, is located behind the sternum but sometimes in the epigastrium, and frequently radiates to the shoulders and arms, particularly on the left side. It may be accompanied by nausea and vomiting and this syndrome suggests an acute abdominal condition. The patient becomes hypotensive and pallid, dyspnoeic and somewhat cyanosed; muscular rigidity is absent or insignificant in degree.

In most but not all cases of perforated peptic ulcer a history of previous gastric trouble can be elicited. Pain starts suddenly in the epigastrium and is severe in character. It may occasionally be referred to the lowest part of the chest but never to the arms. Respiration is shallow and costal in type because of voluntary restriction to reduce pain; the dyspnoea is not so severe as in acute myocardial infarction. In cases of perforation hypotension, pallor and cyanosis appear later as classical manifestations of generalized peritonitis. Here also, radiographs, taken if possible with the patient sitting upright, will usually reveal the presence of gas under the diaphragm and sometimes areas of pulmonary collapse.

Finally, electrocardiography, although often inconclusive, at an early stage may clinch the diagnosis and should be carried out whenever there is any doubt since an unnecessary anaesthetic and laparotomy could be a grave additional hazard for a patient suffering from acute myocardial infarction.

The second feature is the high incidence of respiratory complications associated with perforated peptic ulcer. Until recently it has been generally accepted that surgical and anaesthetic factors, with perhaps some extra bias against the anaesthetic, share the etiological responsibility in this matter. Both surgeon and anaesthetist, however, can take comfort in the fact demonstrated by Le Roux<sup>5</sup> that neither of them is responsible since the pulmonary pathology can be an almost immediate consequence of the actual perforation and is often present

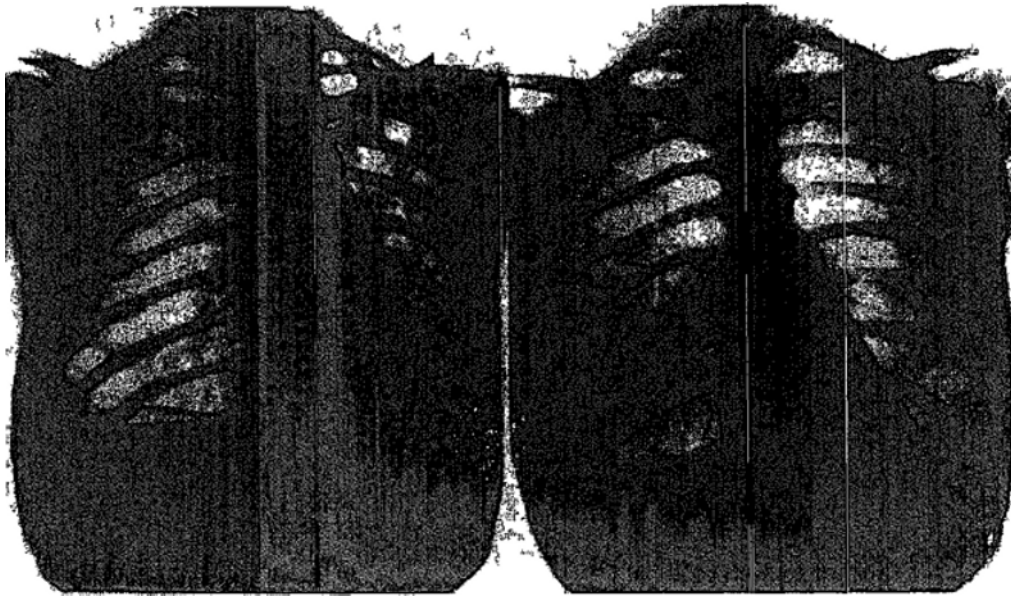


FIGURE 6 (By courtesy of Editor Brit Jour Surgery)

before either of them has seen the patient. In illustration of this I quote two cases from a series of thirty described by Le Roux.

The first patient, aged 29, was admitted three hours after the onset of severe abdominal pain. The radiograph (shown on the left in Fig 6) made on admission showed a pneumoperitoneum and patchy collapse of the left lung. On the second day after closure of a perforated ulcer and immediate postoperative bronchoscopic aspiration the pulmonary opacities had cleared (Fig 6, on the right).

The second patient, a 24-year-old man, was admitted four hours after perforation of a duodenal ulcer. Immediate radiography showed pneumoperitoneum and a shrunken, airless, lower lobe of the right lung (Fig 7, left). Before and after closure of the perforation the bronchi were cleared of secretions. A radiograph on the day after operation showed normal aeration of the formerly collapsed lobe (Fig 7, right).

In 9 of 16 patients suffering from perforated peptic ulcer, preoperative radiographs showed lobular collapse, and two, lobar collapse. From these Le Roux concluded that (a) pulmonary lesions are common soon after actual perforation of peptic ulcers, and (b) such lesions are a result of the perforation. The pain of the latter is much more severe than that which follows laparotomy and the consequent restriction of movement of the ribs and diaphragm predispose to pulmonary collapse. In addition, the irritant gastric juice provides a strong stimulus to the parietal peritoneum of the upper abdomen, the receptor field of reflex respiratory inhibition, and so causes a marked reduction in pulmonary ventilation. Furthermore, mechanism for clearing secretions come virtually to a standstill at the moment of perforation and the significance of this is greater in bronchitic patients and smokers. Le Roux concludes that (1) a postero anterior radiograph should be taken preoperatively with the patient erect (this is more

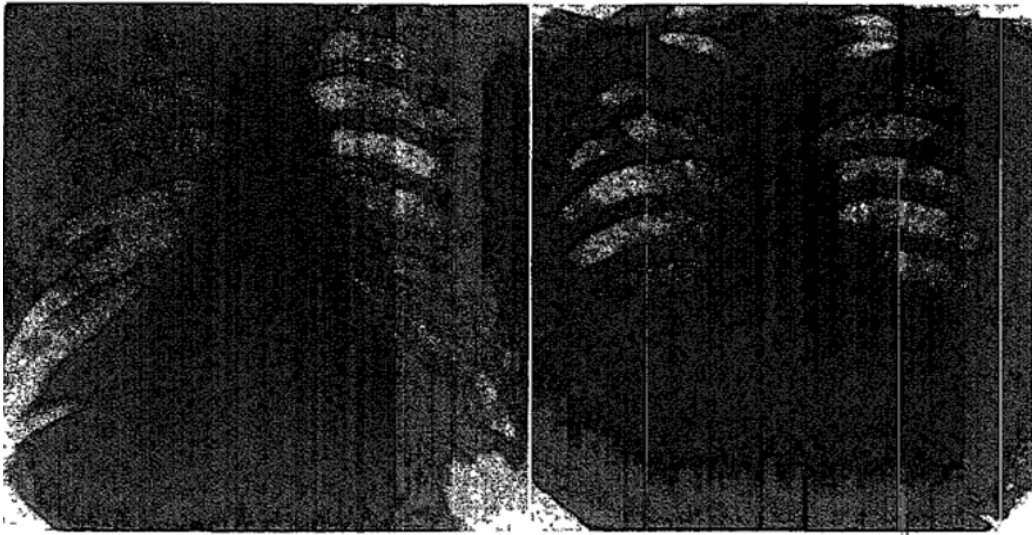


FIGURE 7 (By courtesy of Editor, Brit. Jour. Surgery)

helpful than physical examination when respiratory movements even in patients under analgesics are voluntarily inhibited), and (ii) aspiration of bronchial secretions after operation for perforated peptic ulcer and before if necessary is a sound and justifiable prophylactic measure.

In dealing with cases of perforation, therefore, anaesthetists must be prepared for the preoperative pulmonary complication of lobular or lobar collapse and undertake the initial responsibility for preventing its further development.

#### INCIDENTAL PROBLEMS

During surgical and obstetrical procedures under anaesthesia of any kind, complications of varying degrees of significance may develop inadvertently. Some are related to the operation and others to anaesthesia but occasionally, when a complex of circumstances is present, there may be no obvious line of demarcation. In whatever way it may originate, the situation is frequently a challenge to the vigilance, clinical awareness, and diagnostic capabilities of the operating team, not least the anaesthetist. The latter has his own iatrogenic problems to contend with, but it is not the purpose of this lecture to discuss these or the technology of present-day practice except to say that the sounder his scientific and clinical knowledge the easier it should be for the anaesthetist to assess his contribution, if any, to incidental complications. For his own sake, however, he must also be cognizant of other possible factors not related to the anaesthetic. For instance, during removal of a distal aortic aneurysm, unavoidable division of lumbar arteries may deprive the spinal cord of its supplementary blood supply on which it may be particularly dependent because of the attenuated character of the anterior and posterior spinal arteries in the region, and paraplegia

may follow. In such an event, suspicion could fall on sub-arachnoid or epidural spinal block if either has been employed.

As another example, circulatory collapse frequently associated with cholecystectomy and formerly attributed to some vague intrinsic factor in patients suffering from gall-bladder disease is usually the result of occlusion of the inferior vena cava by abdominal packs or by stretching of that vessel over the vertebral column if the latter is extended for better access—a mechanism which may be facilitated by the use of muscle relaxants.

Apart from massive uncontrollable haemorrhage, pulmonary embolism is the gravest incident that can occur during surgical or obstetrical operations. It is tempting to regard such an accident as fortuitous. Occasionally this may be so, but careful consideration of the clinical findings will show that preventive measures are often possible. Although unrelated to the anaesthetic procedure, pulmonary embolism must be a matter of some concern to the anaesthetist. Having a share in the care and preoperative preparation of the patient, he should keep in mind the pathological conditions and the circumstances in which pulmonary embolism may occur and if necessary broach the possibility to his surgical colleague. In a period of thirty years I have seen eight patients die from pulmonary embolism during manipulation and reduction of fractured neck of the femur at the sixth to tenth day after the accident. Trauma and restriction of movement initiate venous thrombosis in the neighbourhood of the fracture and during manipulation, after an interval of some days, a thrombus may more readily be dislodged. There would, therefore, appear to be a danger period which might be avoided.

Pulmonary embolic block most commonly follows thrombosis of the deep veins of the pelvis or legs and in appropriate cases clinical evidence, for example, increased girth of a leg due to venous obstruction, should be looked for preoperatively or on successive days after operation. Other common sources of blood-formed pulmonary emboli are the right atrium and ventricle, the placental site, and the prostatic bed.

Pulmonary arteries may also be blocked by fat globules from the marrow of fractured long bones, tumour—such as hypernephroma involving the inferior vena cava—air sucked into a large vein, and, perhaps most tragic of all causes, glutinous amniotic fluid from the uterus during parturition.

The rapidly developing signs of acute cor pulmonale can be quickly recognized by the anaesthetist and when the arterial block is massive there is little that can be done quickly enough to prevent a fatal termination. It should be realized, however, that even a small embolus may produce a critical clinical state disproportionate to the size of the lesion, as a result of generalized reflex spasm of the pulmonary vessels and of the bronchi and coronary arteries. It is worth while, therefore, to attempt to eliminate these concomitant factors by the administration of spasmolytic agents.

Time does not permit consideration of other surgical and medical conditions of which anaesthetists should keep themselves well-informed, for example, meteorism which frequently jeopardizes the recovery of patients immobilized after operations on the hip and may wrongly be attributed to new anaesthetic

agents or methods. In Canada, particularly, I might have ventured to discuss with becoming respect the problem of stress and the positive contribution which, I believe, anaesthetists can make towards its prevention or alleviation in extensive surgical operations.

I hope I have indicated the significant overlap of interests between anaesthetic practice and medicine and surgery and the comprehensiveness of a career in our speciality. No longer need there be any inferiority complex in respect to it and I trust that all of us, especially the younger generation, appreciate the finely poised position we have reached in being accorded a responsible and respected share in the care of patients which I believe is adequate compensation for not having patients of our very own. In consolidating this responsible status and working harmoniously with our surgical, medical, and obstetrical colleagues, we can enjoy an acceptable executive and advisory function and, indeed, the best of two worlds.

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