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## What's New

The last Halifax Infirmary Issue of THE BULLETIN was devoted to a symposium on thin bones. It was so well received that when we, on the staff of the Infirmary, were asked to sponsor another issue, we cast around for a further subject worthy of a symposium approach.

When we focused our retrospectoscope on the past decade, we found the progress in medical knowledge to be truly startling. The life of millions of women has been transformed by simple hormonal medication and by means of a pill we can produce multiple births or no birth at will. Diseases unheard of in 1958, such as pulmonary alveolar proteinosis, Zollinger-Ellison Syndrome, and heavy chain disease, must now be considered almost daily in differential diagnoses. A whole new vista of autoimmune diseases and of abnormalities of chromosomes has been unveiled. Transplantations of kidneys, lungs, liver and heart are now almost commonplace. Medicine has unlocked the secret of the molecule of hemoglobin and has synthesized insulin. We have begun to unwrap the tangled skein of chromatin in the cell nucleus and to manipulate the very molecular structure of DNA, the Staff of Life, even to change heredity and to grow for a time, under glass, a minute human infant.

We, of the Infirmary, have chosen, then, to devote our present symposium to a discussion of a few of the recent advances in practical diagnostic methods deriving from these giant steps in knowledge. For complete discussion we should need the scope of well over a year's issues of THE BULLETIN, so we have had to be severely restrictive. Those who wish to learn about aerospace medicine, biocybernetics and research methods must look elsewhere. Many subjects which we would have wished

to mention, such as fetal electrocardiography, the use of intrauterine transfusions, cardiac catheterization, prenatal pelvimetry, and premalignant changes in epithelium, have not been covered, and these omissions render our review grossly inadequate. We have tried, however, to provide some guidelines in the fields of Anaesthesia, Endocrinology, Microbiology, Nuclear Medicine, Ophthalmology, Psychiatry and Surgical Diagnostic Procedures, strictly from the point of view of the practicing physician.

What of the Future? It is safe to say that technical advances will be even greater in the next ten years. Tomorrow will bring us even better tools. We must see to it that we use them rightly, for there is a real danger that our hubris will outstrip our humanity. In "Through the Looking Glass," Alice ran until she was out of breath, and then looked up to find that she was by the self-same tree from whence she started. "In our country," she said, "you'd generally get to somewhere else—if you ran very fast for a long time as we've been doing." A slow sort of Country," replied the Red Queen. "Now *here* you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that."

The widening horizons of our knowledge bring with them ethical considerations which we are apt to ignore. Icarus-like, we soar upward to the sun, inebriated with the headiness of playing God. We must take care that our wings are held together with something stronger than wax, because it is becoming plainer every day that knowledge without wisdom and humanity may be not a blessing, but a catastrophe. □

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# Recent Advances in Pre-Operative Assessment for Anaesthesia

D. A. E. SHEPHARD, M.B., B.S., D.A., C.R.C.P.(C)\*

Halifax, N. S.

Although recent advances in medicine, notably since the advent of open-heart surgery in 1955 and the introduction one year later of halothane (Fluothane), appear to have increased the safety of anaesthesia and operation, attention to the pre-operative condition remains an essential part of the care of the surgical patient. Indeed, it is more important than ever. For today, the anaesthetist has to care for a greater number and variety of patients; his patients suffer from a plethora of coincidental disease, they take an astonishing and increasing number of drugs enabling them to withstand the stresses of their illnesses and the electronic age, and they undergo operations which steadily increase in complexity. Proper pre-operative assessment requires an understanding of the way in which anaesthesia—itsself a changing field—is related to the medical scene, similarly kaleidoscopic. Some comments on recent advances in pre-operative assessment as seen by an anaesthetist are therefore pertinent.

## The Basic Approach

There is no substitute for the time-honoured visit with its attendant history and physical examination, albeit adapted to the anaesthetist's own requirements and clinical acumen. Kekwick has remarked that "the object of his clinical examination of a patient prior to operation is to assess the risks which the particular individual carries in relation to the operation and the anaesthetic. Once they are recognized the type of anaesthetic can be named and other measures can be put into force pre-operatively and post-operatively to diminish or, in some instances, prevent them. Indeed, the primary object of such examination is the prevention of post-operative complications."<sup>1</sup> In order to assess such risks the anaesthetist today can draw on advances in our understanding of medical and surgical disorders, and in our knowledge of pharmacology and pathology, as well as those advances in technology which permit the extension of the clinical examination from the bedside to the laboratory.

## Physical Status and Operative Risk

Physicians, especially those who are not directly concerned with the administration of anaesthesia, often have only a vague idea of the problem of opera-

tive risk; the terms "good," "fair," and "poor" are sometimes considered to be sufficiently descriptive in a medical consult. This of course leaves room for self-congratulation or for lack of surprise depending on the outcome, and commitment is avoided. Attention is therefore drawn to a recent classification of physical status or risk, proposed by the American Society of Anaesthesiologists:<sup>2</sup>

1. A normal healthy patient.
2. A patient with a mild systemic disease.
3. A patient with a severe systemic disease which limits activity but is not incapacitating.
4. A patient with an incapacitating disease which is a constant threat to life.
5. A moribund patient not expected to survive 24 hours, with or without an operation.

In the event of an emergency operation, the number is preceded by the letter E.

This classification has several advantages. First, it is based on the study of many patients in which pre-operative assessment was correlated with the operative and post-operative course: it is therefore realistic; second, it provides a continuous source of education about operative risk; third, it offers a classification which is readily and universally understood, and which therefore can be utilized for record purposes; and fourth, it commits the physician to particulars rather than generalities, always a good practice in medicine!

## Relationship Between Disease and Anaesthesia

Several recent advances in knowledge of disease have influenced pre-operative assessment. Consideration of this illustrates two points; first, that knowledge about "old" diseases, for example myocardial infarction and myasthenia gravis, especially in the surgical patient, is continually increasing, so altering our outlook on medical practice, and second, that we must always be ready to recognize "new" diseases, for example, familial dysautonomia, and their relationship to anaesthesia.

Myocardial infarction is cited because several studies have lately established the risk of anaesthesia and surgery for the patient with a history of infarction. One study<sup>3</sup> gave a mortality rate of 40 per

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cent for those patients having had infarction less than three months before operation, while the recurrence rate for surgical patients having had infarction up to six months before operation was reported in another study as being as high as 100 per cent.<sup>4</sup> Studies such as these help us to evaluate risk on a sound basis.

Familial dysautonomia is referred to as a "new" disease because it was first well described as recently as 1949.<sup>5</sup> Reports in the anaesthetic literature later appeared, so that the autonomic, circulatory and respiratory abnormalities during anaesthesia could be anticipated.<sup>6</sup> There are many diseases which require special pre-operative consideration: the disease in question may influence the management of anaesthesia. Classically, porphyria and myasthenia gravis exemplify this; but more recently, conditions such as sickle-cell anaemia (because of sickling caused by anoxia)<sup>7</sup> and burns (because of the occurrence of bradycardia and asystole)<sup>8</sup> have claimed attention. The anaesthetist has the responsibility to keep not only himself, but also his colleagues informed, for it is sometimes he who may become aware of abnormal behaviour first.

It is a characteristic of potent and valuable drugs that, apart from their usual effects, they may have other significant and far-reaching consequences. Their potential for possible harm must then enter into pre-operative evaluation. In this respect the muscle relaxant and paralyzant succinylcholine may be considered, for this invaluable drug has theoretical and practical facets which must be of interest to all physicians. Theoretically, the relationship of the drug to the genetic make-up of an individual, which may come to light as the result of abnormal apnea,<sup>9</sup> has become an interesting aspect of the developing science of pharmacogenetics; the practical importance of this, now more widely recognized, is that post-operative apnea is not unlikely if succinylcholine is used in persons who have either an inborn deficiency of pseudocholinesterase or an acquired deficiency of this enzyme as occurs in disorders such as liver disease, uraemia and malnutrition. Also, the association of succinylcholine and cardiac arrest at certain stages of burns<sup>8</sup> and the questionable role of this drug in the recently recognized phenomenon of "malignant hyperpyrexia" (unrelated to environmental conditions)<sup>10</sup> similarly illustrate the need for the physician to review frequently the inter-relationship between anaesthesia and disease.

#### **Relationship Between Drug Therapy and Anaesthesia**

This is the age of the Pill. The stresses of the space age have led to the widespread use of drugs by patients who may later require surgery. The phenomenon of "iatrogenic" disease has thus become a significant facet of medicine, and the anaesthetist like other physicians, must consider this pre-operatively.

Essentially, consideration must be given to the question of whether drug therapy in the pre-oper-

ative period may compromise the safety of the surgical patient during or after operation. This aspect of pre-operative evaluation was well reviewed in this Bulletin recently by Dundee<sup>11</sup> and needs no elaboration here. It is sufficient to emphasize that it is a relatively recent phenomenon, and that it is likely to become more important in the future, quite possibly in relation to presently unknown drugs; also that sooner or later every anaesthetist by observing cardiovascular or respiratory complications, especially in patients who have been receiving for example antihypertensive drugs, corticosteroids, and monoamine oxidase inhibitors, comes to recognize the gravity of iatrogenic disease. A pre-operative enquiry into drug therapy before surgery is therefore an important part of assessment.

#### **Psychological Assessment**

Recently there has been an increasing awareness of the importance of considering the surgical patient as a person.<sup>12</sup> Children particularly are sensitive to the experiences of illness, hospitalization, anaesthesia, and surgery. Even a modicum of extra attention to psychological needs makes a difference to the future well-being of children who are surgical patients. Such measures as the mother staying in the hospital with the child<sup>13</sup> and being present at induction of anaesthesia<sup>14</sup> have been advocated; such liberal policies can only be beneficial in view of the many studies which have demonstrated emotional and behavioural sequelae following anaesthesia and surgery.<sup>15</sup>

Adults also appreciate attention to their emotional needs, and as has been shown recently, surgical patients have significant anxiety in relation to anaesthesia and surgery.<sup>16, 17, 18</sup> Despite the brevity of his visit, the anaesthetist may lessen such anxiety; Egbert et al for example have measured the effect in terms of pre-operative sedation and post-operative narcotic requirement which can be related to the visit of a sympathetic and informative anaesthetist.<sup>19</sup>

There is a danger that in a technological era the hidden needs of the psyche may be forgotten. It is therefore encouraging to note recent work on this aspect of pre-operative assessment, which may seem insignificant to some physicians, yet which is of greater reality to the patient than some of the more obvious aspects of anaesthesia and surgery.

#### **Physical Assessment**

The previous discussion has largely been concerned with advances in theoretical knowledge of medicine in relation to anaesthesia. In assessing the physical condition, however, more practical factors operate, which have been discussed by Kekwick: "As in all clinical examinations, two factors operate. First, the thoroughness with which the examination is made and, secondly, that the examiner shall have the skill to realize the significance or insignificance of his findings."<sup>1</sup> This is the essence of pre-operative evaluation.

The clinical examination should therefore be thorough. Today, to be thorough, this examination must utilize various technical aids which have been developed recently and which supplement the clinical examination. This aspect of pre-operative assessment is well illustrated by a consideration of cardiopulmonary evaluation. Anaesthesia and cardiopulmonary function are, dynamically, closely related, and the commonest hazards to be anticipated are associated with the cardiovascular and pulmonary systems. Although it has been said that "no single objective test of cardiac or respiratory function can prove a substitute for a skilled clinical examination in anticipating these hazards,"<sup>1</sup> many useful tests do help complete the cardiopulmonary evaluation. Such elaborate procedures as coronary cine-angiography and isotope scanning of the lungs need not be considered here; many simpler tests and techniques have recently been made available for general use.

#### A. The Cardiovascular System

One cannot but agree with Papper who stated recently that the question of how to evaluate the risk in a patient with cardio-circulatory disease is "incompletely answerable at the present time except in terms of statistics. These are useful but not definitive or final. One can ask the most skillful cardiologist about the risk for anaesthesia and operation in terms of the function of the diseased heart. In any given patient he is hard pressed to give . . . quantitative answers and what he often does is to say that the patient should not become anoxic or hypotensive. This kind of answer is useless to the anesthesiologist because the twin sins of anoxia and hypotension are avoided for all patients."<sup>20</sup>

Assessment of the cardiovascular system before operation remains uncertain. A good history of cardiovascular activity and function together with a competent examination still form the most reliable guide to assessment. Nevertheless, recent developments provide indications that in the future useful methods of cardiovascular evaluation may become available; meanwhile, there are several procedures which should be considered.

**ELECTROCARDIOGRAPHY (ECG):** Although not a recent advance, its value has become more widely recognized. Much monitoring equipment has been developed recently, so that even in the smallest clinic, ECG evaluation should become a regular part of pre-operative work-up. The value of the ECG as a **routine** measure is illustrated by the following case-report:

Case No. 1. A 72-year-old male presented in the operating-room for suprapubic cystostomy and fulguration of a bladder tumor. The immediate indication for surgery was severe hematuria, which had necessitated transfusion of 12 units pre-operatively, 2 being given following the pre-operative visit when a hemoglobin level of 5.8 gms. % was noted. Also noted was a previous ECG which showed occasional ventricular ectopic beats, some ST depression, and a moderate tachycardia; the ECG was interpreted as being suggestive of coronary insufficiency.

Immediately before induction of anaesthesia an oscilloscope revealed an ominous ventricular arrhythmia. It was decided to cancel the operation. The patient was taken to the recovery-room where a definitive ECG was made; the patient was also seen by an internist, who advised correction of the tachycardia and ventricular arrhythmia and careful observation. However, the patient immediately developed signs of pulmonary edema; this condition rapidly deteriorated and death occurred about three hours later.

The value of the ECG is however somewhat limited, because it is not directly representative of the functional capacity of the heart, nor can it be correlated with the incidence of post-operative complications.<sup>21</sup> But it may alert the physician to an abnormality and to the need for preventive measures, as well as providing a base-line for intra- or post-operative electrocardiographic interpretation.

**BALLISTOCARDIOGRAPHY (BCG):** In contrast, the BCG has been shown recently to be superior to the ECG in detecting evidence of degenerative cardiovascular disease, and in its degree of correlation with post-operative complications.<sup>21</sup> Its significance lies in relation to the functional activity of the heart; although it is too sophisticated a device for wide use, it points the way in which, hopefully, pre-operative assessment will move, namely toward an evaluation of functional capacity rather than static description.

**CENTRAL VENOUS PRESSURE (CVP) MEASUREMENT:** An example of evaluation of a functional parameter is the measurement of CVP. Since it was described in its present form by Wilson and Owen in 1961,<sup>22</sup> measurement of CVP has become used in assessment of cardiovascular function; methods are simple to use and rapid to interpret. In the present context it is valuable in evaluation of patients with hemorrhagic shock and with a limited ability to handle large volumes of intravenous fluid.

**BLOOD VOLUME (BV) MEASUREMENT:** Another recently introduced aid to assessment, particularly for patients who are about to undergo major surgery and those who suffer major hemorrhage, is the estimation of BV, a parameter upon which in part the cardiovascular response to anaesthesia is based. Since the use of radio-iodinated serum albumen was first described in simple form in 1960,<sup>23</sup> measurement of BV has become simple and rapid, being now a bedside test. Like the measurement of CVP, it is an important part of evaluation which is likely to become widely applied.

**VENTRICULAR MIXING VOLUME:** The most recent advance in preoperative assessment of the cardiovascular system is the estimation of cardiac reserve derived from the cardiac output, mean transit time, and peak concentration time as shown by indicator dye. Gudwin et al<sup>24</sup> have advocated this for the evaluation of cardiac reserve in patients over 65, a group which is particularly at risk from cardiac causes of postoperative mortality. What is particularly interesting is that operative reserve has now been expressed in mathematical terms, an indication

perhaps that cardiovascular assessment will in the future be placed on a more definitive basis."

### B. The Respiratory System

More tangible, perhaps because of the slower pace of ventilation, is the assessment of the respiratory system. Another reason is the fact that of all the systems, the respiratory is the one most frequently beset by complications; and in major surgery, pulmonary malfunction is the commonest contraindication to surgery. It is not surprising that today pulmonary evaluation is better organized than that of other systems.

In a recent review of evaluation of lung function, Gaensler has remarked that three variables are important—the quantitative estimation of the individual patient's pulmonary reserve, alteration in lung function during and after surgery, and the possibility of complications determining the degree of tolerance required in matching the patient's reserve to the effects of surgery.<sup>25</sup> The estimation of pulmonary reserve may now be accomplished by relatively thorough studies, and many complex and esoteric methods have recently been developed for an exhaustive evaluation of pre-operative lung function. These are well reviewed in standard texts; in the present discussion it is more appropriate to consider briefly simpler tests which can be performed at the bedside or in the office. These do not preclude tests performed in the Pulmonary Function Laboratory, but rather indicate the need for further studies.

EVALUATION OF THE MECHANICS OF BREATHING: Since the majority of post-operative pulmonary complications develop in patients who have either obstructive or restrictive pulmonary disease, evaluation of the patient with this in mind is logical.

- a. *Match Test* Snider et al in 1959 suggested the use of a patient's ability to blow out a standard book match held six inches from the open mouth to reflect the presence of obstructive disorder.<sup>26</sup> Although only a rough test, it has been interpreted as follows: 80% of those who cannot blow out the match will have a maximum breathing capacity (MBC) of less than 60 L/min.; further, 85% of patients who cannot blow out the test match have a one-second Vital Capacity ( $VC_{1.0}$ ) of less than 1.60 L, 85% of those who can having  $VC_{1.0}$  greater than 1.60 L.
- b. *Simple Spirometry* The recent trend towards simple analysis of ventilatory function is reflected in the variety of simple spirometers now available for evaluation of lung function. Only a few of these ingenious devices which estimate the basic parameters required for an analysis of obstructive and restrictive disorder need be mentioned; each clinic has its own favorite methods. But one of the most useful for the measurement of tidal volume, vital capacity (VC), and

minute volume is the respiratory anemometer developed by Wright in 1955<sup>27</sup>. Later, he developed a peak expiratory flow meter for measurement of ventilatory volumes related to time, so that a timed VC could be determined.<sup>28</sup> A simple device for measurement of MBC was described by Warring et al.,<sup>29</sup> while Wang et al.<sup>30</sup> developed a waterless wedge spirometer capable of measuring VC, timed expiratory capacity, and maximum expiratory flow rate from a single forced expiration.

Evaluation of patients with various disorders of ventilatory mechanics can therefore be readily made, so that the anaesthetist can rapidly estimate lung volumes and capacities, appraise diagnosis, and evaluate the need for special preoperative preparation, as in patients with emphysema and chronic bronchitis. He may also assess the need for particular post-operative care; for example, the need for tracheotomy in the patient with myasthenia gravis. Today assessment of the surgical patient with a ventilatory disorder can be put almost on a mathematical basis: indeed some workers have recommended plotting the values of VC, timed VC, and timed expiratory capacity on a grid so that the risk of a particular patient can be forecast as being good, satisfactory, poor or prohibitive.<sup>30</sup>

The following case is illustrative of this:

Case No. 2. A 54-year-old woman was referred to the Anaesthesia Department for preoperative assessment before a diagnostic D & C. She led a wheelchair existence, having survived poliomyelitis at the age of 9, and being left with paraplegia, paresis of the left arm, marked kyphoscoliosis, and susceptibility to respiratory infection. Clinical examination added mediastinal shift to the right. Lung expansion was fair and there were no adventitious. The problem was to predict the likelihood of postoperative pulmonary complications.

She failed the "match test." The tidal volume with Wright's anemometer was 250 ml., the vital capacity being approximately 750 ml. These simple tests suggested obstructive as well as restrictive disease and the need for studies in the Pulmonary Function Laboratory. Among other values, the Vital Capacity was 1075 ml., one-second expiratory capacity 810 ml., maximum voluntary ventilation 25.8 L/min., and the peak expiratory flow rate was 120 L/min. Most values lay between 40–50% of predicted.

	0.5 second expiratory capacity
By plotting:	$\frac{\text{Total Vital Capacity} \times 100}{\text{Observed Vital Capacity}}$
Against:	$\frac{\text{Predicted Vital Capacity} \times 100}{\text{Observed Vital Capacity}}$

as suggested by Miller et al.,<sup>31</sup> lung function was thought to be acceptable. This impression received further support from the normality of the blood gases. Confidence in an uneventful course, without the need for further preoperative or postoperative measures other than careful anaesthetic management and vigilant physiotherapy was confirmed by subsequent events.

**EVALUATION OF ADEQUACY OF VENTILATION:** The tests described reflect the presence or absence of impairment of breathing capacity; they do not give evidence of adequacy or inadequacy of alveolar ventilation. This aspect must also be evaluated, because of the importance of recognizing acid-base imbalance pre-operatively. It is another measure of the advances in medicine over the last decade that today relatively simple methods and apparatus are available for the measurement of pH,  $P_{O_2}$ , and  $P_{CO_2}$  and related parameters.

The assessment of the cardiovascular and respiratory systems has been emphasized because of their importance to the anaesthetist and because such a discussion illustrates the recent improvements in our ability to make a **quantitative** as well as a qualitative evaluation. However, assessment of other systems is important and recent advances in our understanding of fluid and electrolyte balance, the endocrine glands, and hepatic and renal function in particular have enabled the physician to assess a patient more fully. One example of this is the patient scheduled for removal of phaeochromocytoma;

technique in endocrine assay, in electrolyte analysis and in blood volume measurement have changed the face of pre-operative assessment, so that both anaesthetist and surgeon can undertake their joint task with a clearer appreciation of the risks involved, and the ways in which these risks can be reduced significantly.

### Summary

Recent advances in assessment of the pre-operative patient have thus been considerable. A review of this kind also indicates that assessment must always change in the light of advances in medical knowledge and practice; it is likely that at the end of another decade the situation will have changed further. It is to be hoped that further advances will be directed towards evaluation of patients at a deeper and more functional level. One anticipates the development of methodology at the tissue and cellular and even molecular level so that a more fundamental approach to the responses of patients to anaesthesia and surgery may put pre-operative assessment on an even firmer basis than it is today. □

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## Cephalopelvic Disproportion

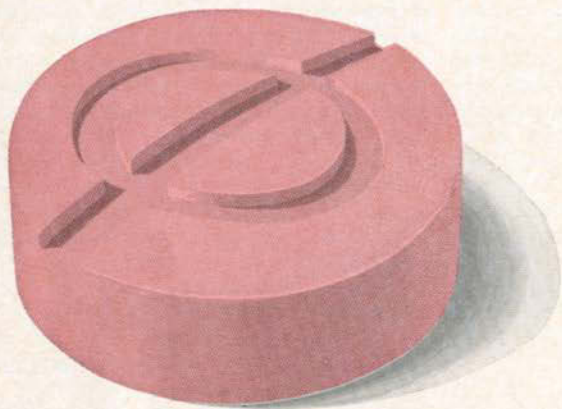
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When dealing with severe intraperitoneal hemorrhage due to a ruptured uterus, immediate laparotomy is mandatory because the hypotensive shock cannot be corrected until the hemorrhage from the large vessels at the site of uterine rupture is controlled.

In retrospect, this patient would probably have survived if she had been taken to the operating room immediately after being hospitalized, given an anesthetic and had a laparotomy performed and clamps applied to the uterine vessels bilaterally. Once the hemorrhage had been arrested, massive blood replacement would have quickly corrected the hypovolemia and death prevented.

### Summary

A maternal death was reviewed by the Provincial Committee on Maternal Welfare. The cause of death was intra-abdominal hemorrhage due to the rupture of a previous classical Cesarean section scar prior to the onset of labour. The preventable factors are discussed. □



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**Dosage:** One or two tablets two or three times daily as required.

**Contraindications:** Gastrointestinal ulceration or sensitivity to ingredients. Large doses taken for prolonged periods may induce nephrotoxicity or gastrointestinal disturbances.

Full information on request.

☉ Narcotic; telephone prescription permitted.



## Butazolidin® alka

**Dosage** *Initial:* 300-600 mg (3-6 capsules) daily in divided doses. *Maintenance:* minimum effective dose, not over 400 mg (4 capsules) daily in divided doses. *Trial period:* one week. □ **Side effects** Serious reactions are uncommon. Occasionally, gastric disturbances (minimized by taking Butazolidin alka with milk or at meal times), mild sodium and water retention. □ **Precautions** Close medical supervision of all patients, especially elderly. Routine blood counts before and periodically during therapy. Patient should report immediately any fever, sore throat, mouth lesions, tarry stools or sore glands. Extra caution in patients with cardiac, hepatic or renal disease, hypertension or receiving anticoagulants. □ **Contraindications** History of drug allergy, peptic ulcer, diverticulitis, or blood dyscrasia. Clinical edema, cardiac failure. □ **Availability** Butazolidin alka: orange and white capsules containing Butazolidin (phenylbutazone) 100 mg, aluminum hydroxide 100 mg, magnesium trisilicate 150 mg, homatropine methylbromide 1.25 mg. □ Full information is available on request.



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# Advances in the Investigation of Endocrine Dysfunction

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Advances in the field of endocrinology have proceeded at a rapid rate, probably more so than other fields, over the past several years. This applies particularly in the field of investigation where advances have been due mainly to the intelligent use of radioactive isotopes which we now know yield a great deal of valuable information. Up until a few short years ago determination of hormone production was carried out mainly by assessing the metabolites excreted in the urine. Today, in many instances, we are able to determine not only the plasma circulating hormone, both bound and free fractions, but also to determine the daily secretion rate of the hormone as well. In the following presentation, only those investigative procedures which we have readily available will be discussed. The more sophisticated tests although not available as standard procedures are readily accessible in other centres if we feel there is an indication for such information.

## Standard Procedures

Investigation of endocrine disorders should be, and usually is, among the most logical forms of investigation in the field of internal medicine. Although the history and physical examination are every bit as necessary as in other fields of medicine, the endocrinologist is very dependent on the laboratory for confirmation of his clinical impression. The physician's prime responsibility is interpretation of the tests in a logical manner at the bedside. This is most important when one considers that in endocrine hypofunctional states, patients will no doubt require continuous therapy for the remainder of their lives. In hyperfunctional states, major surgery or other specific therapy will be indicated.

In the following discussion each endocrine gland will be taken individually and the appropriate forms of investigation outlined. One will see immediately how important it is to have an understanding of the normal physiological mechanisms so that the tests can be properly interpreted.

## Thyroid

**SERUM THYROXIN:** This test has been available in our area for some three years. It has an advantage over protein bound iodine (PBI) in that the result is not influenced by iodine contamination. The normal value in our laboratory for circulating serum thyroxin is 4 to 11 micrograms per 100 ml. It is a measure of the protein bound thyroxin and not

the circulating free thyroxin. However, like the PBI it is influenced by any medication which increases or decreases the ability of thyroxin to bind to protein. Hormone therapy such as the contraceptive pill and estrogen therapy increase the binding sites and therefore cause a false elevation, frequently above the normal for both PBI and serum thyroxin, whereas, testosterone decreases the binding sites and therefore may lower the PBI and serum thyroxin to less than normal values. It is important to note that in both situations, the circulating free thyroxin remains normal and the patient therefore is euthyroid.

**RADIOACTIVE IODINE UPTAKE AND SCANNING:** This is a useful test in assessing the overall function of the thyroid gland. The normal uptake is approximately 15 to 40% in twenty-four hours. Although a radioactive iodine uptake is helpful in determining hyper- and hypo-functioning states, one often needs a thyroid scanning procedure to give a thorough assessment of thyroid function. This is particularly so in patients with uninodular or multinodular goitre where one is trying to decide whether the areas involved are under the influence of TSH or are autonomous. "Hot" or toxic adenomata are autonomous and have a markedly increased uptake compared to the rest of the thyroid gland. "Cold" adenomata are nonfunctioning areas not under the influence of TSH and are potentially malignant. "Warm" adenomata are under the influence of TSH and are usually neither hyperactive nor malignant.

**TRI-IODOTHYRONINE (T<sub>3</sub>) SUPPRESSION TEST:** This test is indicated in any situation where a confirmation of diagnosis of hyperthyroidism is needed. It is also helpful in differentiating endocrine from nonendocrine exophthalmus.

**Procedure:** a radioactive iodine uptake is performed. This is followed by the administration of tri-iodothyronine (Cytomel S.K.F.) 25 micrograms three times daily for seven days. On the sixth day of therapy a repeat radioactive iodine uptake is performed.

**Interpretation:** normally a patient will suppress the radioactive iodine uptake to less than 20% in 24 hours. It is quite safe to say that the ability to suppress the thyroid with T<sub>3</sub> excludes a diagnosis of thyrotoxicosis. However, if suppression does not occur, conditions other than thyrotoxicosis

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may be present, that is, nontoxic goitre or endocrine exophthalmus without thyrotoxicosis.

**TSH STIMULATION TEST:** This is one of our most helpful tests in differentiating primary from secondary hypothyroidism.

*Procedure:* a radioactive iodine uptake is performed followed by administration of 10 units of TSH hormone (Thyrotin, Canada Pharmaceutical Co.) intramuscularly. The radioactive iodine uptake is repeated 24 hours following the injection.

*Interpretation:* normally a two-fold increase in uptake is expected following TSH administration. The presence of this response indicates normal thyroid reserve and excludes the diagnosis of primary hypothyroidism. Again, the absence of a response does not in itself exclude primary or secondary hypothyroidism, since many patients on long term thyroxine therapy, or with long standing pituitary insufficiency will not respond to one single injection of TSH. In this situation several daily injections may be needed to stimulate the "lazy" gland to respond. An increase of greater than 5% above the base line is necessary to indicate some thyroid response.

**PERCHLORATE FLUSHING TEST:-** This is an aid in diagnosing certain types of intra-thyroidal enzymatic defects which may lead to goitre formation and/or hypothyroidism.

*Procedure:* radioactive iodine is administered and a count of the radioactivity determined a few hours later. When this count is satisfactory, one gram of sodium perchlorate is given orally. The count is repeated at 15 minute intervals for one hour.

*Interpretation:* normal individuals retain the majority of the radioactive iodine ingested and thus the count remains much the same. However, in those with a defect in the incorporation of iodine into organic compounds, one notices that the count decreases progressively so that greater than 50% of the dose may be flushed out within the first thirty minutes and up to 90% in the first hour. This flushing effect is seen in several conditions leading to goitre such as Hashimoto's thyroiditis and enzymatic deficiencies that lead to defective organification within the thyroid.

#### **Adrenal**

**ACTH STIMULATION:-** This may be employed in suspected cases of adrenal insufficiency.

*Procedure:* this can be carried out in one of three ways. The first two usually require the determination of 17-hydroxycorticosteroids in the urine. The ACTH can be given either intravenously in the form of a continuous drip or intramuscularly as a long acting preparation. The third and more recent method is that of comparing the response of plasma cortisol to ACTH administration. The procedure is one in which 20 ccs. of heparinized blood is taken for plasma cortisol followed by 25 units of aqueous ACTH intramuscularly. At one and two hour intervals blood is withdrawn for plasma cortisol determination.

*Interpretation:* it has been shown that normal response is such that there is a minimum of a 15 microgram per 100 ml. rise in plasma cortisol one hour following the ACTH injection. In hypoadrenal states, the rise is negligible usually not exceeding 5 micrograms per 100 ml.

**METAPIRONE TEST:-** Used in any endocrine situation where one expects a disturbance in the hypothalamic - pituitary - adrenal axis. This compound blocks 11-beta hydroxylation and prevents the formation of cortisol by the adrenal, thereby increasing the stimulus for the pituitary to produce ACTH. This in turn stimulates the adrenal glands to increase the production of cortisol metabolites which are measured in the urine as 17-hydroxycorticosteroids. As evident from the foregoing, this test is used in evaluating the hypothalamic pituitary ACTH reserves. It is also used in assessing patients with Cushing's Syndrome since it will be helpful in distinguishing those patients with bilateral adrenal hyperplasia from cases of adrenal tumour.

*Procedure:* two twenty-four hour urine collections are obtained for 17-hydroxycorticosteroids. Metapirone 750 mgms. is administered four hourly for six doses starting on the third day. Urine collections are continued the day of and the day following Metapirone.

*Interpretation:* patients with a normal hypothalamic-pituitary-adrenal axis should have at least a twofold increase in the 17-hydroxycorticoid level above the base line values. A lack of response indicates either decrease in ACTH reserve or primary adreno-cortical insufficiency. It then follows that a negative response to Metapirone requires one to carry out an ACTH stimulation test to determine which area is at fault.

**DIURNAL VARIATION OF PLASMA CORTISOL:-** This may be of help in any patient with suspected adrenal hyperfunction.

*Procedure:* 20 ccs. of heparinized blood is withdrawn at 8 a.m. and 10 p.m. for plasma cortisol.

*Interpretation:* the normal value is 5 to 25 micrograms per 100 ml. and in the normal individual, the 8 a.m. plasma cortisol level exceeds the 10 p.m. value by at least 50%. In patients with hypercortisolism this diurnal variation is absent, the two values showing little if any variation.

**DEXAMETHASONE SUPPRESSION TEST:-** This is indicated whenever there is evidence of adrenal hyperfunction.

*Procedure* two 24 hour urine collections for 17-hydroxycorticosteroids as a baseline. On the third day, dexamethasone 0.5 mgms. orally every six hours is begun and continued for three days. This is followed by increasing the dose of dexamethasone to two mgms. every six hours for three further days.

*Interpretation:* with dexamethasone 0.5 mgms. given every six hours one would expect 17-hydroxycorticoid excretion in the urine to be suppressed to low normal levels, usually less than 4 mgms. per 24 hours. However, the patient with

adrenal hyperfunction will rarely suppress at this dose. On dexamethasone 2 mgms. every six hours for three days, the vast majority of patients with adrenal hyperplasia will suppress their 17-hydroxy-corticoids to at least 50% of the basal levels. Patients with adrenal tumour, either carcinoma or adenoma, will behave in an autonomous manner and therefore not suppress.

#### **Adrenal Medulla**

**URINARY VANIL MANDelic ACID (VMA):-** Useful in suspected pheochromocytoma.

**Procedure:** 24 hour urines are collected in a specially prepared bottle and the end products of norepinephrine and epinephrine determined. Normal values vary slightly but are usually less than 10 mgms. per 24 hours.

**Interpretation:** assuming that the patient has been on a VMA free diet which excludes in particular bananas, vanilla extracts and coffee, an elevated VMA is in keeping with increased norepinephrine and epinephrine production. This test has advantages over catecholamine determination in that the substance is more stable and the determinations are more reproducible than the latter.

**GLUCAGON PROVOCATIVE TEST:-** This may be used in suspected cases of pheochromocytoma in which the blood pressure is not markedly elevated.

**Procedure** 0.5 mgms. of crystalline glucagon (Lilly) is administered intravenously. The blood pressure is monitored until stable prior to the injection. Blood pressure readings are then obtained every fifteen to thirty seconds. Rogitine (Ciba) is kept at the bedside in case of an excessive response.

**Interpretation:** this test would appear to have an advantage over histamine in that there are fewer side effects. A response may be considered positive if it is greater than the cold pressor response.

#### **Parathyroid**

**SERUM CALCIUM:-** An elevated or lowered serum calcium on repeated occasions is still the most reliable indicator of parathyroid hyper- or hypofunction. One should be aware that the serum calcium level is greatly influenced by the amount of circulating serum albumen. Levels of less than 8.5 or higher than 10.5 milligrams per 100 mls. are to be regarded with suspicion.

#### **Comment**

In the preceding discussion attempts have been made to outline some of the forms of investigation which we have come to rely on in sorting out our endocrine problems. As you are aware, no attempt has been made to discuss such important topics as diabetes mellitus, hypoglycemia, diabetes insipidus, adrenogenital syndrome, and gonadal dysfunction. Time does not permit and this may well form a topic for a future paper. Not all of the tests discussed are new and many have been in use for several years. They have been included because many physicians may not be familiar with them. I would now like to

outline below some of the most recent advances as applied to investigation in the field of endocrinology. None of these tests are available in our centre but most can be obtained through the proper channels.

#### **Sophisticated Procedures**

**Immunological Assays** Since the original work of Berson and Yalow<sup>1</sup> demonstrating that insulin could be measured by a radio-immunological technique, the field of immuno-assays has burst forth. While it is accepted that this technique does not measure biological activity but rather total hormone, it nevertheless gives an indication of the amount of circulating hormone present. Although the first radio-immunological assays were carried out to determine the amount of circulating insulin, the field has expanded to include growth hormone, thyroid stimulating hormone, follicle stimulating hormone, luteinizing hormone, parathyroid hormone, adrenocorticotrophic hormone, anti-diuretic hormone and others.

**"Free" Hormones** It is generally accepted that the active circulating hormone is that part which is not bound to protein designated as "free" circulating hormone. It therefore stands to reason that the determination of free circulating hormone is a better indicator of hyper- or hypo-function than would be the total circulating hormone.

**Secretion Rates** In cases of hyper- and hypofunction of an endocrine organ one of the most useful tests available today is a secretion rate of the hormone involved. This requires the use of radioactive labelled isotope and in most instances it is not a difficult procedure.

**Enzymes** Renin determinations are frequently indicated in the investigation of patients with hypertension. They are of the greatest value in sorting out the endocrine hypertension of primary aldosteronism from renal hypertension with secondary aldosteronism.

#### **Summary**

In the preceding discussion an attempt has been made to outline some of the most recent and not so recent investigative procedures we have available in our area and also to give some insight into what other tests are available elsewhere if the need arises. The majority of these tests are certainly not of a routine nature and in most instances the patient has to be properly prepared with certain types of diets and medication. It is most important that this proper preparation be undertaken if our results are to be reliable. The majority of the foregoing investigative procedures are best left in the hands of those who are familiar with all aspects of the investigation and in particular the interpretation. I will close by reminding you of the words of Sir William Osler that laboratory tests are only as good as the physician who interprets them. □

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# Interpretation of Sputum Bacteriology in the Antibiotic Era

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The criteria traditionally applied to the interpretation of clinical bacteriological findings have been drastically altered since the advent and almost universal application of antibiotic therapy. In the case of sputum cultures this is particularly true. This fact has not been generally appreciated by physicians. Under these circumstances misdiagnosis may easily ensue, and therapeutic measures may be introduced that may result in the worsening of the patient's condition, if not more serious complications or even death.

It is first necessary to point out that a large proportion of respiratory tract infections are caused by non-bacterial infections. *M. Tuberculosis* and fungi may occasionally be implicated. During the past three decades, "non-bacterial pneumonias" have been given ever increasing prominence and importance. It is now recognized that certain viruses, *Mycoplasma*, *Chlamydia* (*Bedsonia*), and *Rickettsia* are a common cause of pneumonia in man.<sup>1,2</sup>

In the case of non-bacterial pneumonias, the etiologic agent cannot be recovered by the usual cultural methods. Few bacteriological laboratories are equipped to carry out the techniques required. However, the sputum in such cases subjected to routine culture in the usual manner may result in findings that are quite striking but completely misleading as is hereafter described.

It should first be realized that the upper respiratory tract and mouth are "normally" inhabited by numerous micro-organisms; some of which are non-pathogens, some opportunistic pathogens, and others definite pathogens when placed in the proper environment.<sup>3</sup> It should next be realized that the usual methods of collecting sputum invariably involve it passing through the mouth and upper respiratory tract and being thus contaminated by these organisms.<sup>4</sup>

The usual flora found in the mouth and upper respiratory tract of a perfectly well adult, who presumably is not receiving antibiotics, includes large numbers of various types of *Niesseria* which are ordinarily non-pathogenic. Associated with these are various types of *alpha hemolytic* (green forming)

*Streptococci* which are sometimes implicated in chronic lower respiratory tract disease, but which are generally of low virulence. Small numbers of *E coli* and *Proteus sp.* are also often noted. These may be associated with environmental organisms such as *Staphylococcus Albus* (*Epidermidis*), diphtheroids, *Haemophilus sp.*, coliforms, yeasts, *beta H Strep.* other than group A,<sup>3</sup> and other miscellaneous micro-organisms.

The mouth and upper respiratory tract of the hospitalized adult, in addition to the foregoing, may contain a number of micro-organisms that are derived from his peculiar environment and are not usually found in non-hospitalized adults. Soon after admission to hospital, the patient's nares are usually colonized by a hospital strain of *Staphylococcus aureus* (*pyogenes*). We have recently come to appreciate that an almost equally ubiquitous organism in the hospital environment is *Enterobacter sp.* (*Aerobacter*). This then may also colonize the nares and the throat under these circumstances. It should be obvious, but sometimes it is not realized, that these naso-pharyngeal-colonizers may find their way through the naso-pharynx into any specimen of sputum that is collected from hospitalized patients.

The *Staphylococci* and *Enterobacter* (*Aerobacter*) strains in question owe their very existence in the hospital environment to the fact that they are virtually resistant to the usual antibiotics and are usually nosocomial in character. Their ability to colonize the naso-pharynx and upper respiratory tract, therefore, is greatly enhanced by the usual antibiotic therapy given to the patient.<sup>4</sup> It is quite common to find large numbers of *E coli*, *Enterobacter* (*Aerobacter*), and *Staphylococcus aureus* (*pyogenes*) strains in sputum from patients receiving antibiotics, who are not suffering from respiratory tract disease. Furthermore, the application of antibiotic therapy directed against one type of organism, e.g. gram positive cocci, may enhance the growth and colonizing properties of comparatively resistant organisms such as gram negative bacilli. Thus the ubiquitous *E coli* and *Enterobacter* (*Aerobacter*) *sp.* often appear in

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large numbers in the sputum under such circumstances.

There is also a very considerable group of potential pathogens that may exist in the mouth and upper respiratory tract of the well adult and the patient without respiratory tract disease, in what might be called the carrier state. Many clinicians seem to have forgotten that *Pneumococci*, *Klebsiella pneumoniae* (*Friedlanders bacillus*), beta *H Streptococci*, *Haemophilus*, and *Candida* may be "normal" inhabitants of the adult throat and upper respiratory tract. *Pneumococci* are very frequently found in the throat of perfectly well individuals. *Klebsiella pneumoniae* (*Friedlanders bacillus*) often is found in specimens of sputum from perfectly well individuals sometimes in a heavy growth. The author can recall one laboratory technician who could always be relied upon to give a heavy, almost-pure culture of *Klebsiella* from her throat for class demonstration purposes. *Haemophilus* occurs more rarely and in many instances is overgrown by the numerous other inhabitants. *Candida* (*monilia*) is now found in sputum more often than formerly. This is especially true when the patient is receiving broad spectrum antibiotics as *Candida*, of course, is resistant to the usual antibiotics. It is now recognized as a valid cause of pharyngitis in adults under antibiotic therapy. Its presence is so well recognized as a sputum contaminant that some authorities have gone so far as to state that a diagnosis of *Candida* pneumonia should never be made on expectorated sputum, only on sputum recovered by bronchoscopy or preferably on material obtained by lung puncture.<sup>5</sup>

It should also be realized that certain pulmonary pathogens may be quickly excluded from the sputum following antibiotic therapy and will not be identified in it for this reason. Thus sputum cultures should preferably be obtained before antibiotic therapy is begun. On the other hand in certain instances, the offending organism may continue to be found in the sputum even though the required antibiotic response is being obtained. In this respect *pneumococci* are not ordinarily eliminated from the sputum during the treatment of pneumococcal pneumonia. *Pneumococci* may persist in the sputum of patients successfully treated for pneumonia until the time of maximum antibody response. *Staphylococcus pyogenes* may persist in the sputum of patients successfully treated for Staphylococcal pneumonia due, amongst other factors, to contamination from naso-pharyngeal carriers.

Another factor, with a very considerable bearing on the validity of cultural findings in sputum, that is often completely disregarded or overlooked by physicians and nurses, is the procurement and care of the sputum specimen. To delegate complete responsibility for the procurement and care of sputum specimens and the preparation of an informative and relevant requisition to a poorly instructed nurse or

nurses' aide, is to invite trouble. "Spit" is not sputum although most of the material labeled as such received by the ordinary bacteriological laboratory is. Sputum must be fresh or any distinctive pathogens that it may contain, other than *M. Tuberculosis*, will be overgrown by non-pathogens. However, most material labeled as sputum received in the ordinary bacteriological laboratory may have stood at room temperature for hours before reaching the laboratory. Under these circumstances the cultural report on the material submitted for examination is often useless and misleading.

Sputum for routine culture should be collected, after rinsing the mouth with water, as an early morning deep cough specimen and be forwarded to the laboratory immediately. If, in order to procure the specimen before antibiotic therapy is begun, a sputum specimen is procured at night it should be placed in the refrigerator pending forwarding at the earliest possible opportunity to the laboratory. Referral of 24-hour collections of sputum for routine culture only reflects the ignorance of the sender of the essential bacteriological considerations involved. Of course, sputum specimens sent through the mail for routine cultures are virtually useless.

It should be evident from the foregoing that if an accurate, reliable, meaningful bacteriological report on sputum is required, the specimen must be carefully collected and preserved; and the bacteriologist must be given the working diagnosis of the case with some of the salient and pertinent features indicated on the requisition accompanying the specimen. If the attending physician's interest in the case is not obvious in this respect to the laboratory worker, it cannot be expected that the latter will go out of his or her way to render other than a "routine" report on the specimen. Bacteriology is not an exact science. Bacteriological reports on sputum and on many other specimens are interpretative and reflect the examiner's interest and knowledge of the clinical as well as bacteriological features of the case. In the absence of the former, particularly in the case of sputum, reports are apt to be misleading, often erroneous, and could even be dangerous.

Furthermore the clinician, attempting to interpret bacteriological reports on sputa, must be well informed on the bacteriology of the upper respiratory tract. This must include knowledge of the normal and abnormal flora, the influence of broad and narrow spectrum antibiotics on this flora, the part played by environmental colonizers, and the technical factors that may influence the cultural findings. The bacteriological report on a sputum culture is only one piece of evidence, albeit an important one, and should only be interpreted in context with clinical, X-ray, and other laboratory findings in order to establish a diagnosis and to proceed to therapy. The value of a blood culture in substantiating a diagnosis of pneumonia is generally overlooked.<sup>6</sup>

The untutored amateur, who attempts to play the dangerous game of eliminating the "pathogen" by antibiotic therapy, without establishing a diagnosis, may find that each supposed pathogen that he eliminates is replaced by more and more antibiotic-resistant micro-organisms until finally he is faced with a flora that is resistant to all the antibiotics in his armamentarium. His patient is now liable to be exhausted both physically and financially, and the stage is set for more serious developments.

Since the advent of, and almost universal application of corticosteroid, immunosuppressive<sup>7</sup> and antibiotic therapy, various types of nosocomial pulmonary infections are being recognized. These infections almost invariably have a very grave prognosis. In this respect *Enterobacter* (*Aerobacter*), *Klebsiella pneumoniae* (Friedlander), and *Staphylococcus aureus* (*pyogenes*) pneumonias may actually be induced by indiscriminate antibiotic therapy.<sup>8</sup> *Pseudomonas pneumonia* in adults is almost invariably nosocomial and follows long continued multiple antibiotic therapy. This is especially the case in hospital patients where the environment may contain large numbers of these resistant organisms. Treatment of such conditions requires the skill of a therapist, well trained and experienced in respiratory bacteriology and antibiotic therapy. The untutored amateur at this stage should avoid above all else proceeding with what might best be called "multiple antibiotic therapy of desperation" further compounding his difficulties and hastening the demise of his patient.

### Summary and Conclusions

1. Nearly every micro-organism capable of causing respiratory tract disease can occur as a commensal or colonizer of the throat and upper respiratory tract, especially when its growth is enhanced by antibiotic therapy and may, therefore, be found in sputum specimens especially those of hospitalized patients.
2. Nearly every organism that may cause respiratory tract disease, except *M. Tuberculosis*, can be overgrown by commensals and normal flora of sputum, if the specimen is allowed to remain at room temperature. This often occurs and is

invariably the case in 24-hour sputum collections and specimens sent through the mails.

3. No organism should be considered as the etiologic agent of primary pneumonia unless obtained in nearly pure culture in a fresh specimen of sputum previous to antibiotic therapy, and any such conclusion in the absence of supporting X-ray evidence should be supported by finding the offending organism in a blood culture.
4. Superimposed infections following prolonged antibiotic therapy are common and can be caused by any pathogen and most non-pathogens that may be found in the respiratory tract of the healthy individual. However, as such these organisms should *not* be considered etiological pathogens unless found in almost pure culture in repeated specimens of sputum properly collected and preserved. Any such conclusion, in the absence of supporting X-ray findings, should be supported by finding the pathogen in blood cultures.
5. *Pseudomonas pneumonia* is almost always nosocomial (post antibiotic) *Enterobacter* (*Aerobacter*) *Klebsiella pneumoniae*, and *Staphylococcal pneumoniae* are often nosocomial.
6. *Candida pneumonia* is usually overdiagnosed. Some authorities suggest that it should not be diagnosed except on repeated pure cultures obtained by bronchoscopy.
7. Criteria of cure in *Staphylococcal* and *Pneumococcal pneumonia* should not be based on elimination of these organisms from the sputum. *Pneumococci* may persist in sputum till normal antibody response occurs, usually ten days. *Staphylococci* may persist due to nasal and pharyngeal colonization by hospital strains.
8. In view of the many complex factors involved in the examination and interpretation of sputum cultures, the physician who is not conversant with the bacteriology of the upper respiratory tract, and who allows sputum specimens to be submitted for culture without ensuring that they are properly collected and processed, and who fails to give the examiner any information about the clinical features of the case, is not serving the best interests of his patient. □

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# Recent Advances in Nuclear Medicine

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In the six years since the use of radioisotopes was first described in THE BULLETIN numerous developments have taken place, developments which not only have widened the range of diagnostic tests available but which have resulted in progressive reduction in radiation dose to the individual.

All nuclear medicine examinations and their interpretation are insured services under the Nova Scotia Hospitalization Insurance Act.

The radionuclides and examinations described in the previous paper included:

1. Investigation of thyroid gland with radioiodine.
2. Blood and Plasma Volumes with radioiodinated serum albumin.
3. Red Cell volumes, Red Cell Survival studies, and splenic sequestrations using radio Chromium Cr. - 51.
4. Investigation of pernicious anemia and malabsorption states using radiocobalt labelled cobalamin and fat studies using radioiodinated neutral fat and split fat.

## Developments since 1962

The principal developments have concerned two main areas, firstly organ scanning and secondly, development of isotope generators commonly known as "cows" because of the milking procedure by which they are induced to discharge their products.

To a lesser extent dynamic studies, particularly on the circulatory system, are beginning to become important. These latter are in addition to the already well established radiorenogram as a test for kidney function.

## Organ Scanning:

The development in 1952 of the rectilinear scanner, where a carefully collimated scintillation crystal scans regularly across the body, has permitted the visualization of many organs. The scanning mechanism is connected to a mechanical printer and also a photo recorder so that a geographical mapping of the distribution of radioactivity in the body can be determined.

Amongst the organs which can be scanned are the following:

1. THYROID GLAND - scanning of this will demonstrate changes in the size and morphology of the thyroid gland. It will also demonstrate

whether a palpable mass is a functioning or "hot" nodule or non-functioning or "cold" nodule. The cold nodule, of course, has a reputation for high risk of malignancy and should generally be explored.

2. BRAIN - scanning with the appropriate nuclide (see below) has proved a very efficient screening test for brain tumours. With a 85% or better correlation it is unusual to miss tumours in the hemispheres. Most false negatives relate to tumours in the posterior fossa and the base of the brain. By this procedure it is also possible to demonstrate cerebral vascular accidents, particularly in cases which cause tissue damage. In this condition, however, the scan does not become positive until one or two weeks after the episode and remains positive generally for a matter of a few weeks.
3. LUNGS - In patients with pulmonary embolic disease, the lung scan done with macroaggregated particles (with a range of 10-50 mu) will normally show deficits in perfusion of the lung. In many centers it is believed that the initial investigation of patient with suspected pulmonary embolus should be by chest x-ray and lung scan. If these two examinations are negative, it is highly unlikely that the patient has any significant pulmonary embolic disease. This is one of the examinations which may be necessary on an emergency basis.
4. LIVER - Scanning of the liver can give some estimate of its functional activity as well as morphology, and has a particular value in elucidating enlargement of the liver to confirm or exclude the presence of metastases, hepatic abscess, and other space-occupying lesions. This has been found recently to be a particularly fruitful examination.
5. SPLEEN - Scanning of the spleen can be a very sensitive index of early splenic enlargement. It also serves as an index of splenic activity, particularly when contrasted with the liver activity. A relative increase in splenic uptake may also indicate impaired liver function.
6. BONE - Bone scanning with strontium<sup>85</sup> will reveal any area of increased osteoblastic activity. In effect, this is principally reserved for the diagnosis of metastatic cancer to the skeleton

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and this examination will frequently have a lead time over radiography of up to six months. Numerous examples are known of metastatic disease accompanied by a positive bone scan and a normal radiograph.

7. **KIDNEY** - Renal scanning, particularly including dynamic studies on the Gamma Camera, can be most fruitful in diagnosis of space occupying lesions and in the differentiation of renal tumours from cysts and other avascular lesions.
8. **PANCREAS and PARATHYROIDS** - These widely separated organs each have a slightly increased uptake of methionine compared with surrounding tissues. In suitably prepared patients the pancreas can, therefore, be scanned with methionine which has been labelled with radioactive selenium. Scans of the parathyroids and pancreas are, however, not as valuable in clinical practice as some of the other examinations described.
9. **BLOOD POOL** - This will give a very accurate assessment of the position of the placenta, indeed with greater accuracy and much less radiation dose than with X-ray placentography.

This examination can be life saving in cases of placenta previa and also is of great value in determining placental site for amniocentesis, intrauterine transfusion, etc.

#### Radionuclide Generators:

Many of the above organ scanning techniques have been made possible by the introduction of extremely short-lived radioisotopes. The two most popular are Technetium<sup>99m</sup>, which has a half-life of six hours and Indium<sup>113m</sup>, which has a half-life of 1.65 hours.

The extremely short half-life of these nuclides clearly makes them impractical for production in a central laboratory and shipping over large geographical distances. However, both of these isotopes are daughter products of chemically unrelated parent radioisotopes. These isotopes can thus be shipped in a generator where the parent is adsorbed on a column in an insoluble form whereas the daughter substance is soluble. An elution of this column will remove the short-lived isotope generated. With technetium, elution once a day is practical and the generators last approximately one week. With indium, elution two or three times a day is perfectly possible and the generators last for several months.

With appropriate chemical treatment these nuclides can be made to label many organs (table I). It is of interest that the first technetium generator in Canada (and the second or third in the world) was used in the Victoria General Hospital. Similarly the first indium generator in Canada was used in the Halifax Infirmary. These two hospitals are thus gaining a reputation as a repository of information and expertise concerning these generators.

TABLE I

Organ visualized	Technetium - 99m compound	Indium - 113m compound
Brain	Per technetate	EDTA Chelate
Thyroid	Per technetate	
Lung	Macroaggregated labelled albumin	
Blood Pool	Labelled albumin	Gelatin Colloid
Heart		Gelatin Colloid
Placenta		Gelatin Colloid
Liver	Sulphide	" "
Spleen	Sulphide	" "
Kidney	Iron Complex	EDTA Chelate
Pancreas		Labelled amino acid*
Bone		Gallium carrier*

\*Proposed - under development

#### New Imaging Devices:

The rectilinear scanner was the first effective imaging device for radioisotopes. In recent years a number of other species of equipment have been developed and of these the most important is the gamma camera. This is an array of nineteen sensitive cells behind one large scintillation crystal and by complicated electronics it is possible to display on a cathode ray tube a representation of the spatial arrangement of the scintillations which occurred in the crystal. With appropriate collimation, this means that pictures of organs of good diagnostic quality may be made, in some cases better than can be produced with a rectilinear scanner.

It is found that for full realization of the potentialities of organ scanning it is not possible to rely either on the gamma camera or the rectilinear scanner alone but that both devices have their own part to play.

#### Dynamic Studies:

Radiorenography, as reported by Constable and Pomroy,<sup>2</sup> is an extremely sensitive test of kidney function. It is probably essential to do a renogram in patients with suspicion of renal hypertension.

Further dynamic studies have been developed to demonstrate circulation of the blood in the chambers of the heart, of the urine in the ureters and of the cerebral blood flow. Many of these investigations are becoming of increasing importance.

#### Summary

There has been a rapid development in nuclear medicine in the past six years. At present a wide range of diagnostic procedures are available in Nova Scotia including organ scanning both with the gamma camera and the rectilinear scanner using high photon flux, short half-life radioisotopes. In many cases these procedures provide diagnostic information not otherwise obtainable. In others the information is obtained either with greater ease, or with less discomfort to the patient than with other techniques. □

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# Recent Advances in Ophthalmic Investigation

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In a review article in a field such as Ophthalmology written for non-ophthalmological medical conferees an author must be careful to steer between the twin shoals of being so far in left field that no reader could understand the article and being so simple he is talking down to his presumed audience. We will attempt to follow the better known advances in Ophthalmology over the past few years in a logical topographical fashion as illustrated below: (Fig. 1)

- (a) The use of hand readers and magnifying glasses;
- (b) Projection magnifiers;
- (c) Telescopic lenses;
- (d) Bringing the object nearer to the eyes.

The choice of which device to use has to be worked out in a specialized Low Vision Clinic by a close working team of Ophthalmologist and Optician. Such a Clinic has recently been formed in Halifax under University auspices.

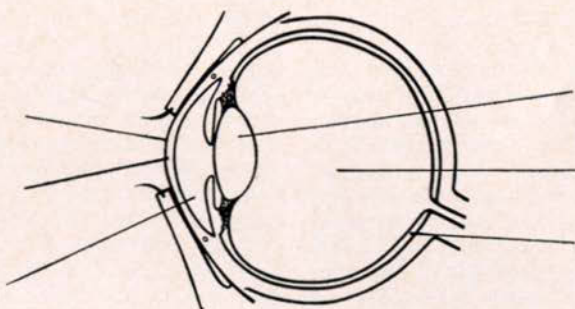
## 1. Low Vision Aids

## 2. Light

## 3. Contact Lenses

## 4. Keratoprosthesis

## 5. Aqueous Humor Dynamics



## 6. Cataracts

## 7. Vitreous

## 8. Retina

## 9. Miscellaneous.

### LOW VISION AIDS:

For the patient whose vision is 20/200 or worse the ophthalmologist may be unable to give a correction to permit the patient to read in the conventional manner. However, due to recent developments<sup>1,2</sup> many patients with as low as 2% vision can be helped to read, but they will have to learn new techniques, using one eye, and a rather unsightly magnifying and illuminating device mounted in a spectacle frame. The general rule is the higher the magnification required the more unwieldy, and unsightly the device. However such devices are preferred if the only other alternative is Braille.

The usual reason for such a device is macular degeneration which robs the retina of its central portion of vision, which is used to distinguish fine detail. The image to be seen must be enlarged sufficiently to fall on the unaffected area of retina surrounding the macula. There are four methods of magnifying the image on the retina:

### LIGHT:

Ophthalmologists and illuminating engineers have had a common interest in artificial lighting but have viewed the hazards quite differently. The illuminating engineer has asserted the more light the better, and he decries low illumination or "inadequate lighting" as being harmful to the eyes. To the Ophthalmologist the diseases supposedly caused by low illumination have not found their way into the medical office. Recently it has been found<sup>3</sup> that only moderate exposure to light causes morphologic changes in the rods and cones. Under ordinary lighting exposure these changes are reversible, but if the light is sufficiently prolonged or sufficiently intense the changes become irreversible and therefore "pathologic". For rodents it has been found that irreversible blindness occurs with exposures to a bank of fluorescent light providing an illumination of 700 to 1000 foot candles for one week. Though the threshold may vary for different species, the effect is

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qualitatively similar for all experimental animals. Until recent times a safe 20 foot candle level was thought to be adequate for reading and this prevails in most public libraries and similar buildings designed a decade ago, but now the recommended illumination has increased to 50 foot candle levels, and some even suggest going into hundreds of foot candles.<sup>4</sup> (out of doors sunlight is 10,000 foot candles). Though we are still safe from irreversible retinal damage by ordinary exposures to light, the margin of safety is narrowing with high intensities of light used for such special purposes as indirect ophthalmoscopy. Since illuminating engineers were cautioning against the hazards of low illumination just a few years ago, it might now seem appropriate for ophthalmologists to caution against the opposite.

#### CONTACT LENSES:

Contact lenses became practical only after the development of the plastic, methyl methacrylate, just prior to World War II. Contact lenses are of two major types, the rather older scleral lens and the more recent corneal lenses. Since scleral lenses were very difficult to fit and worse to wear they fell into relative disuse for a number of years following the introduction of the modern plastic corneal contact lens by Kevin Tuohy in 1948. Tuohy's original lens had a smaller diameter than the visible iris, and the inside or concave surface of the lens was slightly flatter than the longest curvature of the cornea. Without enlarging on details, corneal lenses have been progressively reduced in both diameter and thickness until the present type of lens in wide spread use barely covers the actual area of the pupil. Within the past few years a new principle of measuring corneal curvature at several points has resulted in a "custom fitted" corneal lens fitted to a toric corneal surface. Such custom designed corneal lenses have proven successful in 90 to 95 % of cases fitted and are tolerated during all of the patient's waking hours.

Though the old scleral or haptic lens does not give as good a wearing time as the corneal lens, it can be used in certain conditions where a corneal lens is not applicable. However, recently so-called "flush-fitting" scleral lenses have been used for treatment of certain corneal diseases. The lens is used, not for visual purposes, but as an aid to healing. By means of a mold taken of the diseased cornea an exact duplicate is made of methyl methacrylate, so that a perfect contour fit exists between lens and cornea. This type of lens has been found to be of great use<sup>5</sup> in such conditions as chemical burns of the cornea, chronic corneal ulceration, neuroparalytic keratitis, bullous keratitis, lagophthalmos keratitis, exposure keratitis, pemphigus, Stevens-Johnson disease, and certain corneal dystrophies. Flush-fitting scleral lenses have replaced the use of a conjunctival flap in most of the conditions above.

It is being gradually recognized by physicians and some older ophthalmologists that contact lenses and their fitting is in fact a medical matter, and should

not be left in the hands of technicians without close medical supervision.

#### KERATOPROSTHESIS:

In patients who are blind from corneal disease so severe that a corneal graft is not indicated because it would fail or has already repeatedly failed, there have evolved two new basic procedures: those which try to solve the problem by means of an acrylic implant in the cornea, or keratoprosthesis, and the other group by a new concept to control corneal edema; Dohlman's artificial endothelium.<sup>6</sup>

These procedures, while still experimental, hold out hope for many previously desperate cases. The keratoprosthesis itself is usually a cylinder shaped piece of plastic which is meant to project both in front and behind the level of the cornea, being sutured in the layers of the cornea by an attached skirt of daeron mesh. Because many of these acrylic implants are extruded, one well known investigator in Rome is using Osteo-odonto prosth-kerato-plasty (for the uninitiated this is a central plastic optical cylinder in the middle of a tooth removed from the same patient and sewn into a pocket in the cornea and anchored in place with a layer of buccal mucous membrane). Dr. Dohlman has recently placed a thin transparent silicone rubber membrane sutured to the posterior surface of a penetrating corneal graft, using fine nylon sutures, and this corneal graft is sutured to the recipient cornea in the usual manner. The posterior membrane serves as a fluid barrier, thus preventing corneal edema.

#### AQUEOUS HUMOR DYNAMICS (I.E. GLAUCOMA):

While a good deal of time and money have been expended on glaucoma, the basic problem is to find the glaucoma case before it has progressed too far. Somewhere between five and nine per cent of patients over 45, and especially over 65 years of age are felt to have this disease<sup>7</sup> (which is higher than the incidence of Diabetes Mellitus).

Unfortunately the acute (narrow angle) type of glaucoma which brings the patient to the physician quickly because of severe pain in the eye, blurred vision, and halos around lights affects less than five per cent of the total. The remaining 95% of glaucoma patients have the so-called chronic (wide angle) glaucoma which develops slowly and apparently goes unnoticed until the patient has lost a great deal of his peripheral vision and retinal nerve fibres. Unless these patients have their intraocular tension checked by tonometry, by every physician who professes to do a complete physical examination whether he be general practitioner or internist, a sufficiently high number of these patients is not reached in time. Though the Ophthalmologist has various other means at his disposal to take care of the doubtful case; i.e. electronic tonography to measure the aqueous humor outflow, and applanation tonometry to more accurately check intraocular tension under the biomicroscope, it must be emphasized that glaucoma is now considered by most experts to be a

public health problem and should be picked up by all physicians, not simply specialists in ophthalmology.

#### CATARACTS:

It is felt by some physicians that everyone will get cataracts if he lives long enough, but many of these do not require surgery. This is probably the best known eye problem in aging, and other than trauma in some cases, the etiology is still unknown. When vision drops to a sufficient level (somewhat variable, depending on the occupation of the patient) the only treatment is surgical removal.

Two recent advances in this type of surgery are the enzyme alphachymotrypsin, and the use of cryosurgery.<sup>8</sup> Alphachymotrypsin is an enzyme derived from the exocrine cells of the pancreas and has a specificity for splitting bonds between the tyrosine, tryptophan, methionine, leucine, phenylalanine, and certain other bonds of esters, amides, hydroxyamides, hydrazides, and carbon bonds. It has not been definitely established as to whether the enzyme acts upon the zonule to accomplish complete or partial lysis or disintegration, or by loosening of the zonular attachment to the lens. However, it does allow the lens to be removed very easily without the previous pulling and tugging. There is a danger of post operative glaucoma of a temporary nature.

The cryoextraction of cataract still attracts much attention in ophthalmic literature. By means of a freezing probe attached to the lens a rather large ice ball is formed within the lens which allows the extraction of the cataract without the danger of rupture of its capsule. Complications such as adhesions of the cryoextractor to the iris and cornea have still not been completely resolved.

#### VITREOUS:

It has recently been recognized that the vitreous which normally is attached to the area of the macula, the optic disc, and the peripheral fundus may shrink following degenerative changes with resultant vitreous traction at these points of attachment.<sup>9</sup> This is a common reason for large retinal tears and subsequent retinal detachments.

Surgery on the vitreous itself has become more widespread with development of specialized scissors to cut traction bands or membranes. Though visualization with the indirect ophthalmoscope is preferred, in cases of opacity of the media, the use of ultrasonography has allowed an echogram study of the vitreous cavity. (Useful for differentiating between solid tumors and cysts or simple detachments). While saline injection into the vitreous cavity as an adjunct to retinal detachment surgery is often used in an effort to push the retina back towards the choroid, a search is still continuing for a viscous substance that will be more suitable, since saline does tend to pass through any retinal break and not hold the retina against the choroid during the formation of chorioretinal adhesions. Silicone oil is in widespread current use, but since it is water repellent, has a low specific gravity, and a high refractive index, it has

been suggested that it be replaced by a new substance: glyceryl methacrylate hydrogel.<sup>10</sup> (This is still in the experimental stage).

#### RETINA:

The basic techniques of retinal detachment surgery have now been fairly well established, the purpose being to bring the area of the retinal tear against the posterior choroid and cause it to stick there by artificially caused chorioretinal adhesions. The part that the vitreous plays in this has been discussed above. Much of retinal detachment surgery consists in the rather time consuming and exacting work of forcing the choroid and sclera in towards the centre of the eye so as to bring choroid to the somewhat shortened retina. This is usually accomplished by encircling silicone bands sutured or clipped in place on the sclera.

The use of strong light (i.e. by means of a photo-coagulator) to cause chorioretinal adhesions through the optical system of the eye without surgically having to open the globe, is useful only when the retina is not separated from the choroid by a layer of fluid and/or vitreous. The photocoagulator is also coming into use for cauterizing small blood vessels and/or aneurysms. While the laser has received much more publicity, it is not considered generally as useful since its dose is much harder to control than the photocoagulator, but it does have the advantage of giving a smaller area of burn, which is sometimes required in the region of the macula.<sup>11</sup>

The injection of fluorescein into the ante-eubital vein and observing the emergence of the fluorescein through the blood vessels of the eye has come into increasing use to locate areas of vascular leak or blockage.

#### MISCELLANEOUS:

##### (a) *Steroids in Ophthalmology* -

While I do not intend, in this article, to discuss the pharmacology or toxicology of the eye, it must be emphasized that both systemic and topical use of corticosteroids are increasingly being reported as the cause of ophthalmic complications, including Herpes Simplex Keratitis, various fungal infections, posterior sub-capsular cataract, and glaucoma.<sup>12</sup>

##### (b) *Dyslexia* -

The widespread notion that ocular problems are a major cause of reading disability appears to be mistaken. A recent study of 220 children who had reading difficulties,<sup>13</sup> demonstrated that visual acuity, mixed dominance, heterotropia, and myopia have little or no relationship to reading ability. In the United States apparently one out of four children entering the first grade each year have some difficulty learning to read, and 90 to 99% of the failures in the first and second grades are due to reading difficulties. However it is felt the major responsibility for the treatment of the poor reader remains with the educator, in the field of remedial reading,

with other disciplines such as ophthalmology, psychiatry, pediatrics and social work being ready to help when and if they can. (Neuro-ophthalmology, strabismus, and orbital conditions have been omitted from this review due to limitations of space). □

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# Recent Advances in the Investigation of Psychiatric Disorder

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For many years investigation in psychiatry has been hampered by an unsatisfactory classification. Kraepelin's first crude separations of symptom clusters have been elevated into nosological entities. It would be fair to say that the state of classification in psychiatry is at the stage that classification in Internal Medicine was at the beginning of the nineteenth century. An example of this would be to say that the diagnosis of schizophrenia is in many ways comparable to a diagnosis of dropsy made in the beginning of the nineteenth century. It was only the rise of new techniques of investigation such as the sphygmomanometer that enabled separations to be made of the different pathological conditions which could give rise to dropsy.

Bannister, 1968<sup>1</sup> has given an admirable critique of schizophrenia as a diagnostic entity, pointing out that it is a term used in a disjunctive way. The result, two patients who have no common feature can both have the same diagnostic label. For many years psychologists working in clinical settings have been devising tests which show correlation with clinical diagnosis. It is not surprising that the Rorschach test for example, has been a subject of so much confusion, and heated, acrimonious discussions since the psychologists were attempting to match the findings found in their projective technique with such clinical diagnoses as hysteria, "organicity", and schizophrenia, when such diagnoses themselves differed so widely among the different psychiatrists who were making them.

This paper will attempt to delineate some of the major avenues which have been used recently to attempt to develop some objective criteria with which to evaluate emotional disorders. Two major areas will be discussed as these illustrate the sorts of problems which are met. The particular areas chosen are at the "growing edge" of psychiatry. It should be emphasized that the methods reviewed are mostly used for research investigations and are not generally applied in clinical situations.

## Investigation of

### Thought Disorder in Schizophrenia

An example of the approach in experimental clinical psychology is the attempt to elucidate one parameter of a condition such as the disturbance of

symbolization said to characterize schizophrenia. One term coined by N. S. Cameron<sup>2,3</sup> to describe this type of thinking is "over-inclusive". This implies that the essential failure is in discriminating the boundaries between concepts. Cameron suggested that this type of thinking was quite different from the concrete thinking of the brain-damaged patient.

Attempts have been made to measure this, as for example *Lovibond's Object Sorting Test*.<sup>4</sup> In this test approximately thirty common objects are assembled on a tray. The subject is asked to pick one up and then to pick up others that go with it. For example, cigarette and matches, or fork and knife. Subjects with over-inclusive thinking pick up a larger than usual number of objects. This can be scored numerically. Unfortunately, while there are obvious clinical differences between brain-damaged patients and patients with a schizophrenic thought disorder a simple numerical score does not differentiate between the two. Recourse has to be made through a supplemental score in which the examiner attempts to rate the bizarreness of the groupings.

Payne and his colleagues working at Queen's University have also studied this problem extensively. Payne and Hewlett<sup>5</sup> also applied tests of over-inclusiveness to a group of schizophrenic subjects. They found that only the over-inclusive factor successfully differentiated schizophrenics from all other groups. However, it was also apparent that over-inclusive thinking is by no means characteristic of all schizophrenic patients. Further inspection of the data indicated that roughly half the schizophrenic group were abnormally over-inclusive in their thinking while the remainder were characterized by an abnormal degree of retardation. Retardation as measured by a battery of motor speed tests was common to the depressive group and to the fifty percent of the schizophrenic group who were not over-inclusive in their thinking. These findings suggested to Payne a two factor theory of schizophrenic thought disorder, one form being due to abnormally over-inclusive thinking and the other to a slowing down of the thinking process. Later Payne went on to explore further the significance of over-inclusive thinking using a small battery of three tests which yielded a combined score representing the degree of over-

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inclusive thinking present. A subsequent investigation by Payne et al<sup>6</sup> indicated that over-inclusive thinking was not a characteristic of a group of chronic deteriorated patients but was more typical of the acute stage of schizophrenia. Subsequent studies, including those of McGhie and Hawks<sup>8</sup>, and of Gathercole<sup>9</sup> have thrown some doubt on the validity of Payne's concept of over-inclusive thinking. Hawks for example found no significant inter-correlation among the three tests making up the battery and concluded that it was very doubtful that the tests were measuring the same factor.

It will be apparent from the introductory remarks that the hope of a clinical psychologist conducting these investigations was to measure a definitive variable in psychiatric illness. If successful, such attempts would lead to a re-definition of psychiatric illness as to whether or not this characteristic is present and aid in further study and evaluation and research in possible etiological factors.

An entirely different approach to the measurement of thought disorder in schizophrenia has been taken by Bannister<sup>10</sup> who has applied the *Repertory Grid Technique*. This technique was devised by Kelly<sup>11</sup> to assess normal personality. It is difficult to do justice to this interesting development in a short space. However, the technique is a sorting technique which attempts to measure statistically relationships between conceptual constructs. A construct according to Kelly is built up by an individual during the course of his development and determines his cognitive attitudes to his environment and his reactions to new situations. The technique is relatively simple. The person who is to be tested is asked to make a list of persons who he knows. He is then given a list of constructs, these might include such concepts as "religious, sincere, aggressive, affectionate". He is then asked to indicate on a special score sheet whether these constructs apply or not to each of the people that he has listed. The statistical work on the test is however quite complicated. It consists of finding correlations between the different constructs used; that is if it is possible to determine from a person's answers whether there is any relationship between the different constructs employed, for example, if there is a relationship between aggressive and sexually attractive, if these were two of the concepts used. Bannister was able to show that schizophrenic patients who manifested thought disorder clinically, showed loosening of their construct relationships, that is that consistent patterns of relationship between different constructs was broken down. In later work, Bannister<sup>12</sup> indicates that thought disorder in schizophrenic patients operates at a near normal level in terms of consistency of conceptual structure in dealing with objects and that their thought disorder is more in evidence when they think about people. Other reference will be made to Repertory Grid Technique when we discuss attempts to measure objectively personality

and personality change. From this brief account it would be possible to see that experimental measurement of thought disorder has not yet reached the stage of clinical usefulness.

### Objective Assessment of Personality

The assessment of personality functioning is one of the most important aspects of psychiatric investigation. Personality functioning not only affects prognosis but also affects the way in which symptoms will be presented and is a whole key to successful treatment, particularly indicating whether psychotherapy is likely to be useful or not. The basic tool of assessment of personality in psychiatry has been traditionally the interview technique. Here, as described by Harry Stack Sullivan<sup>13</sup>, a psychiatrist is a participant observer and much of his data as to personality functioning derives from the pattern of interaction which the patient sets up with him. However, it is very difficult to substantiate that there is any very general agreement between different psychiatrists. This discrepancy is even more pronounced, and comparison between different papers is difficult, because of a lack of any generally accepted personality theory or description which is acceptable to all psychiatrists. Further, changes in personality taking place as a result of psychotherapy or concomitant with psychotherapy have been frequently described in terms of a particular psychodynamic theory which the author holds. This again has made it very difficult to compare one person's results with another's.

Two approaches to this problem of personality measurement seem to the present reviewer to hold a reasonable promise of eventually yielding some objective method of personality assessment. The first approach I wish to discuss is the *factor analytic approach to personality measurement*, particularly that of Catell<sup>14</sup>. Catell's approach is that one must first find out by experimental and statistical methods what the natural boundaries of the functional unities in personality may be. The essence of factor analysis is that one inter-correlates over a sufficient sample of people a large variety of behavior manifestations. Then by examination of the correlation patterns the psychometrist discovers how many independent functional entities are necessary to account for the observed co-variation among the manifold manifestations. The number of independent variables which are necessary to account for the behavioral variations are called by Catell "*source-traits*." From these studies he has devised the *Sixteen Personality Factor Questionnaire* (Catell and Eber).<sup>15</sup> However, as yet, work on changes of personality with psychotherapy, using such tests is not extensive, although some reports are in the literature (Ewing et al<sup>16</sup>). The subject is well reviewed by Catell<sup>17</sup>.

The *repertory grid technique* can also be used to measure change in personality under therapy and is a very useful tool in research although as yet it has little application in clinical psychiatry as a computer

is needed to score it effectively. Basically it is possible to show reliable change taking place in a person, in the relationship between his constructs, using a single patient.

### Summary and Conclusions

In this brief paper an attempt has been made to pick up some of the highlights of current research techniques in investigation in psychiatry. Focus has been made on those techniques which attempt to elucidate and measure clinical entities rather than those which attempt more basic biological and physiological research. While the results reported above are scanty it is to be hoped that such investigation if continued may yield a more workable grouping of psychiatric disorder, based more soundly than the present descriptive groupings of illness. □

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# Percutaneous Transhepatic Cholangiography

D. E. MORRIS, B.Sc., M.D., F.R.C.S.(C.)

Halifax, N. S.

In the presence of jaundice, oral and intravenous cholangiograms usually do not demonstrate the hepatic and common ducts. Laboratory studies are often equivocal and it is difficult or impossible to differentiate between hepato-cellular disease and ductal obstruction. The problem of drug induced cholestatic jaundice is encountered with increasing frequency and the usual laboratory tests have an obstructive pattern. In these cases the *Percutaneous Transhepatic Cholangiogram* may be helpful. Twenty-five percutaneous cholangiograms have been performed during the past four years and these form the basis of the present report.

## Selection of Cases

The procedure is helpful when the cause of jaundice is not clear. It is also often helpful in cases of obstructive jaundice when demonstration of the exact site and nature of the obstruction prior to surgery may make the operative procedure easier. If ductal obstruction is found operation should be performed on the same day in order to decrease the risk of complications. It is therefore necessary that the patient be prepared for surgery before performing the procedure. This includes having the patient in optimal general condition, the prothrombin time normal or close to normal (over seventy percent), and cross-matched blood available.

## COMPLICATIONS

There have been no complications in this series of cases. Bleeding and leakage of bile from the liver have been reported by others. Pneumothorax and septicemia have also been rare complications. No reactions to the radiopaque dye have been reported. Because of the possibility that these complications may occur it is recommended that surgery be performed on the same day when extra-hepatic obstruction is found. The patient is given Vitamin K and a broad spectrum antibiotic before attempting the cholangiogram.

## Technique

If the patient is co-operative the procedure can be performed under premedication and local anaesthesia with very little discomfort. The best results are obtained by doing the procedure in the X-ray Department using the fluoroscope and image intensifier, but many of ours have been done successfully without this aid either in the X-ray Department or

in the Operating Room. Strict sterile technique is necessary. The patient is supine with the film centered under the costal margin at the mid-clavicular line. Various sites have been chosen for introducing the needle but there is probably little advantage in one over the other. We usually choose a point just under the costal margin about two centimetres to the right of the xiphi-sternum. The liver edge is palpated and the degree of enlargement determines to some extent the vertical angle of the needle. Percussion of the liver is also helpful in this regard. Local anaesthesia is infiltrated at this point through all layers of the abdominal wall including the parietal peritoneum and the capsule of the liver which can be felt as a definite increase in resistance to the passage of the needle. A six inch No. 21-gauge lumbar puncture needle is introduced through the abdominal wall and into the liver towards the area of the porta-hepatis. The patient holds his breath while the needle is being introduced quickly to its full length. (unless the patient is exceptionally thin or is a child in which case the needle is introduced to a depth which would approximate the middle of the liver). The trocar is then removed from the needle and a 10 c.c. syringe containing 5c.c. of saline is attached. The needle is very slowly withdrawn keeping a slight negative pressure on the syringe. Small amounts of saline are injected frequently to be sure that the needle does not become plugged. If blood is withdrawn the needle is retracted until the flow of blood ceases and the syringe is cleaned and filled with fresh saline. The slow withdrawal of the needle is then continued until it is close to the surface of the liver and if no bile has been aspirated the needle is quickly removed while the patient again holds his breath and is reinserted at a slightly different angle. Unfortunately it is much easier to aspirate blood than bile. When bile is obtained the needle is anchored by placing a straight hemostat on it, flush with the skin, and having this held by an assistant. A 30 c.c. syringe containing 20 c.c. of *Cholografin* (Iodipamine Meglumine-Squibb) is attached to the needle by means of a short length of plastic tubing which has also been filled with the contrast medium. Before doing this as much bile as possible is aspirated from the liver. Some of this is saved for culture and sensitivity tests. If the fluoro-

\*From the Departments of Surgery, Dalhousie University and the Halifax Infirmary, Halifax, Nova Scotia.



scope is being used a small amount of dye can be injected and its course can be followed on the television monitor to be sure that it is within a duct. If this is not available then bile is aspirated after introducing each 5 c.c. of dye to be sure that the needle is still properly placed. An X-ray can be taken after an injection of 10 c.c. of dye to show proper placement and this will usually indicate enlargement of the ducts. The remainder of the dye is then injected in order to fill the entire duct system. If an extrahepatic ductal obstruction has been demonstrated the needle can be removed and further X-rays can be taken with the patient in various positions to obtain further detail. Since surgery will be performed within a few hours it is not necessary to aspirate the dye and bile following the procedure. If there is no obstruction or dilatation of the ducts demonstrated, or if the obstruction is intrahepatic and considered to be inoperable, then the dye and as much bile as possible should be aspirated before removing the needle. It may be helpful to attempt to introduce a polyethylene catheter into the duct which may be left. The use of a plastic catheter, introduced over a needle, instead of a lumbar puncture needle has been advocated by some as being advantageous but we

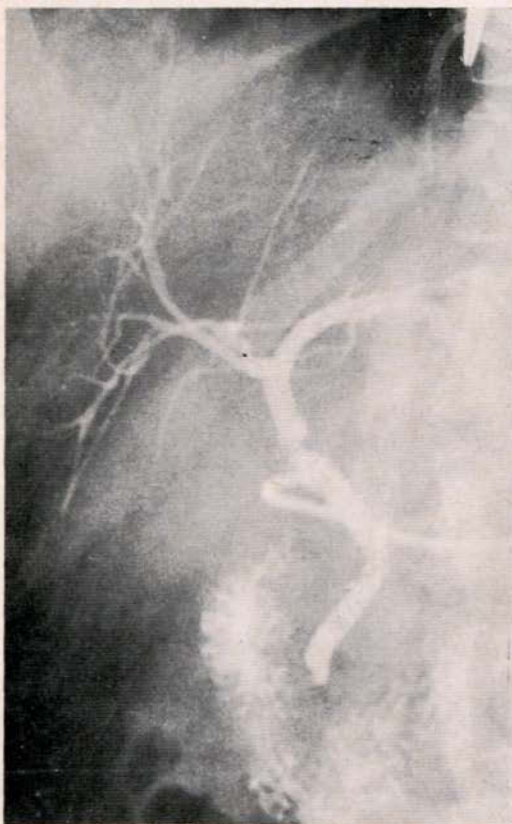


Fig. 1 T-tube cholangiogram showing normal ducts

have had no experience with this method. If obstruction has been complete for some time only a cloudy white or clear fluid (white bile) may be aspirated instead of bile. This must be watched for carefully or it will not be noticed. If four attempts to enter a bile duct, with the needle entering in different directions, are unsuccessful then the procedure is abandoned. If operation does not follow then the patient is watched carefully for forty-eight hours for evidence of bleeding or peritonitis.

#### Results

If there is no obstruction of the major bile ducts, and therefore no dilatation, then it is usually not possible to aspirate bile from the liver. It is sometimes possible to inject a small amount of dye into normal ducts with the help of the fluoroscope and image-intensifier. It was hoped in the beginning that it would be possible to enter a dilated duct in the liver in all cases of obstruction and that the inability to enter a bile duct would indicate with certainty that the jaundice was not obstructive in origin. Although this is usually the case there have been a few unsuccessful attempts in patients who were later proven to have obstructive jaundice. This has been the finding in all reported series to date.

In this series of cases there were fifteen cases of obstructive jaundice. In three of these attempts to perform a percutaneous cholangiogram were unsuccessful. It was only possible to visualize the ducts in one case of non-obstructive jaundice and this was with the aid of the fluoroscope and image-intensifier.

#### CASE REPORTS

1. **Mr. G. M.** - 63 yrs., was admitted to the medical service with a three month history of general malaise, weight loss and increasing painless jaundice. There was a history of "hepatitis" six years prior to admission. Liver function tests were of a mixed hepato-cellular and obstructive type. The percutaneous cholangiogram shows marked dilatation of the ducts within the liver but the common duct is not well visualized. (Fig. 2) On close inspection a round defect can be seen at the lower end of the common duct. At operation the gall bladder was contracted and thickened, the common duct was dilated and the pancreas was enlarged and firm. The stone could not be palpated. On opening the common duct it was found to be filled with a thick organized material which could be lifted out in one piece in much the same way that an organized thrombus might be removed from a vein. The stone could not be moved from above and it was necessary to open the duodenum. A sphincterotomy was done and a large stone was removed. T-Tube cholangiogram then showed a free flow of bile into the duodenum. The common duct was not well visualized because of the unusual nature of its contents which did not allow the dye to permeate freely.

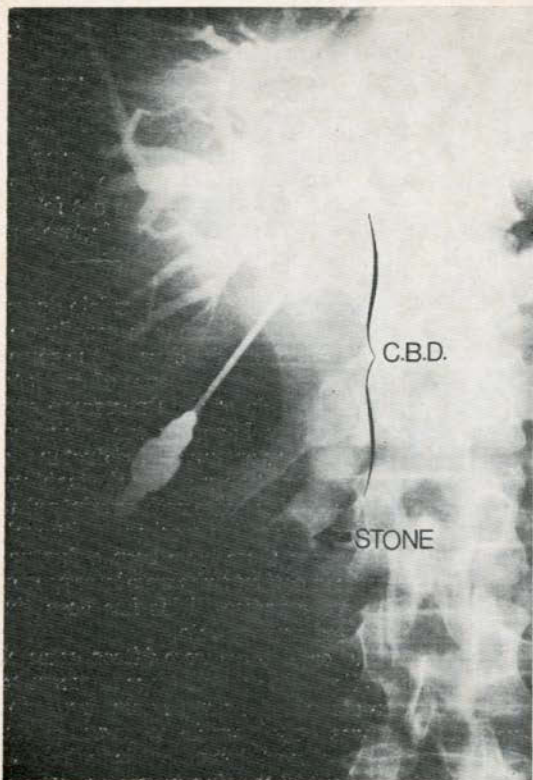
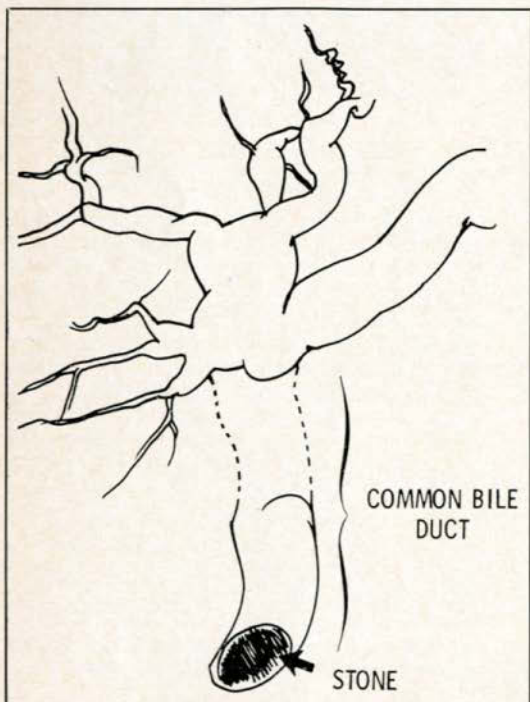


Fig. 2 Case No. 1 The common duct is poorly outlined due to inspissated material in the duct



2. Mr. C. M. - 45 yrs., developed jaundice shortly after a gastrectomy several years prior to this admission. Several attempts had been made to relieve his jaundice by means of cholecystoduodenostomy and cholecystojejunostomy but jaundice had recurred following each procedure. The last procedure was described as being very difficult due to dense adhesions. On admission he was deeply jaundiced and had recurrent attacks of chills and fever associated with pain. The percutaneous cholangiogram shows marked dilatation of the biliary system. (Fig. 3) Four large stones can be seen in the common duct and a small amount of dye can be seen entering the duodenum from the lower end of the common duct. There is no evidence that any of the previous attempts at by-pass using the gall bladder are functioning. This information allowed us, at operation, to dissect out the

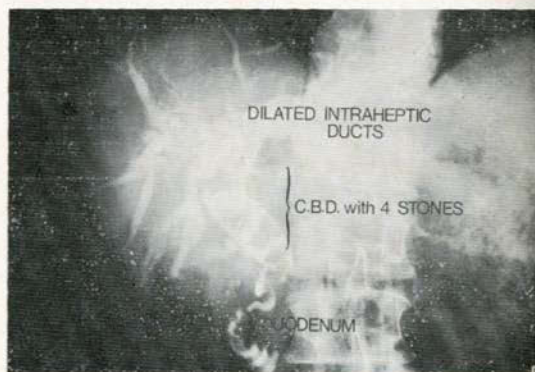
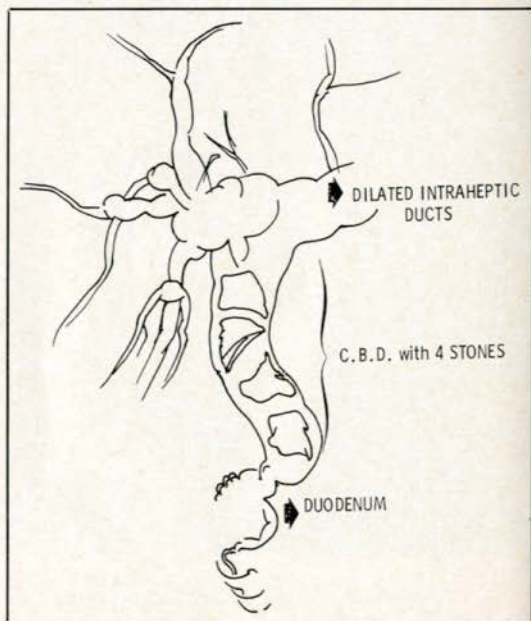


Fig. 3 Case No. 2 A small trickle of dye goes into the duodenum



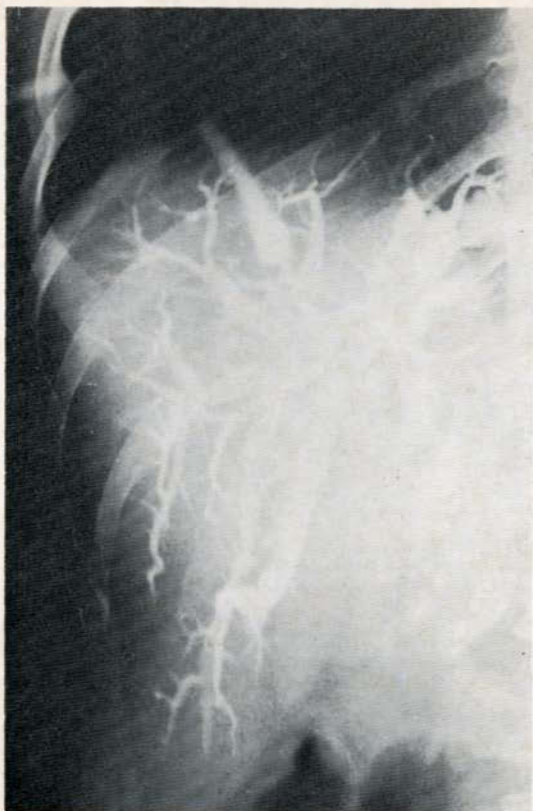


Fig. 4. Case No. 4. Shows good retrograde filling of intrahepatic ducts suggesting obstruction of the common duct.

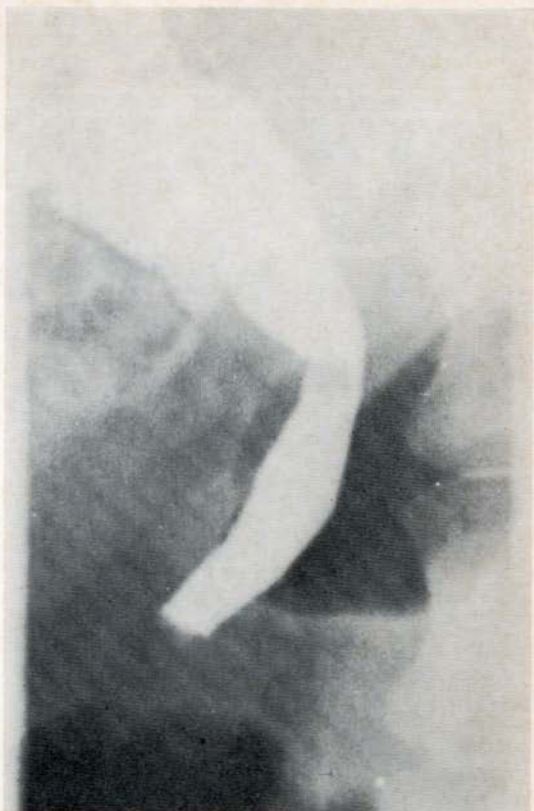
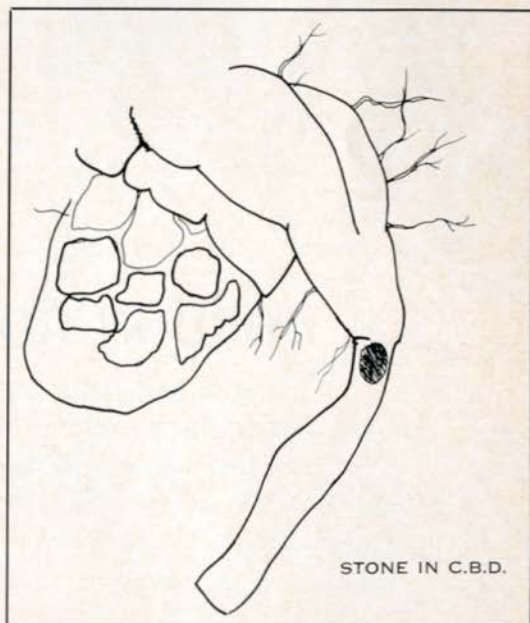
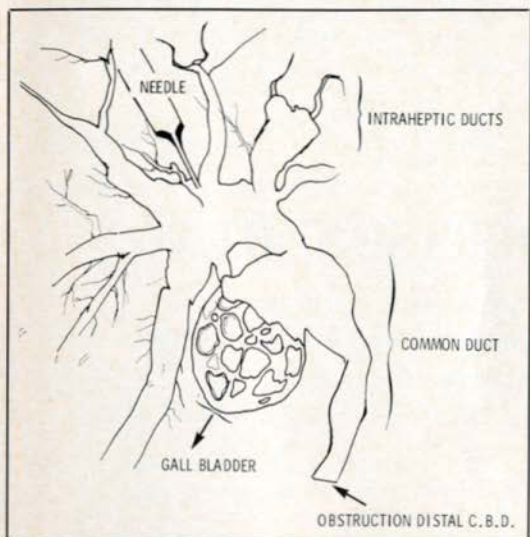


Fig. 5. Case No. 4. Magnified detail of cholangiogram in Fig. 4. Showing stone in the common duct. The stone moved freely in the duct but the lower obstruction remained complete. An impacted stone was removed by duodenotomy and sphincterotomy.



gall bladder and take down the previous anastomoses without fear of destroying his only bile pathway. We were then able to follow the gall bladder down with some difficulty until we could palpate four stones and were thus able to identify the common bile duct. The stones were removed and a choledochojejunostomy was done. He has now been free of jaundice for several years in spite of fairly severe liver damage due to biliary cirrhosis. This was a very difficult dissection because of the many previous operations and it would probably not have been successful without the help provided by the percutaneous cholangiogram.

3. **Mr. R. M. - 19 yrs.**, developed jaundice following the use of Chlorpromazine. Since most cases of drug induced cholestatic jaundice resolve in a short time after withdrawal of the drug it was felt that obstructive jaundice would have to be ruled out in this patient after his jaundice had persisted without change for four months. His liver function tests showed an obstructive pattern. A percutaneous cholangiogram was attempted but no bile could be aspirated. It was possible to inject a small amount of dye into a very small intrahepatic duct with the help of the fluoroscope and image-intensifier. There was no dilatation of the ducts. When the jaundice had been present for six months and showed no signs of subsiding a laparotomy was done which confirmed the diagnosis of drug-induced cholestatic jaundice with no evidence of extra-hepatic obstruction.

4. **Mrs. R. T. - 29 yrs.**, was admitted to Hospital with a diagnosis of hepatitis. Jaundice had been present for one week with some abdominal pain and nausea. Liver function tests were not helpful. Jaundice persisted with no abdominal pain or tenderness. A percutaneous cholangiogram was done with the help of the fluoroscope and image intensifier. (Figs. 4 and 5). There is marked dilatation of the intrahepatic and extrahepatic ducts with complete obstruction at the lower end of the common duct. No dye went into the duodenum. A stone can be seen in the common duct in one film. This

stone was moving up and down and then disappeared, presumably into the gall bladder. The large gall bladder can be seen filled with stones.

#### Discussion

Although this procedure was described almost thirty years ago it has not been widely used and it is only within the past ten years that its usefulness has been recognized. The diagnosis in a case presenting with jaundice can usually be made on the basis of the history, physical examination and liver function tests. However it is not unusual for these findings to be equivocal and the diagnosis to be in doubt. In such cases the percutaneous transhepatic cholangiogram can sometimes be helpful. Although an unsuccessful attempt does not necessarily mean that the jaundice is non-obstructive it does add some further weight to this diagnosis and the patient can often be observed for a further period of time. The procedure is particularly useful in cases of stricture by clarifying the exact anatomy so that the operation can be planned in advance. With further experience it should be possible to clarify the cause of jaundice with more accuracy. Many of our cholangiograms were done using polaroid film in order to save time. These films are adequate for diagnostic purposes but unfortunately they can not be reproduced by photography. We have therefore not been able to include some of our more interesting cases. □

#### APPRECIATION

To Mrs. Carol Forgeron for typing, Mr. William Coughran—Photography Department, Halifax Infirmary, and Audio-Visual Department, Dalhousie University for line drawings and printing.

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## F. GORDON ROBERTSON, C.L.U.

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# MEDICAL-LEGAL ENQUIRIES

IAN MAXWELL, M.B., Ch.B.

## WHEN TO TURN OFF THE RESPIRATOR

"Thou shalt not kill; but needst not strive  
Officiously to keep alive."

(The Latest Decalogue)

**Q.:** *What is the legal position of a doctor who turns off a respirator on a non-breathing patient whose heart is still beating?*

**A.:** This depends on a great many factors. A victim of poliomyelitis may be unable to breathe, supported only by artificial respiration, yet be mentally alert. To discontinue willfully such support would be murder. On the other hand, often there comes a time when it is in the interests of a dying person to discontinue heroic methods of preservation of what has become a meaningless "life".

New medical techniques for prolonging life are forcing both the legal and medical professions to re-examine their traditional attitudes in the case of the comatose patient with absent brain waves who, according to best clinical judgement, has virtually no chance of recovering. What should the doctor do? How much weight should he give to the wishes of the family, to their financial condition, to best uses of hospital equipment, and to the consideration that he should be giving his time rather to patients with a better chance of recovery?

If these cases have disturbing ethical implications, how much more problematic is the case of the doomed patient who still shows brain activity or even a degree of consciousness; are we now discussing "therapeutic euthanasia"? It is indisputably clear that acting with intention to terminate life is murder, regardless of one's motives, no matter how merciful. There is, however, a fundamental distinction in Law between acting and omitting to act. Cessation of therapy in a patient with a reasonable chance of recovery, although it might give rise to suit for negligence—even criminal negligence—could seldom be considered an act of murder. Not all omissions are illegal, however, and it is very questionable whether failure to prolong life unreasonably would ever be judged negligence; there is no case on record of such a judgement having been handed down.

The decision to discontinue resuscitative measures must be purely a medical one and pro-

viding the doctor acts on medical grounds, in consultation with one or more colleagues, he will not be harassed either by the Law or by Moral Theologians. Pope Pius XII, discussing this very problem, stated that if the physician thinks there is no hope of life being prolonged without extraordinary means, and if the family agrees, he can stop the respirator with a clear conscience.<sup>1</sup> Stopping the respirator does not, according to His Holiness, cause death; death results from the disease or injury which is giving rise to the respiratory paralysis. Again, in the House of Commons of Great Britain in March, 1968, the Minister of Health stated, "No attempt should be made to lay down . . . rules which doctors should observe in reaching what must be a clinical decision."<sup>2</sup>

In deciding when a life is "meaningless" the question arises "meaningless" to whom? There is a danger that relatives may put pressure on the doctor for reasons which are not completely unselfish or in the best interests of the patient, and these he is wise to resist if he is to retain his integrity. It is also fundamental that the decision be made in the interests of the dying patient and not that the doctor is looking for a kidney, heart, liver or other spare part.

It is becoming generally agreed that medical ethics demand that transplant teams should disassociate themselves completely from any decisions concerning which case can be considered hopeless. This principle of complete separation of attending physicians and transplant surgeons was recently stressed by the World Medical Association. In their Statement on Death, adopted August, 1968,<sup>3</sup> they stress this separation as follows:

"If transplantation of an organ is involved. . . the physician determining the moment of death should in no way be immediately concerned with the performance of the transplantation."

Notwithstanding the foregoing, there is no obligation to preserve a patient's life merely because it is medically possible to do so, and it is proper for the doctor, the relatives and the religious advisor to ask themselves whether rather than prolonging life, they are merely prolonging the dying process. Dean Whitlow<sup>4</sup> has put the matter very clearly,

"Many of the mechanical procedures now in use ought perhaps to be regarded in their proper nature as temporary. Their normal function is to win time for the restorative measures to take effect. If, after they have been given a fair trial according to the circumstances of the case, it becomes evident that the patient can never be restored to functioning on his own, it may be said that the mechanical procedures have failed in their purpose. All they are doing is keeping the patient in a condition of artificially arrested death, and they should, therefore, be discontinued."

In summary then, medical advances are now posing problems which the doctor of yesterday seldom needed to consider. Nowadays, by the use of artificially aided respiration and circulation it is possible to maintain the dying in a state of suspended animation for weeks or months, and the time may come when one may question whether efforts to prolong life are still proper, and whether they should not rather be discontinued. The decision is a grave one for all of us, and no one will take it lightly. We shall find it slightly less onerous if those caring for such patients, that is the doctor, the relatives and their minister of religion, satisfied in their consciences that they have no ulterior motives, recognize their efforts as prolonging the act of dying rather than prolonging life.

In such a situation there does not appear to be any contravention of the law.

I.M.

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## 1969 CAMSI Drug Appeal

Each year, as one of its national projects, the **Canadian Association of Medical Students and Internes (CAMSI)** undertakes to send a shipment of drugs to an underdeveloped part of the world. These drugs are acquired from Pharmaceutical companies and private physicians who donate their surplus supplies. This year they are again asking the doctors of Nova Scotia to contribute to this project by sending any useful extra drugs and samples, prepaid, before February First, 1969, to the following address:

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# Cephalopelvic Disproportion\*

Reprinted from the Canadian Medical Association Journal Vol 94, P. 26, May 21, 1966

A 37-year-old married white woman was pregnant for the second time and her expected date of confinement was July 15, 1961. She had poliomyelitis as a child which resulted in weakness of the right arm. She had had epilepsy since childhood, controlled with  $1\frac{1}{2}$  grains of diphenylhydantoin sodium (Dilantin Sodium), three times daily.

A classical Cesarean section had been performed in 1959 for cephalopelvic disproportion.

The patient's prenatal course was uneventful until May 15, 1961, when she was 32 weeks pregnant, at which time she experienced sudden sharp abdominal pain and felt faint. A physician saw her at home 10 minutes after the onset of the abdominal pain and at this time the radial pulse was not palpable; the systolic blood pressure was 40 mm. Hg; the abdomen was tender; the uterus was boggy; and the fetal heart sounds could not be heard. There was no vaginal bleeding. The patient was given  $\frac{1}{4}$  grain of morphine subcutaneously and she was immediately transferred to hospital by ambulance.

On admission, the patient was in profound shock and immediate resuscitative measures were instituted. A venous cutdown using dextran (Dextraven) was established in the right ankle. Blood transfusion was begun one-half hour after her admission. Shortly after admission, she was seen by a consultant, who considered that her condition was too poor for surgery and that the shock should be treated before a laparotomy was performed. The patient received 1500 c.c. of dextran and 2500 c.c. of whole blood over a three-hour period. During this time there was no clinical improvement, and she died three hours after admission to hospital. No laboratory work had been done during her three hours in hospital.

A complete autopsy was performed. *The abdominal cavity contained several litres of blood and blood clot.* The intraperitoneal hemorrhage had originated from a 5.25-cm. tear in the upper end of the classical Cesarean section scar. A finger could be inserted into the uterine cavity through this opening. The fetal membranes had not ruptured. The uterus contained a normal female infant which presented as a vertex and was of a size consistent with a 30-week pregnancy. The placenta was firmly attached to the left lateral wall of the uterus and showed no signs of premature separation. The

liquor amnii was normal and did not contain any blood.

## Decision of Committee on Maternal Welfare

After a review of the case, the Provincial Committee on Maternal Welfare concluded that this was a preventable maternal death. The preventable professional factors can be summarized as follows. A low transverse Cesarean section should have been performed for cephalopelvic disproportion two years earlier. Furthermore, poor judgment was reflected in the decision that the patient's general condition would improve with intravenous dextran and blood transfusion before a laparotomy was performed to control the rapid massive intraperitoneal bleeding. This maternal death was "ideally preventable" under the terms of reference of the Provincial Maternal Welfare Committee and there is no implication of negligence.

## Discussion

The sudden onset of severe abdominal pain and the development of shock in 10 to 15 minutes implies serious pathology. In a pregnant woman beyond the sixth month of pregnancy who has had a previous Cesarean section, this sequence of events means a ruptured uterus until it can be proved otherwise. This maternal death again demonstrates the dramatic events that supervene when a classical Cesarean section scar ruptures in the course of a subsequent pregnancy. The rupture of a classical Cesarean section scar seldom occurs during labour but characteristically takes place in the seventh or eighth month of pregnancy when the uterus is accommodating itself to the rapidly growing fetus. Such a rupture is dramatic and complete, and usually occurs without warning either to the patient or to the attending physician.

Opiates are valuable for the relief of pain and anxiety, but they should not be used in a shocked pregnant patient. They cause the vital signs to become further depressed and interfere with the clinical evaluation of the patient.

It became apparent early in this patient's hospital course that it was impossible to correct the hypovolemic shock quickly. As soon as intravenous routes were established, immediate laparotomy was indicated in order to arrest hemorrhage from the dehiscence of the classical Cesarean section scar.

(continued on page 204)

\*This series of articles arranged by an editorial subcommittee of the C.M.A. Committee on Maternal Welfare, and originally published in the Canadian Medical Association Journal, is being reproduced in the Bulletin at the request of the Medical Society of N. S. Committee on Maternal and Perinatal Health, by kind permission of the Editor of the Canadian Medical Association Journal.

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**Parenteral route —** 25 to 100 mg per day by deep I.M. injection.

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**Contra-indication:** sensitivity to antihistamines.

**Tolerance and precautions:** generally well tolerated. If drowsiness is encountered, diurnal dosage may be reduced or amphetamine associated. Should drowsiness persist, the patient must be told not to drive a car or operate machinery. Dizziness is rarely seen but if it does occur dosage may need to be reduced. On resuming treatment after interruption, dosage must be redetermined commencing with low doses.

**Overdosage — symptoms:** hyperkinesia, agitation, delirium, hypertension or symptoms similar to that of barbiturate poisoning, depression, coma; **treatment:** no specific antidote; centrally acting emetics will not help because of the antiemetic effect of the drug. Gastric lavage, artificial respiration, oxygen, analeptics.

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# A Great Physician

By Eileen Chapman

When I saw him standing there in sneakers, work shirt and garden jeans, it hazily crossed my mind that a maintenance worker had entered the room to attend to one or another of his varied duties—and then the quiet, cultured voice leaned towards me and spoke, "How are you feeling?"

Aroused from my lethargy, I realized it was the usually trim, white-coated man, very much out of character in running shoes, but out of character in this aspect only.

It was one of the rare June evenings in which the Medical Superintendent had found an hour before dusk to work in his garden. When he was called to the telephone he could have instructed one of his assistants, for he had already worked a ten hour day—but he didn't.

This compassionate devotion to the service to which his life was dedicated, and his profound depth of understanding of the physical and emotional struggles of the tuberculosis patient, made Dr. Charles Beckwith an unforgettable character to

scores of patients of the former Halifax Tuberculosis Hospital.

His contribution to the warfare against tuberculosis in Nova Scotia and the skill with which he superintended the hospital, are well known.

Rumours of the midnight oil burning in his office often reached the patient's ears. Rumours of greener hills far away, to which he turned a deaf ear, and the amazing revelation that monetary reward was placed secondary to the pursuit of his goal—the eradication of tuberculosis in Nova Scotia, demonstrated the character which made him one of Nova Scotia's best loved physicians.

It was with pleasure, but not surprise, that his former patients learned of the honorary Doctor of Laws degree conferred upon him by Dalhousie University, in September of this year, shortly after his retirement from his most recent duties as executive secretary of The Medical Society of Nova Scotia.

May he now enjoy in his retirement, the luxury of leisure, which for so many years he sacrificed, that others might live more abundantly. □

## Mercy Flights Deputy Minister's Warning

In a letter recently circulated to all Nova Scotia physicians, Dr. J. S. Robertson, Deputy Minister of Health, warned that mercy flights by the Air-Sea Rescue Service might have to be withdrawn unless the medical profession learns to use the service properly.

He said "In connection with this important life-saving service, I would like to emphasise that Air-Sea Rescue can only accept responsibility for **transportation** when it is not available from other sources. Hospital accommodation, history, record of drugs given, must be the responsibility of others; i.e., the physician sending in the case.

I cannot over-emphasise the importance of:

1. the referring physician ensuring that a bed is available in the hospital to which the patient is being sent. This means **direct contact with the hospital administration**;
2. the referring physician being able to establish the **need** for a mercy flight and that no other suitable means of transport is available. Air-Sea Rescue are only authorized to provide transport if no other means of transport is available;
3. the importance of a written history pro-

vided by the physician to accompany the patient. Patients have been sent in to hospital unconscious with no history and no accompanying relative;

4. a written note on medication given;
5. the importance of permission for operation in the case of a child unaccompanied by parents. A recent case from New Brunswick had to be delayed for hours while permission was sought by telephone.

I would again emphasise—the Air-Sea Rescue people provide **transportation only**—all other arrangements, hospital bed, history, record of medication, permission for operation, etc., must be arranged before the flight and are the responsibility of the referring physician as with any other patient.

It was noted that criticism had been directed against the service unfairly because referring doctors had not followed these steps. In view of the present acute bed shortage in certain areas, it was especially important that advance arrangements for admission be made by the referring doctor with the hospital to which the patient was being referred.

All physicians in Nova Scotia are asked to cooperate in ensuring the maintenance of this important public service. □

# Flash Page

## TO ALL PHYSICIANS:

### Re: PREGNANT Rh NEGATIVE PATIENTS

The Rh Immune Serum Globulin is now available for use in Nova Scotia. It is supplied in phials of 1 ml. to be injected intra-muscularly.

The criteria, as determined by the Rh Committee, are as follows:

- 1.) Rh negative gravida married to an Rh positive husband.
  - 2.) Rh positive baby who is Coomb's negative.
  - 3.) No antibodies in the mother's blood at delivery.
- The injection of the immune serum globulin must be given within 48 hours of delivery.

The distribution of the immune serum globulin is through the Rh Committee, and a representative in each of the Medical Society Branch areas:

Dr. J. R. Greening	Dr. N. G. Glen
Antigonish	Amherst
Dr. F. W. Prince	Dr. D. G. Black
Bridgewater	Digby
Dr. N. K. MacLennan	Dr. R. J. Fraser
Sydney	Musquodoboit Harbour
Dr. B. R. Wheeler	Dr. C. B. MacLean
Truro, N. S.	Inverness
Dr. H. A. Locke	Dr. G. W. Turner
New Glasgow	Windsor
Dr. W. H. Jeffrey	Dr. G. V. Burton
Shelburne	Yarmouth

These Liaison Officers will be only too pleased to release the phial to you without delay, if the criteria are fulfilled, the accompanying form is completed, and the follow-ups are done.

Because of much voluntary work and help from the Red Cross, Provincial Government and many others, our Province has been able to get this program going before many Provinces in the Country. It is now up to us to see that this disease becomes a thing of the past in Nova Scotia.

Rh Committee of The  
Medical Society of Nova Scotia

## FORTHCOMING MEETINGS

The Nova Scotia Medical Bulletin will be pleased to publish announcements concerning forthcoming meetings in the Province, in Canada or elsewhere. Notification should be sent addressed to The Nova Scotia Medical Bulletin, Sir Charles Tupper Medical Building, Halifax, N. S.

- The British Council Course in Cardiac Surgery (No. 938), London, Birmingham, April 13th-26th, 1969.
- The British Council Course in Gastroenterology (No. 936) London and elsewhere, June 22nd-July 5th, 1969.

For Information apply  
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