RES MEDICA
Journal of the Royal Medical Society

Contents

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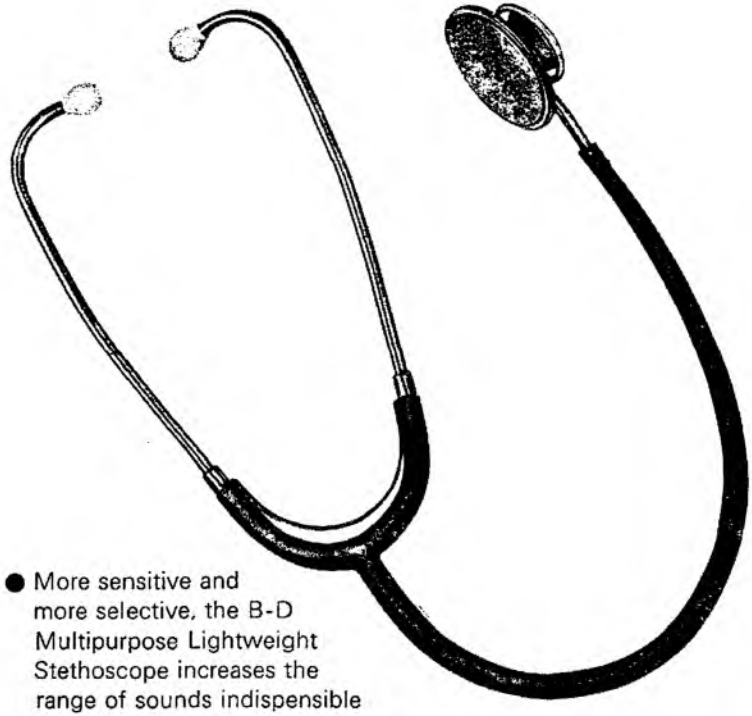

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Journal of The Royal Medical Society

VOL. VI. No. 5. SPRING 1971

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Contents

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EDITORIAL

The Society's image has subtly changed in Edinburgh. In other parts we are held in the same regard, but students here look at us with different eyes. We are rich now, amazingly so for a student society. We have exchanged a parcel of our tradition and history, the work of 50 generations of past members, for hard cash. Our books for money. The tangible for the tangible and the intangible for the tangible.

The Society has not yet realised what kind of bargain it has made. It has not been able to adjust its thinking to this new state of its affairs. Like the man in the street who suddenly wins a lot of money we do not know what to do with it. A large proportion, of course, must be set aside for the building of our new and much needed premises, but after this deduction, the Society still remains possessed of a considerable sum. The last editorial on this page spoke about the Society's position "at the crossroads" of the future. We are still dithering indecisively in the middle of the road.

Now is the time for the Society to lay the foundation of what it hopes to become. It can use its assets to expand, to enlarge the concept of a student medical society, unique in being autonomous and independent, or it can remain within its present limited construction. If we use our wealth to provide a solid basis for the Society for the next 100 or 200 years, then we can crystallise into a society serving every medical student, with each student playing an equal part in the running of the Society. The most successful society in this sense or in a sociological context, is one in which each member plays a part and has a sense of belonging. Many of our members do not feel integrated into the Society — and non members still describe it as a 'clique' of pompous people; to now be a wealthy clique makes the crime worse in their eyes. Some people are merely frightened of joining the Society because of its image. It is becoming therefore increasingly necessary to make the Society inclusive of every medical student; we believe that it benefits the student and certainly each additional member of the Society makes us a more interesting and potent body.

So how are we to widen the Society's sphere? The cumbersome constitutional apparatus of the Society should be examined and may have to be reformed. Present students feel that the machinery for administering the Society is heavy and ponderous, with its provisions for eligibility to vote in elections, the pre-set form of such elections and the vast numbers of office bearers. There is a lack of communication between those who administer the Society and those who merely belong to it. Attempts to communicate are made two or three times a year in business meetings. They are poorly attended, which is not wholly inexplicable. Much of the time is occupied by argument, esoteric and fierce, between older members, about abstruse points of constitution or law. Younger members find it boring and frustrating, when the main aims of the meeting are concealed by a cloud of pedantic dust.

It is hopeful that the next generation of office bearers have no connection with the Society as it existed in Melbourne Place. In its change of home the character of the Society has inevitably changed, and will continue to. Those of us who had any connection with the old society and the members of the old society find it difficult to accept what is patently happening to it now. It is evolving. The next generations of members are not hampered by a memory of what used to be grand and formal. They only know the Society as it is now, and are looking at the future rather than on the past.

Present members may be able to alter the constitutional and administration structure of the Society. An elected committee is still the most pracical way of running the Society but the conveners could be pruned and one president is adequate. Perhaps we will reach the stage of having ordinary members taking the chair at meetings. The essential axis of the Society has always been and surely should remain the opportunity to put forward, and to defend, one's ideas in discussion with one's peers. This was implicit in the Society's foundation and has always been its main purpose. Long may it continue so. But let us clear away the dead wood which has accumulated around this theme. One aim should be a twentieth century Society.

CONTRACEPTION

Nancy B. Loudon

"Every Child a Wanted Child" — this was the stated ambition of a campaign launched by the Family Planning Association in June, 1969. Few enlightened people would disagree with this ideal, yet the majority give little thought as to how it can be achieved and most are quite unaware of how difficult it is for women, especially among the lower social groups, to obtain advice on contraception. Millions of pounds are spent each year in an attempt to stop the world population explosion, but in Great Britain, one of the most densely populated countries in the world and one which boasts of its Welfare Services, free Family Planning advice is available to only a small percentage of women. It is estimated that in Scotland as few as 25-35% of pregnancies are planned. One in three of babies born to mothers under the age of 20 are conceived before marriage. The illegitimacy rate is rising steadily. Add to these the number of abortions which are induced therapeutically or illegally each year and a dismal picture of unplanned pregnancy emerges.

Before the introduction of the National Health Service, Family Planning advice was provided on a pathetic scale by a few family doctors and private consultants or in clinics established by voluntary bodies. Seldom was it available in hospitals. Training in the subject in medical schools was practically nonexistent. As Sir John Peel rightly says the story of the provision of Family Planning and contraceptive services in this country is one of prolonged effort on the part of a dedicated voluntary service and Sir Theodore Fox cynically points out that they have developed in spite of the medical profession rather than because of it. However, family doctors, local authorities and hospitals are at long last involving themselves in this service although at the moment arrangements are often sketchy, confused and inadequate. Lip service may be paid to the idea of a comprehensive contraceptive programme — adequate implementation of it is rare. On June 1st, 1966, the Scottish Home and Health Department sent a circular on Family Planning to the local authorities in Scotland, the last paragraph of which read as follows:— "An adequate Family Planning service fully integrated to other community services will not only contribute

largely to the dispersal of ignorance and fear and to the increase of happy family life, but will also relieve the burdens placed on other local authority services by the physical ill-health and mental distress which so frequently arise from lack of knowledge and advice. The Secretary of State hopes, therefore, that local authorities will take all steps in their power to promote the welfare of their citizens in the ways outlined in this circular." Acting on this document many local authorities in Scotland provided Family Planning advice free to all *married* women in whom further pregnancy might be detrimental to health. On 28th June, 1967, the National Health Service (Family Planning) Act received the Royal Assent. Unfortunately, this Act applies only to England and Wales and similar provisions for Scotland were delayed until the passing of the Health Services and Public Health Act in July 1968. Section 15 of this Act conferred on local health authorities a general power with the Secretary of State's approval to make arrangements for the giving of advice on contraception, the medical examination of persons seeking such advice and the supply of contraceptive substances and appliances for any persons who needed them on *social* grounds and not as hitherto only in *medical* cases. At last it seemed that it would be possible to provide free contraception to thousands of women in the country who because of social circumstances could not afford to pay for it and to bring it to those under-privileged and over-fertile mothers who were too apathetic to seek it. This was the encouragement and support which had been so long awaited. Joy was short-lived and hopes dashed as one read on — "In the light of the present *economic* position, however, it has been decided to defer for the present bringing this section into force and a separate circular on guidance about it will be issued to the authorities in due course." The position therefore in 1970 in Scotland is this. By law Local Authorities are empowered to provide Family Planning advice for women on both *medical* and *social* grounds but because of the economic situation they are discouraged from acting in the latter category. Could anything be more ridiculous or short sighted? We are back where we started and still unable to assist the very groups in the community who most require our help. Surely people in authority are still not blind to the fact that families who present social problems and who produce unwanted children year after year are a constant drain on the community resources in innumerable ways and that the more children produced into those families the greater the burden becomes. The Secretary of State himself in his first circular on the subject admitted the value of Family Planning in reducing this burden on the community; every doctor, health visitor, and social worker recognises it and yet the basic truth of it is ignored. The aim must be to reach such families with the necessary advice before they become "problems" at all. Many of them reach a stage of such despair that the effort to prevent further decline does not seem worth while. If you live in chaos with mounting debts and the child care officer and probation officer on your doorstep every week does it really matter if you produce one more baby? Can you be any worse off? Many family doctors help individual patients in these circumstances but others for a variety of reasons ignore their plight. The provision of free advice to these families is absolutely essential and all possible means must be employed to convey it to them. Indeed it has even been suggested that instead of paying family allowances to families of more than three children the most rewarding scheme would be to provide them with an allowance if they practised efficient contraception.

INDICATIONS — MEDICAL OR SOCIAL

How is one to differentiate between social and medical indications for giving contraceptive advice — this is what the Secretary of State asks us to do, but it is frequently impossible. Even to attempt to do so seems to make nonsense of the idea of a National Health Service. The anomaly is clearly demonstrated by two cases seen on the same day at a family planning clinic. A woman in social class 1, with two children had had a mitral valvotomy and it was considered that further pregnancy would be detrimental to her health. She attended the clinic, had an intra-uterine device inserted without payment, and will be able to attend regularly free of charge for the rest of her reproductive life. The second patient was a young girl of 17 who had one child of 14 months, and another of 2 months and whose husband was due to be released from prison the following week. No contraceptive advice had been offered to her by the Maternity Hospital and her family doctor refused to help on religious grounds. She was

living on National Assistance, could not afford to pay for advice and the local authority in that area is not empowered to make provision for women in such circumstances. Fortunately, a sympathetic health visitor came to her rescue and brought her to the clinic where she was seen without charge as part of the clinic's charitable function. Does it not seem disgraceful that this girl should be dependent on charity for contraceptive advice in Scotland in 1970. It is even more ridiculous when one thinks that should she become pregnant there is every likelihood that she would have the pregnancy terminated at considerable expense to the National Health Service, for she was determined to make every effort legally or criminally to have any future pregnancy aborted. Have not our priorities become rather confused? How can the Secretary of State for Scotland condone such a state of affairs? Every effort must be made to bring pressure upon him to rectify this absurd situation. In answer to a parliamentary question in July 1969 Mr. Ross asserted that there was no demand for such a service in Scotland. I hope that such a demand will now be made vociferously not only by interested members of the medical and nursing professions but by individuals and societies who appreciate the urgent need for the implementation of the Act. If there is doubt in anyone's mind as to the value of an integrated Family Planning Service they need go no further than Aberdeen for proof. Before the second world war a Family Planning Clinic was established there to give advice to the women of Aberdeen and in 1948 it was taken over by the Corporation and became the first Local Authority contraceptive clinic in Britain being euphemistically called the Gynaecological Advisory Clinic. In November 1966 the Local Authority made Family Planning advice available free of charge to anyone who wished it and thereby made Aberdeen the first and only city in Great Britain to provide a free Family Planning Service. In 1968 this service cost the authorities £10,600 and the benefits to the community have been obvious to anyone who studies the reports, fewer unwanted pregnancies, better maternal and child health and a vast saving on the cost to the Social Services. But even this example has failed to convince Local Authorities in Scotland that they should follow suit, and that such a service actually saves money.

Advice to the Unmarried:- In June 1967 the National Council of the Family Planning Association passed a resolution which enabled clinics, if they wished, to give contraceptive advice to the unmarried, but at that time one difficulty was that a fifth of local authorities refused to allow their premises to be used for this purpose. In October 1969 it became mandatory for all Family Planning Association Clinics to give contraceptive advice to all women irrespective of their marital status. Much earlier however, in the face of strong opposition, Mrs Helen Brook, exasperated by the inactivity of other bodies, had already set up advisory centres to provide contraception and advice for unmarried girls. These advisory clinics are now well established in the larger cities throughout the country. There is no evidence to suggest that giving contraceptive advice to the unmarried increases sexual promiscuity in any age group. The available evidence shows that the vast majority of young unmarried people coming for advice have a stable relationship with their partner and began their sexual relations before coming for advice. Surely in this group above all others the innocence of ignorance is not worth preserving and every effort must be made to prevent an unwanted pregnancy and all its tragic implications and results.

EDUCATION

If in time family planning facilities are freely provided by Local Auhorities, family doctors, hospital and family planning clinics, it matters not who give the advice as long as it is readily available, the next problem is to persuade women to use them. In Spite of the publicity given to the subject by the mass media in recent years many women are still ignorant of the facilities available and others are too shy to ask for advice. Vigorous campaigns must be launched to educate families. The husband as well as the wife has to be convinced of the benefits of family limitation. Opposition from the husband is often a major factor in the failure of the wife to persevere with contraceptive measures and the importance of this fact is too often ignored. Once a mother has been persuaded to practice contraception, continued support is essential but in some poorly motivated families this will necessitate domiciliary visiting by a member of a specially trained team of workers. Such a domiciliary scheme in Southampton reduced the number of pregnan-

cies in problem families from 142 per annum to 38 per annum, an estimated saving of £2,755 to the exchequer and £5,678 per annum to the Local Authorities on child care alone. Education must be directed especially towards the lower income groups who are usually as resistant and apathetic towards persuasion about the importance of family planning as they are to other services such as cervical cytology, immunisation and vaccination. Sporadic information is of no use at all. Advice must be constantly available throughout the whole of the child bearing years, for those unmarried girls who wish it, for the married woman who wants to space her children and for the older woman especially as she reaches the end of reproductive life. These years before the menopause are often fraught with fear of pregnancy especially as women in this age group often feel particularly shy about asking for advice on this subject. Publicity in the form of eye catching posters, free literature and films must be readily available. Well informed speakers, both medical and non-medical, must be trained to address groups and societies. Advertising information on family planning is a delicate subject and should only be carried out in the most circumspect way, but it is necessary to do it for ignorance to be dispelled. How, where and by whom are the questions. Surely the publication of the addresses and times of family planning clinics should offend no one. At one time the Post Office refused to publish the telephone number of the Edinburgh Family Planning Clinic, but now clinic numbers are accepted for inclusion in the yellow pages of the telephone directory. Advertising in newspapers and public places is often frowned upon and advertising of family planning on television is banned along with matrimonial agencies, fortune tellers and undertakers. Progress is slow and frustrating!

TRAINING OF DOCTORS AND NURSES

More comprehensive training in the subject must be introduced into the curricula of medical students, nurses and social workers and adequate post-graduate education must be provided for them. A survey among General Practitioners in Sheffield two years ago revealed that only 32% of doctors had received either undergraduate or post-graduate instruction in contraceptive techniques. However the Royal College of Obstetricians and Gynaecologists has now decided to include this topic in the syllabus for its Diploma examination in Obstetrics and the General Nursing Council have introduced it into its curriculum. In May 1969, Mr Richard Crossman announced a government grant of £20,000 per year for the next 5 years for training in family planning and last month he issued a circular encouraging hospitals to provide this service for their patients. As he did not however allocate any money to supplement the already overstretched hospital finances, to enable Hospital Boards to act effectively on his advice, it is doubtful if much significance can be placed on this gesture.

METHODS OF CONTRACEPTION

Finally, what methods of contraception are employed by couples today? Ancient methods, good and bad, are still used with varying degrees of success. New techniques are heralded as revolutionary and wonderful only to be abandoned for one reason or an another. Statistics as to safety vary depending on source and preference of the writer. The whole position is unsatisfactory and confusing. Some couples still practice long spells of abstinence for want of better knowledge. Others calculate the safe period with its pathetic results or resort to temperature recording which is inhibiting to the majority and laborious to all. Some even spend large sums of money buying expensive calculators only to be confused by their instructions, deceived by their promises and devastated by their failure. Coitus Interruptus is still the only refuge for many, with frustration even when successful and desperation when it fails. Chemicals alone are of little use and even modern aerosol preparations in spite of the claims made on their behalf do not offer an accepted degree of safety. Caps of varying types require pre-meditation, are messy to use, have to be fitted by a doctor and checked regularly. Their popularity is declining but they do offer a reliable means of contraception when used in conjunction with a chemical. The washable sheath has mercifully almost completely disappeared although a few husbands in the poorest section of the community are still condemned to its use in an attempt to limit their families. Disposable condoms offer a high degree of safety and are still the commonest form of contraception in

this country today, although many find them aesthetically unacceptable.

The intra-uterine device returned to vogue with the introduction of malleable plastics which enable devices of varying shapes to be made, all of which can be straightened out into a thin introducer and inserted unto the uterus without anaesthesia. Once inside the uterine cavity they immediately return to their original shape. Generally they are simple to insert but are not free from side effects. The pregnancy rate is approximately 3%, the expulsion rate varies with different devices and approximately 30% of users complain of heavy or irregular bleeding, pain or backache at some time in the cycle. However, this is the only form of reversible contraception at present available which requires no conscious effort on the part of the user and it may therefore be the method of choice in patients of low intelligence, or those who are poorly motivated to use contraceptives of any kind.

Female sterilization is increasing in popularity due to a more permissive attitude on the part of gynaecologists coupled with simplification of techniques and improvements in anaesthesia. Bilateral tubal diathermy through the laparoscope generally allows the patient to leave hospital 48 hours after the operation — a major consideration for a woman with a large family who would never consider tubal ligation when it involved a stay in hospital of 10 - 14 days. The effort of arranging for someone to look after her family at home during this time made it impossible. Male sterilization by vasectomy is also becoming more popular and the Simon Population Trust has done much to bring it to the attention of the public. A male sterilization clinic has been set up in Cardiff under the Family Planning Association and plans are afoot to extend this service. A patient must be made to realise that an operation for sterilization is virtually irreversible and can therefore only be considered when the family is complete. It should be performed only after frank and thorough discussion has ensured that both partners fully realise the implications of the step they are taking and have made the decision absolutely of their own free will.

Oral contraceptives now exist in bewildering array. In spite of fears about their dangers and the alarming reports in the press and television "The Pill" is still the method chosen by 1¼ million women in this country. These women want a contraceptive which will not fail — they consider the advantages and the risks and they choose the pill. Never has a drug received such wide publicity, such stringent testing or engendered such strong emotions, but it provides such a simple method of contraception that its discovery must still be regarded as a major therapeutic triumph. New pills are constantly being tested and approved; low dosage progestogen therapy offers high hopes of a reliable contraceptive regime free from the dangers of thromboembolic phenomena and other side effects. As these pills are taken continuously the confusion created by cyclical therapy is removed and it is much easier to follow instructions. More recently hormone therapy by injection monthly, 3 monthly and even 6 monthly has been submitted to clinical trial but so far no trials have been undertaken in this country.

Drugs are being used to try to stimulate ovulation at a time which can be calculated so that the safe period may be accurately determined and if successful this, one hopes, would at last provide a reliable contraceptive regime acceptable to the Roman Catholic Church.

Experiments are continuing with immunological methods of contraception and with pills and injections for men. The much talked of "Morning After Pill" has so far failed to materialise. Its development is a hope for the future and marks a new era in contraceptive history — for the first time a contraceptive will be available for use after the act of intercourse and for the first time a woman will be able in the cool light of dawn to change her mind.

When contraceptive methods fail and unplanned pregnancies occur women now turn to abortion and this has even been described as a method of contraception. This is a contradiction in terms and I hope will never be considered as an alternative to sound contraceptive methods. Until there is a comprehensive Family Planning Service in this country there will be all too many unplanned pregnancies.

There will be abortions therapeutic or illegal. Surely the most ridiculous anomaly of all is that in Scotland today a woman has to pay for her family planning advice and if it fails or is omitted she may well have the pregnancy terminated at the expense of the State. The time has now come for Family Planning services to be integrated into the National Health Service and not to be considered as an optional extra — at a price.

INTERPRETATION OF THE ELECTROCARDIOGRAM

John I. Hall,

Ph.D., M.B., Ch.B., M.R.O.P.(Edin.)

Accurate interpretation of an E.C.G. may provide valuable information on the assessment of a patient's cardiovascular system. Students, both under-graduate and post-graduate, may have to interpret an E.C.G. in the course of their daily ward duties or during a clinical examination and in this article emphasis is placed on the main diagnostic features of some of the more common E.C.G. abnormalities. Numerous books are available for more advanced study.

The E.C.G. is particularly useful in the diagnosis of cardiac rhythm and myocardial infarction. It may reveal evidence of conduction defect, hypertrophy of the myocardium or pericarditis and may also indicate therapeutic response in certain electrolyte disturbances. On the other hand, non-specific E.C.G. changes are common.

ELECTROPHYSIOLOGY

Like every living cell a cardiac muscle fibre at rest is polarised; the cell membrane has a positive charge on its outer surface and a negative charge within. When stimulated the polarity reverses and the intracellular potential becomes positive. This rapid change (depolarisation) is followed by a slower recovery phase (repolarisation) until the cell is again in its resting or polarised state. As this activity spreads along the muscle cell an action potential is produced which may be detected by connecting suitably placed micro-electrodes to a recording galvanometer.

The E.C.G. is a method of recording these electrical forces which occur in heart muscle. The instrument is designed to produce a positive or upward deflection on the tracing when an impulse passes towards an electrode and vice versa. At rest, i.e. when no current is flowing, the base line of the tracing is horizontal or iso-electric.

GENESIS OF THE E.C.G.

In a normal heart the sino-atrial node originates the cardiac impulse. This impulse spreads over both atria to reach the atrio-ventricular node. It then passes through the bundle of His and down the main conducting bundles on the left and right of the interventricular septum. The ventricular muscle is stimulated as the impulse passes from endocardial to epicardial surface through the specialised conduction tissue of Purkinje.

These events are illustrated diagramatically in FIG. 1. The ventricular septal activation

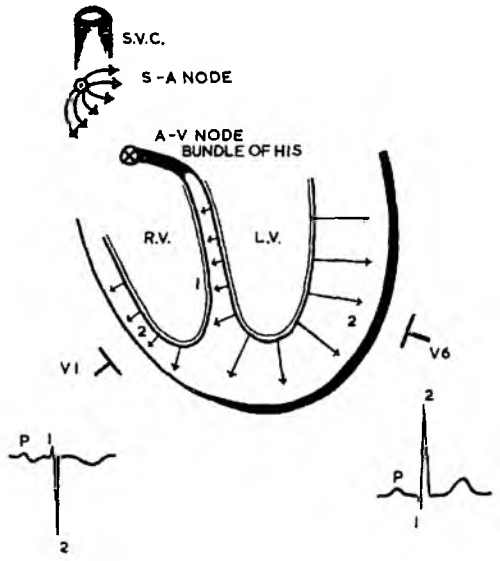


FIG. 1

Conduction pathway of the heart to show the genesis of the ECG recorded from 2 electrodes one over the right ventricle (V1) the other over the left ventricle (V6).

in the normal heart passes from the left to the right side. Thereafter, both ventricles are activated simultaneously but the wave form produced by stimulation of the left ventricle predominates over that of the right ventricle since its muscle mass is always greater.

E.C.G. waves are designated by the letters:— P. Q. R. S. T. U. (FIG. 2); small letters may be used for relatively small waves, e.g. q, r, s. The P wave is produced by atrial depolarisation; the QRS complex is produced by depolarisation of the ventricular septum and muscle of both ventricles while the ST segment represents complete ventricular depolarisation. Subsequent recovery (or repolarisation) is denoted by the T wave and U wave.

The routine E.C.G. consists of 12 leads:

(a) standard limb leads
- Lead I — right arm to left arm
- Lead II — right arm to left leg
- Lead III — left arm to left leg

These leads are bipolar and record the difference of potential between two limbs in such a way that relatively positive electrical forces in the left arm (Lead I) and left leg (Leads II and III) are represented as upward deflections on the E.C.G.

(b) unipolar limb leads
- aVR — right arm
- aVL — left arm
- aVF — left leg

(c) unipolar chest leads
- V_1 — fourth right interspace adjacent to sternum
- V_2 — fourth left interspace adjacent to sternum
- V_3 — mid-way between V_2 and V_4
- V_4 — fifth left interspace in mid clavicular line
- V_5 — in same horizontal plane as V_4 but in the anterior axillary line
- V6 — as for V_5 in mid-axillary line

Unipolar leads record electrical forces at the site of the exploring electrode on the individual limb or position on the chest. These routine leads provide a satisfactory survey of the electrical forces over different parts of the heart in the frontal (limb leads) and horizontal (chest leads) planes for routine recording but if more extensive cover is necessary additional leads may be recorded on the right (V_3R, V_4R), round the back of the chest (V_7 to V_9) and in higher interspaces.

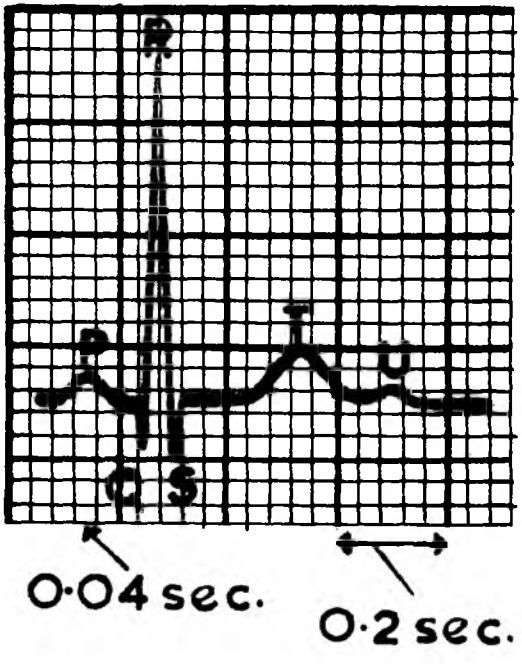


FIG. 2

Normal ECG complex.

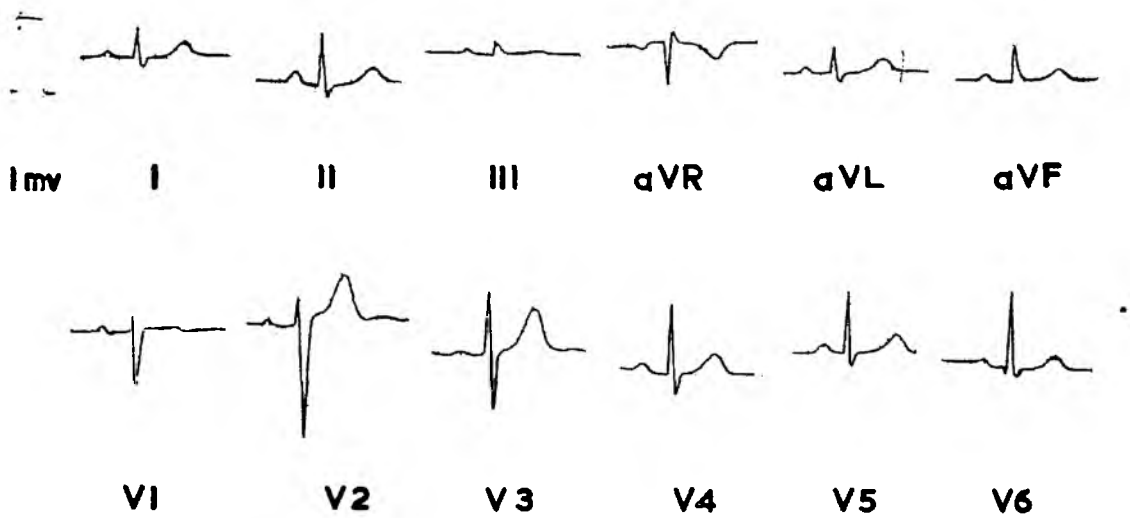


FIG. 3
Normal electrocardiogram.

When these leads are related to the electrical forces in the normal heart it will be apparent that the significance of the different E.C.G. waves varies with the lead in which they are recorded (FIG. 3). A few examples will make this clear:

1. AVR faces the cavities of the heart. The electrical force from the SA node spreads over the atria away from the electrode and the P wave is therefore negative. Depolarisation of the septum and the ventricles also passes away from the electrode and produces a deep negative wave (Q). The T wave is also negative.
2. V1 usually faces the heart in the region of the right atrioventricular junction. The electrical force from the SA node may pass towards the electrode producing an upright P wave or may be intermediate and produce a diphasic P as illustrated; the electrical force through the ventricular septum is towards the electrode and the initial ventricular deflection is therefore a small r wave. As the ventricles are activated, the greater mass of the left ventricle generates the dominant electrical force away from the electrode and this is reflected in the deep S wave. The T wave is also negative.
3. V6 faces the epicardial surface of the left ventricle; the initial electrical force through the ventricular septum is away from the electrode so that an initial small Q wave precedes the tall R wave produced by left ventricular activation.

ARTEFACTS

An E.C.G. tracing may be distorted by electrical currents which are not produced by the heart, e.g. muscle movements of the body (shivering), faulty contact between skin and electrode, electromagnetic disturbances in the environment. The patient should therefore be relaxed, comfortable and warm; electrodes should be clean and firmly applied and the instrument must be adequately earthed.

MEASUREMENT AND TIMING OF E.C.G. WAVES

E.C.G. tracing paper is squared in millimetres with bold lines every 5 mm. (FIG. 2). In order to ensure uniformity, all records should be standardized so that an impulse of 1 mv. produces a deflection of 10 mm. in height on the tracing. Records from the same patient at different times and those from other patients may then be compared. Each mm. length represents a time interval of 0.04 second and a bold line occurs every 0.2 second. The PR interval or atrioventricular conduction time represents the time interval between the onset of atrial and the onset of ventricular depolarisation. It is measured from the start of the P wave to the beginning of the Q wave of the ventricular complex. In adults the normal range for the PR interval is between

0.12 and 0.20 second (3 and 5 small squares). The normal QRS complex is less than 0.10 second and seldom more than 0.08 second (2 small squares).

HEART RATE

Heart rate is most readily calculated by counting the number of bold lines between comparable points on successive cardiac cycles (usually the peaks of the R waves). This number, divided into 300 (300/5ths of a second per minute) gives the heart rate per minute, i.e. 3 = 100 per minute; 4 = 75 per minute; 5 = 60 per minute; 6 = 50 per minute. If the points do not co-incide with a bold line, the number of small squares may be counted and this number divided into 1500 (1500 times 0.04 second = 1 minute). When the rhythm is irregular, the heart rate may be calculated by multiplying the number of cardiac cycles between 30 bold lines (6 seconds) by 10.

E.C.G. INTERPRETATION

The normal E.C.G. pattern in the different leads varies to some extent with the position of the heart in the chest, obesity, chest and spinal deformities, the phase of respiration and the height of the diaphragm. There is therefore a wide range of normality which has to be taken into account before changes in the pattern can be attributed to heart disease. It must also be recognised that the normal E.C.G. per se does not exclude serious underlying heart disease.

DISORDERS OF RATE, RHYTHM AND CONDUCTION

Interpretation of an E.C.G. should always be correlated with the patient's age, clinical features and current or previous digitalis administration. One should always look over the whole record since the rate and rhythm need not necessarily remain constant. At this initial survey one can also see if the rhythm is regular or irregular, whether the ventricular complexes are consistent in shape or whether bizarre forms are present. The next step is to look for P waves and check their relationship to the QRS complexes. This is usually seen most clearly in leads II and V1.

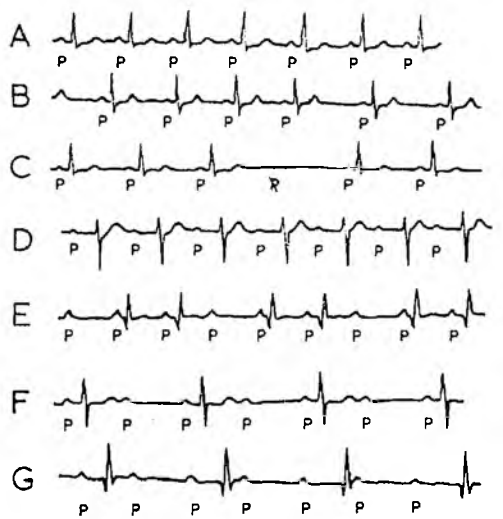


FIG. 4

A. Sinus rhythm, rate 88/min. PR 0.16 sec.
B. Sinus arrhythmia.
C. Sino-atrial block.
D. 1st degree heart block. PR 0.32 sec.
E. 2nd degree heart block; Wenckebach periods.
F. 2nd degree heart block (2 : 1 block).
G. Complete heart block, atrial rate 88/min. Ventricular rate 42/min.

Normal sinus rhythm (FIG. 4A) is present when P waves precede each QRS complex; the PR interval remains constant (within the normal range); the ventricular complexes occur regularly and the cardiac rate is between 60 and 100 per minute. Sinus rhythm with a rate less than 60 per minute is a *sinus bradycardia* and when over 100 per minute is considered to be a *sinus tachycardia*. Variation of the heart rate with respiration, becoming faster with inspiration and slower with expiration, is called *sinus arrhythmia* (FIG. 4B). It is a normal variant and should not be confused with *sino-atrial block* which is abnormal. Sino-atrial block is caused by failure of the SA node to initiate a cardiac impulse resulting in absence of a complete cardiac cycle (FIG. 4C).

Atrioventricular block which is also abnormal may occur in various forms. *First-degree atrioventricular block* is present when the PR interval exceeds 0.2 second (FIG. 4D). *Second-degree AV block* occurs in two forms. The first is characterized by a series of cardiac cycles in which there is progressive lengthening of the PR interval until an impulse is blocked and fails to initiate a QRS complex (FIG. 4E).

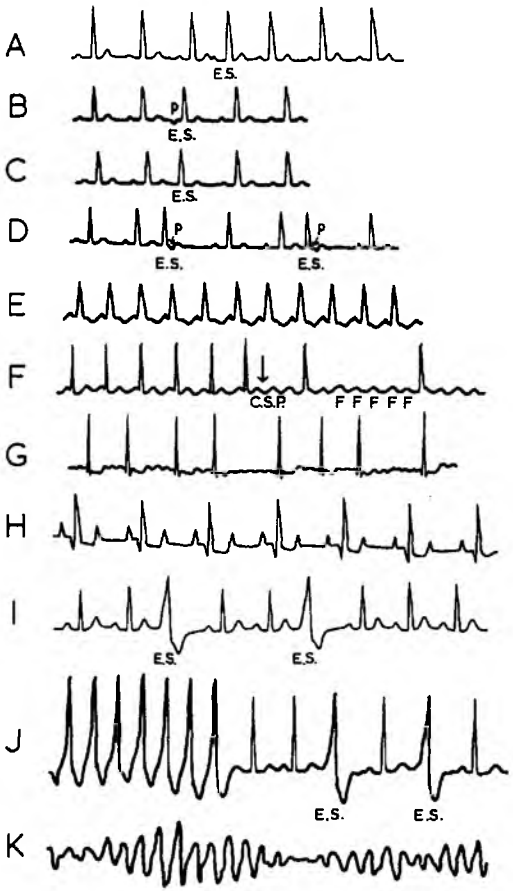


FIG. 5

A. Atrial ectopic.
B. Nodal ectopic; inverted P wave preceding QRS complex.
C. Nodal ectopic; P wave incorporated in QRS complex.
D. Nodal ectopics; inverted P wave following QRS complex.
E. Paroxysmal atrial tachycardia, rate 158/min.
F. Atrial flutter 2 : 1 block, atrial rate 300/min. Ventricular rate 150/min. Carotid sinus pressure (C.S.P.) increased the block and revealed the characteristic "saw-toothed" flutter waves (F).
G. Atrial fibrillation, ventricular rate approximately 100/min.
H. Paroxysmal atrial tachycardia with block, atrial rate 166/min.
I. Ventricular ectopics.
J. Ventricular tachycardia, rate 200/min. reverting to sinus rhythm. Two ventricular ectopics with the same configuration as the tachycardia are present.
K Ventricular fibrillation.

This sequence is known as a Wenckebach period. Following each blocked beat the sequence is repeated. Wenckebach periods may be short or long but are usually constant in any particular patient. In the other form of second-degree atrioventricular block the P waves are regular and the PR interval is constant but the impulse is blocked usually after every second atrial beat (2 : 1 atrioventricular block) (FIG. 4F) or less frequently in a more complex pattern (3 : 1, 3 : 2). *Third-degree or complete heart block* is characterised by complete independence of P waves and QRS complexes (FIG. 4G). The atrial rate is usually normal while the ventricular rate, although regular, is slow at about 40 per minute or less. The ventricular complexes often have a bizarre shape since their focus of activation lies outwith the normal conduction pathway.

ATRIAL ARRHYTHMIAS

Irregularities of the rhythm may arise from ectopic foci in the atria or AV node. These *supraventricular ectopics* have normal QRS complexes but the P wave may be distorted and the PR interval depends on the distance between the ectopic focus and the AV node (FIG. 5A). When the ectopic focus is in the AV node itself the P waves are inverted in leads II, III and AVF and may precede (FIG. 5B) or follow (FIG. 5D) the ventricular complex. This depends on the delay in retrograde conduction into the atria. Sometimes the P wave cannot be seen (FIG. 5C), since it is incorporated into the ventricular complex. A rapidly recurring series of supraventricular ectopic beats constitute a *supraventricular (atrial or nodal) tachycardia* (FIG. 5E). The rate may vary from 150 to 250 per minute but is perfectly regular in any particular case. P waves which are often small and of abnormal shape, may be difficult to identify. The ventricular complexes have a normal configuration. If the tachycardia continues for more than a few hours secondary myocardial ischaemia many cause ST segment and T wave changes.

Atrial flutter, like paroxysmal atrial tachycardia, is due to a rapid series of impulses arising from an ectopic focus within the atria. Atrial flutter distorts the base line of the E.C.G. by so-called "saw-toothed", regularly recurring flutter waves at a rate of 200 to 350 per minute (FIG. 5F). The ventricles can seldom respond to such a rapid rate but are

activated by every second or third flutter wave. The ventricular rate is usually regular (2 : 1, 3 : 1 or 4 : 1) and the QRS complexes have a normal configuration although the ST segments are distorted by the flutter waves. Sometimes the ventricular response varies with resultant irregularity of the heart rate.

Atrial fibrillation is characterised by completely disordered atrial activity (FIG. 5G). The E.C.G. tracing shows an irregular base line which may vary from coarse irregular waves to almost a flat line. The ventricular response is totally irregular.

Before leaving atrial arrhythmias, mention should be made of *paroxysmal atrial tachycardia* (PAT) *with block* (FIG. 5H). This is uncommon and when present it is usually due to digitalis toxicity. The atrial rate is about 180 per minute (120 to 250) but in contrast to atrial flutter there are iso-electric intervals between peaked P waves.

VENTRICULAR ARRHYTHMIAS

Ventricular ectopics are readily distinguished from those of supraventricular origin by their broad, bizarre shape and inverted T waves (FIG. 5I). This is because their conduction pathway to the rest of the myocardium is through ventricular muscle rather than through normal conducting tissue. Ventricular beats arising from the same focus have the same bizarre shape in any particular lead but when they arise from different foci the complexes vary in shape. Ventricular ectopics may occur singly or in runs of 2 or 3 in rapid succession. When a ventricular ectopic follows each normal beat this is known as coupled rhythm.

A rapidly recurring series of ventricular ectopic beats constitute *ventricular tachycardia* (FIG. 5J). The rate usually varies between 150 and 200 per minute and is slightly irregular. P waves may sometimes be detected occurring at an independent slower rate. Ventricular tachycardia is a dangerous arrhythmia usually due to serious myocardial disease. It may herald the onset of *ventricular fibrillation* (FIG. 5K) with cessation of ventricular contraction.

CAROTID SINUS PRESSURE

The electrocardiographic interpretation of tachycardia is not always easy but can often be clarified by the response to vagal stimulation produced by carotid sinus massage. Carotid stimulation should be performed with the patient recumbent while an E.C.G. trace is being recorded. The carotid sinus is at the bifurcation of the common carotid artery. This point lies just below the angle of the jaw and once the vessel has been palpated, gentle massage is applied postero-medially in the line of the vessel with either the thumb or two or three fingers. The vessel lumen should not be obliterated. Each side should be massaged separately, since one side is frequently more sensitive than the other. Sinus tachycardia responds with temporary slowing of the heart rate whereas a supraventricular tachycardia will cease abruptly or remain unaffected. With atrial flutter the ventricular response is temporarily slowed to reveal the characteristic "saw-toothed" flutter waves which previously may have been obscured by the ventricular complexes (FIG. 5F). Very occasionally, atrial flutter may revert to sinus rhythm. PAT with block responds to carotid sinus pressure in the same way as atrial flutter. The ventricular rate in atrial fibrillation is sometimes slowed temporarily but ventricular tachycardia is unresponsive.

CARDIAC HYPERTROPHY

1. *Atrial Hypertrophy.* Atrial hypertrophy may be revealed by the size and shape of the P waves. Tall peaked P waves (over 2.5 mm. in height), seen best in leads II, III and AVF and in the right chest leads, suggest *right atrial hypertrophy* (FIG. 6B). Broadened bifid P waves (longer than 0.12 second) usually seen best in leads I, II, aVR and aVL suggest *left atrial hypertrophy.* These P wave changes which are sometimes transient may result from temporary atrial hypertension, but are seldom sufficiently marked to constitute certain evidence of hypertrophy of the atrial walls.

2. *Ventricular Hypertrophy.* The amplitude of the QRS complex is increased by ventricular hypertrophy but it may be affected by many other factors such as body build and the closeness of the heart to the chest wall. In contrast, significant degrees of ventricular hypertrophy may be present before the amplitude of the QRS complex affords certain E.C.G. confirmation of its presence.

Left ventricular hypertrophy. In an adult of normal build, left ventricular hypertrophy is suggested by the following criteria:

(a) a combined amplitude of the S wave in V1 and the R wave in V5 or V6 exceeding 35 mm. (FIG. 6A).
(b) an R wave in aVL exceeding 13 mm.
(c) an R wave in aVF exceeding 21 mm.

None of these figures is absolute and not all of them need be present in any one case. In children and thin adults similar large voltage complexes may be normal variants.

Right ventricular hypertrophy. The E.C.G. changes of right ventricular hypertrophy are less striking since right ventricular hypertrophy seldom exceeds the bulk of the normal left ventricle. Nevertheless, leads over the right ventricle (VI, V3R, V4R) may show a dominant R wave instead of the normal S wave (FIG. 6B). These additional leads should always be recorded when right ventricular hypertrophy is suspected but is not revealed in lead VI.

In more advanced cases of ventricular hypertrophy, repolarisation is abnormal. The ST segment may be depressed and the T wave asymmetrically inverted in leads over the left ventricle in left ventricular hypertrophy (FIG. 6A) and in leads over the right side of the heart in right ventricular hypertrophy (FIG. 6B). Some T wave inversion is a normal variant in leads V4R, V3R and VI so that these changes are only significant of right ventricular hypertrophy when marked or extend to lead V2 or V3. The ST segment and T wave changes are due to relative ischemia or replacement fibrosis and constitute a manifestation of "strain" on the relevant ventricle. Sometimes a "strain" pattern occurs without electrocardiographic evidence of ventricular hypertrophy.

BUNDLE BRANCH BLOCK

Complete bundle branch block produces broad, notched or slurred QRS complexes (their duration measures 0.12 sec. or more) and abnormalities of the ST segments and T waves in all leads. These changes are due to:

1) the excitation wave passing through atypical pathways in the myocardium on the side of the blocked conduction bundle.
2) asynchronous activation of the two ventricles.
3) abnormal repolarisation after delayed ventricular activation.

The shape of the complex depends upon whether the left or right main bundle branch is blocked.

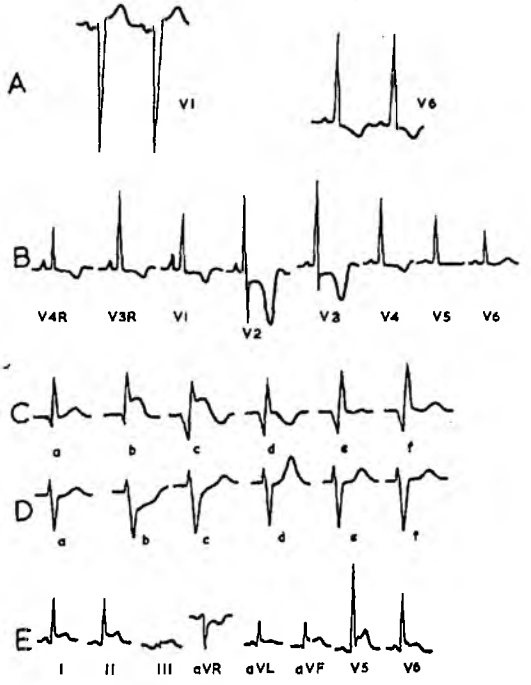


FIG. 6

A. Left ventricular hypertrophy SV 1 + RV 6 > 35mm.

B. Right ventricular hypertrophy. Note that an R wave is the sole deflection in the ventricular complexes over the right side of the heart. The P wave in V 1 is tall and peaked (P pulmonale); T wave inversion extends to V 4.

C. Serial electrocardiographic patterns from an electrode overlying a myocardial infarction (compare D below).
(a) Normal complex.
(b) ST elevation (concave downwards).
(c) Pathological Q wave; ST elevation; T wave inversion.
(d) ST segment isoelectric.
(e) T wave low upright.
(f) Persisting pathological Q wave; T wave normal.

D. Serial electrocardiographic patterns from an electrode facing the opposite side of the heart to an infarcted area (compare C above).
(a) Normal complex.
(b) Reciprocal ST depression.
(c) ST depression less marked.
(d) Peaked T wave.
(e)(f) Normal complex.

E. Acute pericarditis ST elevation (concave upwards) in all leads except a VR.

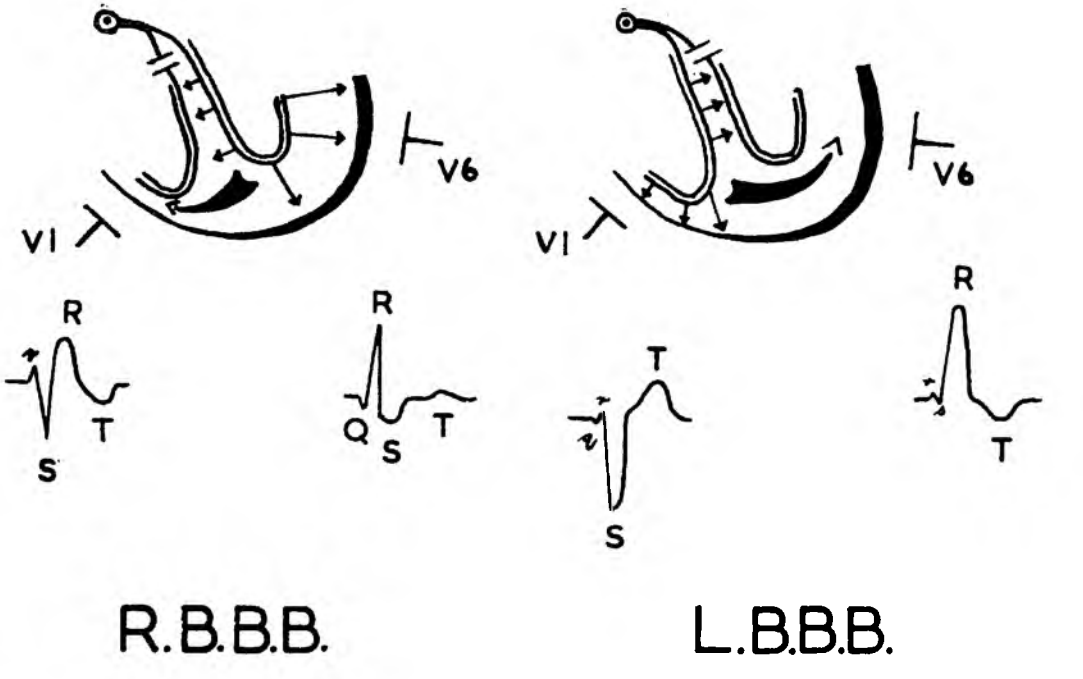


FIG. 7

Genesis of the ECG complex in right bundle branch block and left bundle branch block as recorded from 2 electrodes one over the right side of the heart (V 1) the other over the left (V 6). (see text)

In right bundle branch block delayed activation of the right ventricle causes a tall secondary R wave in the right ventricular leads and a slurred terminal S wave in the left ventricular leads (FIG. 7).

In *left bundle branch block* the initial small Q wave of septal activation is absent in the left ventricular leads and late activation of the left ventricle delays the peak of the R wave which is notched or slurred on the upstroke by earlier right ventricular activation. This also causes notching or slurring of the QS complex in the right ventricular leads. These changes are best seen in the chest leads (FIG. 7)

MYOCARDIAL INFARCTION

The E.C.G. usually develops characteristic changes after a recent myocardial infarction. In leads overlying an infarcted area these changes, in order of their appearance, are:— 1) elevation of the ST segment, 2) the appearance of a pathological Q wave, 3) symmetrical inversion of the T wave.

The recognition and interpretation of these changes becomes clearer if the mechanism of their origin is understood.

CHANGES IN THE ST SEGMENTS

As noted previously a resting normal muscle has a positive surface charge but when stimulated or injured this surface charge becomes negative (the negative current of injury). An anoxic area on the epicardial surface of the heart will therefore have a constant negative charge while surrounding healthy muscle will carry a normal positive charge. This difference of potential between injured and normal

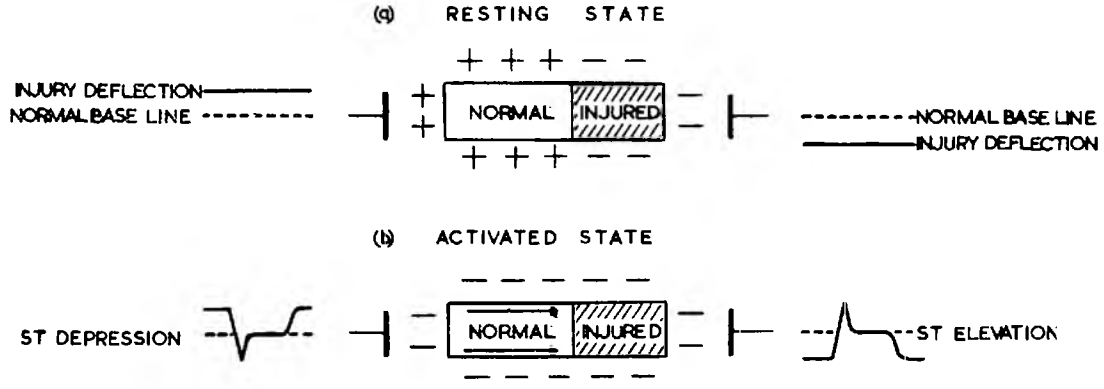


FIG. 8

Diagram of cardiac muscle :

(a) to demonstrate the depressed base line recorded from an electrode overlying injured myocardium in the resting state.

(b) to show ST elevation in a lead overlying injured myocardium in the activated state. Arrows indicate the direction of the stimulus. Reciprocal ST depression is present in a lead facing uninjured myocardium. (see text)

myocardium is reflected in the E.C.G. as a depression of the normal base line in leads overlying the injured area and as an elevation in leads over normal myocardium (FIG. 8A). When the healthy muscle is activated it also becomes negative and current will cease flowing. The depressed base line therefore returns to the normal iso-electric level giving the impression of an elevated ST segment (FIG. 8B). When healthy muscle is restored to its resting state the negative current of injury reappears and the base line again becomes depressed.

PATHOLOGICAL Q WAVES

Pathological Q waves of myocardial infarction exceed 0.04 second in duration and may be deep. They only appear when the infarct involves the whole thickness of the ventricular wall (transmural infarction) and do so because the infarcted myocardium, being dead, is "electrically inactive". Leads overlying an infarcted area of left ventricle therefore record electrical forces of exactly the same pattern as those within the cavity of the ventricle, i.e. the deep Q wave of aVR in the normal E.C.G. (vide supra).

SYMMETRICAL T WAVE INVERSION

This does not appear until recovery of the infarcted muscle has begun.

E.C.G. changes of myocardial infarction follow a sequence, the time intervals of which vary within wide limits. ST elevation usually disappears within the first few days while the pathological Q waves may decrease in size but usually persist for years and often remain as a permanent abnormality. Inverted T waves which develop as the ST elevation subsides usually become upright during the first few months but also may persist for years. This sequence of events is illustrated in FIG. 6C. Leads facing the opposite side of the heart may show reciprocal ST depression during the acute stage and tall peaked T waves as recovery takes place (FIG. 6D).

The position of the infarcted area can be localised by the leads in which the infarct pattern develops.

Anterior myocardial infarction is shown in the chest leads and normally in leads I and aVL.

Inferior myocardial infarction is shown in leads II, III and aVF.

When an infarct does not involve the whole thickness of the ventricular wall (*intra-*

mural infarction) the changes affect only the ST segments and T waves. Q waves do not develop.

Although the characteristic E.C.G. changes of myocardial infarction develop within the first few hours of its occurrence this is not invariable and diagnosis then depends on the clinical picture and elevation of certain serum enzyme levels. It must be recognised that in some patients E.C.G. confirmation of a myocardial infarction may never occur while in others it may only develop after an interval of days. Additional leads in higher interspaces or round the back of the chest may be required to detect and localise an infarct.

ANGINA PECTORIS AND MYOCARDIAL ISCHAEMIA

Angina pectoris is usually diagnosed from the patient's history of exertional chest pain. The E.C.G. is usually normal but may show evidence of myocardial ischaemia, especially if recorded while the patient has pain. When the history is equivocal and the resting record negative an exercise test may establish the diagnosis (vide infra). The E.C.G. feature of acute myocardial ischaemia is plateau type ST depression (1 mm. or more) in leads overlying the ischaemic area. In ischaemia, in contrast to infarction, muscle injury is intermittent and confined to the sub-endocardial region of the ventricles. As a consequence, E.C.G. leads facing the surface of the heart record the changes of uninjured muscle and show ST depression during phases of ischaemia. Anterior ischaemia is best shown in the chest leads, inferior ischaemia in leads II, III and aVF. Biphasic or symmetrically inverted T waves may develop in the same leads during recovery from an ischaemic episode and provide confirmatory evidence of the diagnosis.

EXERCISE TEST

A resting record is taken and then the patient is exercised by climbing repeatedly over steps, by climbing stairs or by using a bicycle ergometer or tread mill. The amount of exercise is determined for each patient, consideration being taken of age, sex, weight and general clinical state. An exercise test should not be carried out in elderly people or those in poor physical condition. It is valueless when patients are having digitalis or other similar drugs which affect the E.C.G. and is unnecessary when ST segment and T wave changes are already present. Exercise should be stopped if anginal symptoms or other features of distress develop. The E.C.G. is repeated during or immediately after the exercise, after five minutes rest and subsequently at five minute intervals if the record is not returning to normal. Development of ST depression of over 1 mm., especially if followed by inversion or diphasia of the T wave, constitutes a positive test. The changes are usually transitory but occasionally persist for over an hour.

PERICARDITIS

Acute pericarditis, like acute myocardial infarction, produces ST elevation but in contrast to myocardial infarction, the elevation is concave upwards, the changes are more widespread and occur in all the limb leads reflecting epicardial potentials as well as in the chest leads (FIG. 6E). Pathological Q waves are absent unless there has been associated myocardial infarction. During recovery the ST elevation disappears and is replaced by T wave inversion before returning to normal.

ELECTROLYTE ABNORMALITIES

Disturbances of the electrolyte balance can produce most bizarre E.C.G. changes, particularly affecting the ST segment and T waves. The most frequently encountered electrolyte disturbance concerns potassium. *Hyperkalaemia* (FIG. 9A) produces tall peaked T waves and reduces the height of the R wave. The QRS complex is broadened and P waves may disappear. The extent of these changes depends on the severity of the electrolyte upset. *Hypokalaemia* (FIG. 9B) is associated with prominent U waves, flattening of the T wave, ST depression and prolongation of the PR interval.

DIGITALIS

Digitalis often affects the E.C.G.; the changes may mask or simulate changes of underlying heart disease and before interpreting the record it is essential to know whether a patient has taken this drug. The most

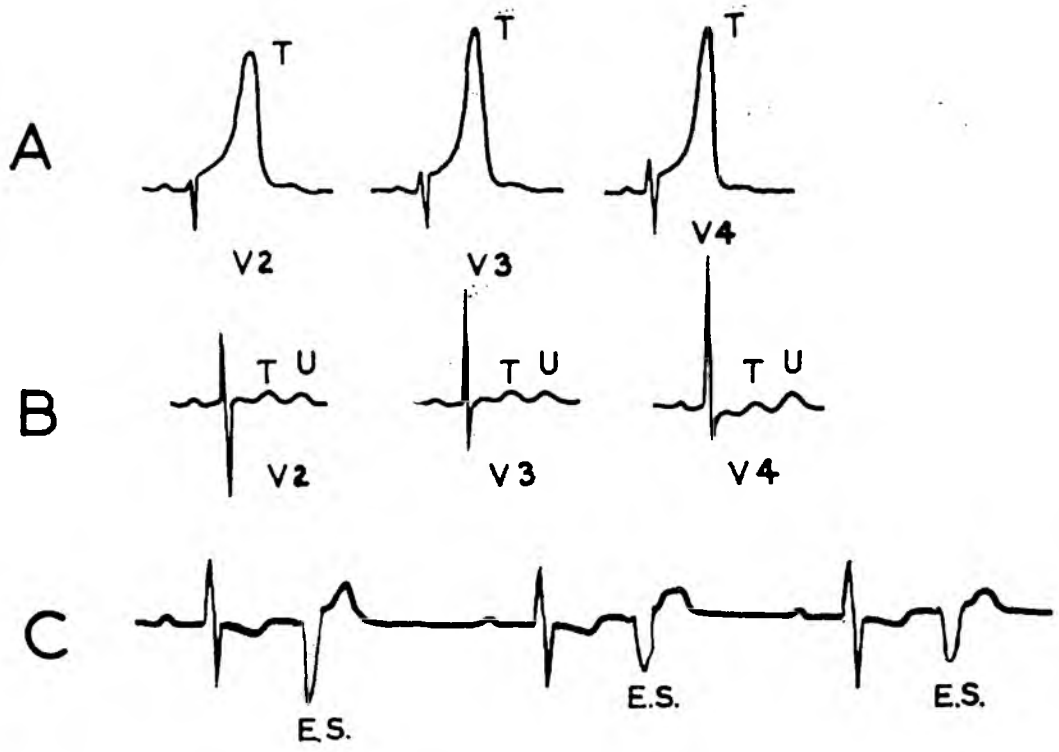


FIG. 9

A. Hyperkalaemia. Tall peaked T waves; diminished amplitude of R waves.

B. Hypokalaemia. Prominent U waves; flattening of T waves; slight ST depression (V 4).

C. Digitalis toxicity. Coupled ventricular ectopics of multifocal origin; prolongation of PR interval; sagging ST segment.

common change is sagging of the ST segment which may mimic myocardial ischaemia. Bradycardia, prolongation of the PR interval and occasional ventricular ectopics are also common. More serious toxic effects of digitalis are infrequent in the absence of overdosage or hypokalaemia secondary to inadequately controlled diuretic therapy. In these circumstances ventricular ectopics become more frequent, they may be coupled (FIG. 9C), multifocal in origin or progress to ventricular tachycardia. Complete heart block or paroxysmal atrial tachycardia with block may develop.

SUMMARY

In this paper the more common E.C.G. abnormalities encountered in clinical practice have been outlined and explained in an attempt to clarify their interpretation.

ACKNOWLEDGEMENT

I am very grateful to Dr. R. M. Marquis for helpful advice on the preparation of this paper.

TO AWAKE A SLEEPING BEAUTY

John Wallwork, B.Sc.

Every year over 1,000 hospital admissions for accidental poisoning, attempted suicide, or drug overdosage occur in this city and there is no doubt that the size of this problem is increasing.

A large variety of drugs are taken and the specific treatment of the more common poisonings is adequately dealt with in an excellent monograph of Mathew and Lawson. It will help however to consider some general principles of how to tackle the acute problem clinically. You can :

(1) Prevent the drug entering the body's circulation (stomach washouts)
(2) Prevent the drug reaching its site of action once in the body
(3) Prevent the drug from exerting its effect at this site by
    (a) direct competitive inhibition
    (b) providing alternative metabolic pathways to overcome drug action
(4) Enhance the rate of drug metabolism
(5) Remove the drug from body—(diuresis, dialysis).

Of these methods, the first, and the last to a lesser extent, is widely used in practice in this country. Again I refer you to Mathew's book for the details.

I am interested in the third of these, that is to prevent the drug from exerting its effect at its site of action by providing alternative metabolic pathways, with particular reference to barbiturate poisoning, which constitutes the largest single group of agents encountered in clinical practice.

Before we can antagonise a drug's action in this way we must know where that site of action is, and how the drug works.

Let us look at a little simple biochemistry. The main biochemical pathway for the production of energy is the metabolism of glucose. Represented in a simplified form.

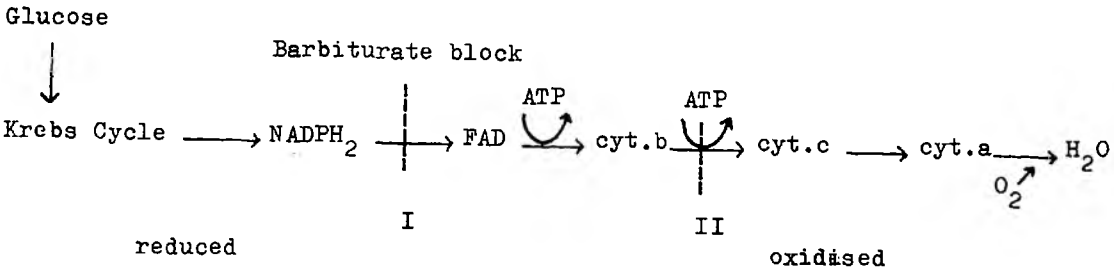
Glycolysis → Krebs cycle → E.T. Chain → Energy.

Theories concerning the mode of action of barbiturates on this system have varied. Early work by Brody and Bain suggested that the action of barbiturates was mediated by an uncoupling of oxidative phosphorylation. However Aldridge and Parker (1960) showed that inhibition of respiration occurred without uncoupling, in liver mitochondria; more important from our point of view, they also showed that the inhibition produced by barbiturates on the respiration of mitochondria, did not occur when succinate was used as substrate instead of glucose. It was concluded that the block must occur somewhere before the entry of succinate into the metabolic process.

Elaborate techniques used by Chance and Hollinger in 1965 corroborated this work.

Imagine the process as a production line with substrate in a reduced form at the left and products in oxidised forms to the right. If we stop this continuous process somewhere in the middle, there will be a build up of reduced substances to the left and a depletion of oxidised substances to the right of the block. The substances involved can be measured in both their oxidized and reduced state in the presence of a barbiturate in the metabolic pathway. Therefore the site of block in the chain can be determined by the point at which the transition between elevation of the reduced proportion and depletion of the oxidized proportion of such substances occurs. This is then the site of action of the barbiturate.

Chance and Hollinger showed a build up of reduced $NADPH_2$ and a depletion of oxidized cytochrome b in the presence of barbiturate and concluded that its site of action must be between $NADPH_2$ and FAD cyt. b (Site I in diagram). If the site of action had been site II then they would have observed an accumulation of reduced cyt. b and depletion of oxidized cyt. c.



It can be concluded that barbiturates prevent respiration of liver mitochondria by inhibition of the metabolism at the site shown ($NADPH_2$/cyt. b).

This is very satisfying biochemically, but all this work was done in vitro, a long way from the complicated structure and mechanism of whole brain. Does barbiturate have the same action in whole brain?

We designed an experiment on the hypothesis that barbiturates have the same site of action in vivo and in vitro. It involved anaesthetising rats with a barbiturate and giving them a substrate, metabolised in brain, which enters the pathway before the proposed site of action (we used pyruvate), and one that enters after the proposed site of action (we used succinate). We observed.

This sounds easy. However, the difficulties in administering substances to the brain in known concentration are great. The substances we used, pyruvate, succinate, are utilized by other tissues in the body; they are also highly ionized and therefore will not easily cross the so-called blood-brain barrier.

Recently new techniques have been developed to overcome such difficulties, some of great sophistication; we used a rather crude but effective technique.

Once the rat is anaesthetized by an intraperitoneal injection of barbiturate, a small hole is bored at a particular point on the skull. Substances are then injected in small volumes into one of the lateral ventricle of the brain, through a special needle so designed that the depth from guard to tip is the depth required to reach the lateral ventricle in rats of a certain weight.

Using this technique the experiment was elaborated using three groups of rate of the same age, sex and weight. One group received standard dose of barbiturate alone, one group barbiturate and intraventricular succinate and the other group barbiturate and intraventricular pyruvate. The sleeping times of all rats, that is the time from onset of anaesthesia to time of arousal, were determined.

Other variables were eliminated by using

(1) Rats of the same strain and weight and receiving a standard dose of barbiturate I.P.
(2) Starved rats, so that absorption from peritoneum would be more predictable.
(3) Male rats since Brody has shown that barbiturates have different lengths of action in different sexes.

The results were striking. There was no significant difference in the control group and the group given pyruvate; both groups having sleeping times of around 100 minutes. However, the group receiving succinate had a mean sleeping time of around 30 minutes. This is a highly significant difference.

It can be argued that succinate in some way decreased the concentration of available barbiturate either by increasing its metabolism or by inactivating it. In order to eliminate this possibility, samples of blood were collected from all rats by decapitation at the time of arousal. The blood barbiturate levels were estimated. The levels in the blood of the succinate group killed at around 30 minutes were found to be significantly higher than the levels in the control and pyruvate group killed around 100 minutes. This was to be expected if the succinate did not affect the barbiturate blood level and it was concluded that the

action of succinate must be central in the brain. (Intra cellular oxidation at reversal level).

From these results we can postulate that our original hypothesis was correct since, like the mitochondria discussed earlier, the rats could utilize succinate for energy production, to overcome the barbiturate anaesthesia, but were not able to utilize pyruvate. We therefore concluded that the barbiturates act in the similar way in whole brain as they do in isolated mitochondria.

The question now arises as to whether the action of barbiturates cannot be reversed in humans, if succinate can reverse barbiturate anaesthesia in rats. This seems to be a good idea, but I have already mentioned difficulties due to blood-brain barrier effects, which would exclude the possibility of using succinate intravenously. In fact two workers, Soskin and Taubenhous, tried this, with no effect, in 1943, long before Kregs invented his cycle.

It is difficult to persuade anybody that boring holes in human heads to inject directly into brain tissue is of justifiable therapeutic value. And the present mortality rate after hospital admission is small, due to the extensive supportive therapy employed in overdose treatment.

It has been suggested that we perform cysternal punctures in particularly ill patients but this is a difficult and not widely practiced technique and would be available only to the few.

We must use an intravenous route of administration if this method of treatment is to be useful and we must therefore modify the succinate molecule in some way. It occurred to us that the answer might be to make a fat-soluble succinate molecule with the active site free. It could enter the brain and still act as a substrate for metabolism. A substance that appeared to have the required physical properties was monoethylsuccinate, highly soluble in water and organic solvents.

$CH_2 — COOH$	$CH_2 — COCH_5$
$CH_2 — COOH$	$CH_2 — COOH$
succinate	monoethylsuccinate

Finding a recipe to make this substance proved to be more difficult. However, we now have a whole 50 grams and hope to begin work soon. The theory is that this substance will enter brain in sufficient concentrations and will be split by esterases to give free succinate and, incidentally, ethyl alcohol to bring you round drunk.

As I have already indicated, barbiturate poisoning is a major problem. Much time and money and many lives could be saved if every doctor in the land could wake these sleeping beauties with a simple injection.

There is a long way to go. This is only the beginning.

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THE TREATMENT OF HEAD INJURIES

J. W. Fowler, M.B., Ch.B., F.R.C.S.E.

Trauma has become the endemic disease of modern civilisation. Head injury occurs in 70% of all injuries and causes death in 25%. The number of significant head injuries is rising year by year as shown by the table of the figures at the Royal Infirmary of Edinburgh.

TABLE 1

Year	*Number*
1962	830
1963	691
1964	941
1965	1020
1966	1251

In no other system of the body is a knowledge of the functional anatomy more essential than in the diagnosis and treatment of the head-injured. The brain is contained loosely within the bony skull. It is separated from it by the meninges and by a subarachnoid layer of cerebro-spinal fluid (C.S.F.). The brain maintains continuity with the bony skeleton by means of the cerebral veins which pass from the cortical surface to the dural sinuses. The width of the space between brain and skull depends on brain bulk. Thus in states of cerebral atrophy due to age or disease the space will be increased.

The bony confines of the skull consist of a smooth vault and occipital region. In relation to the anterior extremity of the temporal pole lies the exremely sharp area of bone, the lesser wing of the sphenoid. The skull contents may be divided into a supratentorial and an infratentorial portion. The features which influence the symptomatology in the supratentorial area, other than those described, are the arrangement of certain blood-vessels and nerves in relation to the bony skeleton. The middle meningeal vessels, entering via the foramen spinosum, run laterally along the floor of the middle fossa, extra-durally, carving a groove in the bone. In the lateral wall of the middle fossa this may become a bony tunnel, thus enclosing the vessels and making compensatory movement in any direction impossible.

The third nerve runs anteriorly from the mid-brain, along the medial side of the tentorial hiatus to pierce the dura at the side of the posterior clinoid process; lying immediately laterally and superiorly to it is the uncus of the temporal lobe.

The infratentorial space is small in volume with a smooth bony lining and contains medulla, pons, and cerebellum. Superiorly it is limited by the unyielding tentorium which splits peripherally to enclose the transverse and sigmoid sinuses.

PATHOLOGY OF SKULL INJURY

Brain injury may result from two forms of trauma:—

a) Static in which local damage to the skull is sustained, with little underlying damage to brain substance.

b) Acceleration/deceleration injuries in which bony injury is slight and brain damage severe.

a) Static injury

In this the head is stationary and a force acts directly on the skull. This usually causes a depressed fracture with local damage to the underlying brain. The mechanism is usually an object such as a stone or a hammer, etc., hitting the skull.

b) Acceleration/Deceleration injury

This is the form of injury as occurs when a person falls to the ground and strikes the head, or in car accidents, where the deceleration is severe and sudden.

The degree of injury produced by deforming forces depends upon both direction and momentum of the deforming force. The brain is free to move in an antero-posterior plane to a much greater extent than in a lateral one because of the stabilising action of the Falx. Thus frontal or occipital injury tends to produce the most severe brain injury. In acceleration/deceleration injury the lines of stress are maximal in the region of the brain-stem.

At the moment of impact there is severe distortion of the brain substance. The brain then accelerates in the direction of the force. When the skull comes to rest, the brain is carried into it by its momentum, thus being injured at two places a) at the site of the injury and b) at the point opposite to the injury, the 'contra-coup' effect. There may also be injury to the supporting veins.

In severe distortion not only does brain move in relation to skull, but grey matter moves in relation to white.

In concussional head injury the degree of displacement is slight, there is only physiological disturbance of function, followed by complete functional recovery.

More severe displacement causes the condition of contusional injury in which unconsciousness is prolonged, and initial recovery imperfect; and lastly laceration of brain substance where residual deficit always remains.

The first decision regarding a brain injury is whether there is a significant injury or not. The seriously traumatised patient presents no problem. It is in the minor head injury that difficulty is experienced in selecting those cases requiring close observation.

There are three criteria employed in assessing the need for admission to the Head Injury Unit of the Royal Infirmary of Edinburgh, viz.,

a) A period of unconsciousness, however brief.

b) Skull or spinal fracture.

c) Should clinical judgement indicate that a period of observation be necessary, e.g. a history of high velocity accident with no apparent deficit.

There are two purposes of admission of a head injury to hospital, observation and secondly treatment.

Trauma to the head can cause death by both the severity of the original injury and by late complication of the injury.

The accurate assessment of a head injury depends upon the course the level of consciousness has followed from the time of injury, combined with the findings of the clinical examination.

The vital importance of a knowledge of the conscious level immediately following the accident cannot be over-stressed, therefore a history must be obtained from witnesses or the ambulance driver. In the South-eastern area of Scotland every ambulance carries a head-injury card which is pinned to the patient. On this is noted the state of consciousness of the patient at the time of the accident, in transit and on arrival in hospital.

Once in hospital a full neurological and general examination is carried out. Speed is essential in the care of the severely injured patient, and the development of a set routine is imperative for this.

1) The airway must be cleared and endotracheal intubation carried out if indicated.

2) The pupils, head and neck must be inspected for signs of cerebral compression or obvious cranio-cervical injury.

3) The blood-pressure and pulse must be recorded and an intra-venous infusion set up. Shock must be immediately treated. It is advisable to set up an I.V. infusion in any moderately traumatised patient, even if shock is absent, as the handling necessary in the proper assessment may produce collapse, and at this stage great difficulty may be encountered in setting up an I.V. infusion. Blood

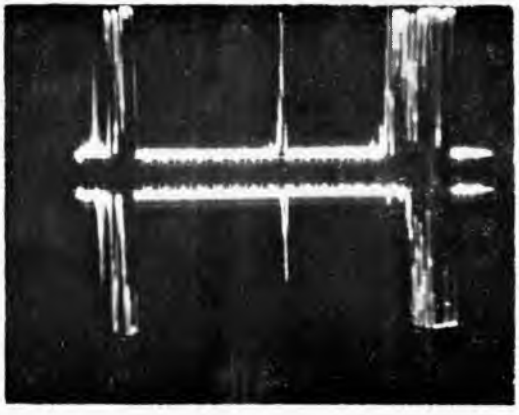
should be withdrawn for cross-matching at this point.

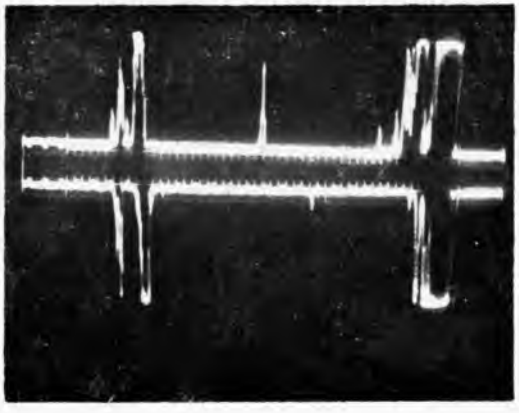
A note should be made of the conscious level; whether the patient is lucid and well-orientated, will obey commands easily and at what level of complexity, or whether he is drowsy but responding, reacting to the various degrees of pain, etc.

Clinical, radiological and echo-encephalographic base lines having been established, the patient's vital signs are monitored at frequent intervals, every 15 minutes in the first instance and increasingly as the patient recovers.

The treament of the primary pathology of brain injury or uncomplicated skull fracture is observation.

Echo Tracing





The pulse, blood-pressure and respiratory rate are recorded.

The neurological findings are noted.

Radiological assessment is then carried out. This should include four films, namely postero-anterior, lateral and townes views of the skull, and at least a lateral view of all seven cervical and first thoracic vertebrae. An echo-encephalogram is helpful at this stage. Essentially this consists of placing a probe in the temporal region of the skull and sending high-frequency sound waves through the bony structures to bounce off the mid-line structures. A polaroid photograph is then taken of the tracing.

The probe is used from right to left and from left to right. The mid-line structures should coincide in both directions. The ECHO is a very useful ancillary investigation which may give some warning of an intra-cranial haematoma. The displacement has to occur at or near the temple however and an occipital or frontal displacement may not be shown. Too much reliance must not therefore be placed on this investigation.

THE VITAL SIGNS

1) Pulse

An injured patient will usually have a tachycardia. This will gradually fall to a normal level with rest. In the face of intra-cranial compression the pulse may show an initial increase in rate, and then a progressive fall, the rate of fall depending upon the rate of accumulation of clot or swelling of brain. Should the rate fall to 60 beats or less/min. then cerebral compression should be assumed until proved otherwise.

2) Blood pressure

In the face of cerebral compression the vasometer centre is rendered anoxic. It responds firstly by causing a widening of the pulse pressure, followed by an increase in both systolic and diastolic pressures. Terminally there is cardiovascular collapse.

3) Respiration

In cerebral compression this shows a progressive fall in rate, maintaining a regular rhythm initially, but becoming deeper. It then

becomes periodic (Cheyne-Stokes breathing) followed by respiratory arrest.

4) Conscious level

This is the most reliable of all the clinical signs. The patient may become a little confused having been lucid previously. He may become dysphasic and will become gradually more and more unresponsive as the intra-cranial pressure rises.

5) Neurological state

a) The state of the pupils is of vital importance. Change in pupillary reaction is usually a late sign of cerebral compression. At first the pupil on the affected side may be smaller and then a little larger than its fellow, but react to light, at first briskly and then more and more sluggishly, until it remains dilated and fixed. The homolateral is the first affected. This is due to the depression of the uncus into the tentorial hiatus, leading to compression of the third nerve. As the pressure grows, the mid-line is displaced to the opposite side and the contralateral third nerve is then compressed, leading to bilateral dilated pupils.

In the face of greatly raised supra-tentorial pressure the medial aspect of temporal poles herniate down through the tentorial hiatus causing compression of the mid-brain structures.

b) Limb signs. In the classic intra-cranial haematoma the motor cortex is compressed leading to contra-lateral limb spasticity with positive Babinski response. As the pressure rises, and the mid-brain is compressed, the contra-lateral cerebral peduncle becomes compressed by the margins of the tentorial hiatus, leading to ipsilateral limb spasticity and positive Babinski response. It is therefore vital to assess all signs in conjunction.

The most important feature in the build-up of an intra-cranial haematoma is depression of the level of consciousness, with associated increasing restlessness. Again it should be stressed that it is the change in conscious level from the time of the accident that is important.

Any alteration in the vital signs calls for urgent reappraisal of the clinical situation.

The person who has been severely injured may be unconscious at the time of the accident and remain so. The level of consciousness and reactivity to stimuli being noted, it is then possible to assess whether the conscious level improves or not.

Should it improve, then the care of the unconscious patient is all that is necessary.

Should the level deepen, then urgent reassessment and a search for cerebral compression should be carried out. If the reason is not readily apparent, then burr-hole exploration at least should be carried out.

TREATMENT OF PRIMARY PATHOLOGY

The three main causes of unconsciousness are:—

a) Diffuse neuronal disruption.
b) Brain-stem injury.
c) Cerebral compression.

Immediate treatment of all unconscious patients:—

1) Clearing and maintenance of the airway.
2) Emptying of stomach via naso-gastric tube.
3) Regular monitoring of vital signs.
4) Treatment of any cuts, with Anti-tetanus toxoid and penicillin cover.
5) Care of the bladder; initially use only Paul's tubing and only catheterise if absolute retention occurs.
6) Maintenance of electrolyte balance.

THE DECEREBRATE PATIENT

In acceleration and deceleration injuries the brain-stem bears the brunt of the force. Injury to this area causes unconsciousness with decerebrate signs in all limbs. The state is present from the time of injury and should be diagnosed when this is so.

The clinical signs of brain-stem injury are:—

a) Unconscious from the time of injury,
b) Decerebrate rigidity,
c) Hyperpyrexia,
d) Constricted pupils.

Should all these conditions not apply, then cerebral compression should be assumed and the appropriate action taken.

PRIMARY BRAIN-STEM INJURY

In this injury the most dangerous complications are decerebrate rigidity and hyperpyrexia.

Decerebrate rigidity causes increased intra-thoracic pressure with increased central venous pressure, and raised intra-cranial venous pressure. Thus any small haematoma may be rapidly enlarged. The increased muscle activity will cause an increase in the level of CO_2

production, and this, along with an interference with respiration, will lead to acidosis and cerebral vein distension.

The hyperpyrexia, which is partly produced by damage to the regulating mechanism, and partly by increased heat production from muscle activity, causes a reflex increase in the respiratory rate; this leads to a less effective inspiratory volume and may lead to oxygen lack.

The decerebrate rigidity and hyperpyrexia may be treated by giving Sparine or Largactil 100 mg. t.i.d. or q.i.d. as necessary. Once the diagnosis of brain-stem injury has been made, it is beneficial to place the patient on an artificial ventilator and curarise him. This is followed by a fall of all the parameters to normal. It is normal to continue ventilation for 48 hours.

Other methods of cooling include aspirin, tepid sheets and fanning. Cooling should be started early, when the temperature is on the rise, and should be aimed at keeping a core temperature of 98-99° F. Shivering should not be induced as it would increase the heat production.

Still under primary pathology may be considered :

DEPRESSED FRACTURES

These may be divided into two groups, namely

a) The smooth depression of less than the cortex in depth, and

b) The sharp spiculated depression.

The first needs no treatment other than that of the unconscious patient. The second requires elevation of the fragments.

Should either injury be compound, then operative intervention is indicated, with excision of the wound, autoclaving and replacement of the fragments, if possible, and antibiotic cover, usually penicillin and sulphadiazine, together with anti-tetanus toxoid.

TREATMENT OF SECONDARY PATHOLOGY

Secondary pathology may be listed as follows:—

1) Extra-dural haematoma

2) Sub-dural haematoma

3) Rhinorrhoca

Aetiology: Fractured nose including cribriform plate. This indicates that the subarachnoid space is compromised and the patient in danger of contracting meningitis.

Treatment: (a) Conservative, prophylactic antibiotics, Penicillin and Sulphadiazine. The patient warned not to blow the nose.

(b) *Opertive*: If the discharge is profuse or continuous for ten to 14 days, operative exposure and dural closure is undertaken.

Otorrhoea. CSF discharge from the ear almost always ceases spontaneously.

4) Brain swelling

5) Traumatic epilepsy

6) Meningitis

7) Hydrocephalus

8) Pulmonary oedema

9) Gastric erosion.

EXTRA-DURAL HAEMATOMA

In the early stages, the haematoma being extra-dural, there is no associated brain damage. As the pressure builds up the cortex becomes progressively compressed and if it is not relieved death occurs. The decompression of an extra-dural haematoma should be carried out swiftly by the diagnosing doctor or unit, unless access to a specialist unit is available within a few minutes. Should this not be done, then a patient, potentially curable, may be condemned to decerebration or death.

Extra-dural haematomas lie mainly in the middle temporal fossa. They are close to the site of injury or occasionally contra-coup. They are usually due to rupture of a branch of the middle meningeal artery or vein. Occasionally they may be frontal or occipital in situation, due usually to venous damage.

The mortality of operating upon a conscious patient is 5%. It becomes 75% when pupillary dilatation or unconsciousness supervenes. The morbidity is even higher.

Operative treatment of extra-dural haematoma.

The burr hole.

The first is placed at the site of the fracture or haematoma. Should this be negative, then one is placed in the contra-coup area.

PLACEMENT OF BURR HOLE

i Contralateral to hemiparesis
ii Side of Dilating Pupil
iii Side of superficial Haematoma
iv Side of fracture.

SUBDURAL HAEMATOMA

The primary pathology is usually acceleration/deceleration injury with severe brain distortion and either rupture of veins, laceration of brain or both. The haematoma usually arises from injury to parietal or temporal poles, or occasionally from the tearing of a cerebral vein.

The haematoma may be fluid or clot. It is usual to do six burr holes in an exploration for a sub-dural haematoma. In the acute subdural following localisation of clot, it is usually necessary to do the appropriate craniotomy. The chronic subdural, which is usually fluid, can be released via burr holes. These are bi-frontal, bi-temporal and bilateral posterior parietal. They are all carried out bilaterally because 50-70% of subdural haematomas are bilateral. Should a fluid haematoma be encountered, then all that is required is that it be washed away with saline using a fine rubber catheter, introduced via a burr hole. A clotted sub-dural haematoma requires the turning of a bone flap.

Again it should be stressed that the compression caused by the haematoma causes severe brain damage, and should be relieved as soon as possible after diagnosis. Once the clot has been released through a burr hole, then time is available for the transfer of the patient to a specialist unit, or for the flying squad to reach him.

BRAIN SWELLING

Cerebral oedema consists mainly of an increase in intra-cellular fluid, with some increase in interstitial fluid. This causes great expansion of the brain tissues, and ultimately compression of the brain within the bony skull. The supratentorial increase in pressure may cause coning (downward herniation of the uncus through the tentorial hiatus) and death. Brain swelling may be local or diffuse; it may appear quickly or take some time to develop. The signs of cerebral swelling do not differ in any way from the clinical picture of raised intra-cranial pressure. If there is any doubt then burr hole exploration should be carried out to exclude any remedial cause.

The actual pathology of the situation is far from clear; possibly following the distortion and cellular damage oedema occurs as in any other situation; this in turn causes congestion and occlusion of blood vessels, leading to anoxia which further increases the damage, leading to further oedema. Superimposed upon this may be an obstructed airway, low pO_2, increased pCO_2, all leading to cerebral vascular dilatation and stasis and a decrease in general cerebral perfusion.

The brain tissue is therefore subjected to:—

a) Increased tissue tension,
b) Vascular occlusion,
c) Anoxia,
d) Raised venous pressure.

It is not altogether surprising that it reacts as it does.

TREATMENT

Accurate diagnosis and the exclusion of intra-cranial clot is the first step.

Should the oedema become intractable then internal decompression is done; this involves removal of the affected part if it is destroyed, or of one of the silent areas usually the right frontal lobe. This allows the remaining brain tissue room to expand. It is of no avail to remove part of the skull, as the brain herniates through the space, causing kinking of the veins and venous infarction thus serving no purpose.

Osmotic diuresis induced by mannitol 25% procures a little time; the effect lasts for 3-4 hours and is usually followed by further and often increased cerebral oedema. During this time, dexamethazone, an anti-inflammatory steroid, may be given, 10 mg. I.V. to start with and then 4 mg. q.i.d., reducing the dosage over the next eight days.

VENTILATION

By placing the patient on a ventilator three things are accomplished:—

a) Normal O_2 saturation to the brain tissue.
b) The pCO_2 level may be maintained at 30 mm Hg. At this level there is slight intra-cranial vascular constriction thus reducing the tissue tension.

c) Any increase in temperature or muscle tone can be abolished.

It is usual to keep the patient on the ventilator for 48 hrs., the oedema usually subsiding in this time.

TRAUMATIC EPILEPSY

This occurs in 3-5% of head injuries. It may be either immediate or delayed.

Epilepsy may be a manifestation of contusion, laceration or overlying haematoma. Treatment consists of excluding an overlying haematoma and controlling the fits. This may be carried out using Epanutin, and if this is unsuccessful, Valium may be used. Should these be ineffective, then I.V. Paraldehyde or a Pentothal drip may be used.

MENINGITIS AND HYDROCEPHALUS

The treatment of these conditions is standard.

PULMONARY OEDEMA AND GASTRIC OR DUODENAL EROSION

These are infrequent complications of head injury. They are mediated via the hypothalmic nucleus and the autonomic nervous system.

Experimentally pulmonary oedema may be abolished by the beta sympathetic blockade using propranolol. In practice, it may be adequately treated by positive pressure ventilation which drives the fluid back into the capillaries.

Gastro-intestinal bleeding must be treated in the usual manner.

In the case which presents difficulty or which is deteriorating slowly, or remaining static, angiography may be employed. These investigations will usually show the position of any surface or intra-cerebral clot.

The management of the head-injured places a premium upon accurate initial clinical assessment and continuous reappraisal. It makes definitive thinking and action imperative. In no other area in the treatment of the accident case, can lives be saved so easily or ruined so completely.

My thanks go to Mr. J. F. Shaw for his advice on the preparation of this article.

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AUTO-IMMUNITY
FACT OR FICTION

Alasdair K. T. Conn

Read before the Society Wednesday 14th January 1970

The recognition that the mammalian organism is capable of developing an immune response against its own normal tissue components has aroused interest in the implication of auto-immune reactions in human disease. This interest may, however, be too widely applied, and the label "auto-immune" may be applied to a particular clinical entity with a complete disregard for the rather exacting criteria which this aetiology demands; indeed one might say that the word auto-immune is almost synonymous with the word idiopathic, in the clinician's dictionary.

Some definitions first. By auto-immune disease it is widely understood that there is a failure at some point for the body to differentiate between its own tissue components and those of a foreign material; it can no longer distinguish, if one likes to put it in more crude terms, between "self" and "non-self". Consequently the host launches an immunological response towards its tissue components, with the resulting pathological changes and clinical manifestations.

The subject of auto-immunity has however, like so many other intensely investigated fields been clouded by vague and indeed, often confusing, terminology. The term auto-immunity at present enjoys the widest use, and under this rather nebulous heading are included many diseases resulting from the reactivity of antibodies directed toward the host tissues. These diseases range from Hashimoto's thyroiditis, and rare forms of haemolytic anaemia right through to disseminated lupus erythematosis, rheumatic fever and dermatomyositis.

Before we even begin to consider exactly what significance the immunological response has in these diseases, we can perhaps make a few pertinent points.

First, it can be shown, and this will be discussed in more detail later, that the auto-immune process plays an intricate, and perhaps as yet incompletely revealed part in the process of cellular damage. It still remains to explain how the process came to be in existence; so that, when we use the term auto-immunity we are describing a particular pathogenic mechanism; we are not forwarding an aetiology. Auto-immunity is a process, like degeneration is a process; it does not explain how this process came about.

Second, auto-antibodies, and, presumably, auto-reactive delayed hypersensitivity, can occur as a result of tissue damage. Trauma to an organ may lead to cellular necrosis and death, with the liberation of tissue components, and these tissue components may elicit an immune response; but this need not be an aggressive respanse. One example is that of the post myocardial infarction, or Dressler, syndrome. Following myocardial infarction, antiheart antibodies, as detected by both indirect immofluorescence and antibody consumption tests were present in the serum of recovering patients, but absent from that of controls. Following recovery, the levels of these antiheart antibodies fell to undetectable levels. Dressler suggested that cardiac necrosis may lead to this auto-immune response. In rabbits certainly, animals immunised against rabbit heart do not develop any histological changes in the myocardium, despite high levels of circulating antibody. Kaplan found transient antiheart antibodies were sometimes

present after heart operations, especially commissurotomy. Antibodies to liver are found in rats following administration of hepatotoxic agents. Therefore the demonstration of an auto-immune response, i.e. the detection of antibodies towards the host's own tissues, does not seem, in itself, to provide good evidence that tissue damage in disease has an immunological cause.

Unfortunately this concept is not so well instilled into many of our minds as it could be. Auto-immunity is not synonymous with auto-aggression. And yet, the immune mechanism need not invariably benefit the host — the anaphylactic response, with its often fatal outcome, is a dramatic example to the erring physician.

It may be seen that an auto-immune process can play a part in the perpetuation of a pathological situation. A question that must be answered is that if, once initiated, the process is self-perpetuating, or whether the original perturbation is necessary for the continuation of the pathological state. In other words how important is the immune process in the prolongation of the disease. This problem can be tackled from several angles.

One must be immediately put on one's guard by the observation that many auto-immune antibodies can be present without overt pathological damage. The Wasserman reaction, for example, demonstrates antibody to cardiolipid — a phospholipid which occurs in mitochondria of mammalian cells. This auto-antibody develops after several types of virus infection, including vaccination and glandular fever; diseases in which there may be minimal observed tissue damage. It is perhaps worthwhile first to consider that perhaps if the spirochaete had not been observed and isolated in cases of syphilis, this disease too, in the light of a positive antibody reaction to heart tissue, may have been found in the ranks of the auto-immune disorders.

One method of determining the relationship of the genesis of the sensitised state to the prolongation of the clinical disease is to see if damage to the corresponding organ follows injection of extracts of various tissues, and if, once initiated in this way, the process is self perpetuating. Field and Laspary attempted this with testis and brain and found that the lesions produced in the target organs tended to decrease in intensity once the course of infection was terminated. However, the organ that has received the greatest amount of attention concerning this aspect of research has undoubtedly been the thyroid gland. It was early discovered that the serum of patients with Hashimoto's thyroiditis contain auto-antibodies against thyroglobulin, that this antibody is organ specific and that it does not cross react with extracts of thyroid glands from the six other mammalian species studied. Since then, antibodies toward microsomal thyroid antigen have been discovered. Experimental immunization of animals with homologous or autologous thyroid extracts should, and indeed does, lead to the production of circulating thyroid antibodies and to lesions within the gland virtually indistinguishable from the pathological appearance of Hashimoto's disease. There is, however, no consistent relationship between the level of circulating antibodies and the severity of thyroid lesions, at least in neither rats nor rabbits. However, the injected extract has an important bearing on the results — aqueous preparations of thyroglobulin are rapidly catabolised and do not persist as a sustained stimulus. In the case of injections of thyroglobulin incorporated with complete Freund's adjuvant the stimulus is sustained. Homologous thyroid extracts without adjuvant do not produce a rise in antibodies or a thyroiditis, it is only when thyroglobuln plus adjuvant, or thyroglobulin that has been altered chemically by coupling onto a diazonium derivative is used that any measurable response is obtained. Once the hypersensitive state is attained, using altered thyroglobulin, subsequent injections of unaltered thyroglobulin do not perpetuate the response indefinitely. An interesting result since recent work has demonstrated that thyroglobulin is physiologically secreted into the lymphatics.

We saw that in the case of Hashimoto's thyroiditis which has been experimentally induced, the level of antibodies does not correlate well with the degree of pathological damage within the gland, and so we need to consider the relative importance of delayed hypersensitivity and antibody, or humoral factors in auto-immune disease. In certain cases, for example the haemoloytic anaemias, the antibody is almost certainly more important. In the experimental field a transient allergic glomerulonephritis can be induced by the transfer of large amounts of serum from an auto-immunized host developing antibodies towards its own kidney.

In other auto-immune disorders however,

delayed hypersensitivity may be important. Evidence that both delayed hypersensitivity and antibody production was important in the pathological response was forwarded by Brown et al, working on experimental orchitis in guinea pigs. They defined a system, using differently prepared tissue extracts, whereby in some animals only antibody toward the testes developed, and others in which only a delayed hypersensitivity phenomenon developed. In neither case was there a characteristic orchitis. Only when antibody was transferred to animals of the delayed hypersensitivity type, or cells transferred to the animals in whom antibodies had developed was the characteristic testicular damage obtained. So in this experimental situation both and cell mediated factors may be important.

Whilst we know that auto-antibodies may be present in a large number of diseases, what do we know of the aetiology of these so called auto-immune diseases. There may be several ways in which the auto-immune process may be initiated and the aetiological factor might have to be present for the auto-immune process to be continued. One needs to consider the several types of auto-immune disorder.

First, there is the group of diseases in which the auto-immune disease follows infection; and the obvious syndrome illustrating this is rheumatic fever, following a streptococcal infection of the throat. Kaplan has shown that auto-antibodies to heart occur in acute rheumatic fever and that some, but not all, of these react with streptococci. Rabbits immunized with streptococci develop auto-antibodies, and antibodies toward human heart. It may be that the antigens of streptococci and heart tissue are similar or it may be that streptococcal antigens react as haptens.

Let us now consider some auto-immune diseases such as thyroiditis. Current thinking about aetiology of this condition must surely change, for although the label auto-immune is applied, it is, as I have endeavoured to explain, merely describing the process, not the aetiology. Current thought revolves around the discovery that often a family history is obtained in these patients, and that many people who are clinically normal have high levels of thyroid antibodies, within these family groups. Indeed Hall and Stanbury having recently examined a number of families affected by the condition have shown that the incidence approached 50% in siblings and that there is almost invariably an abnormality in one or other parent of an affected patient. This is compatible with dominant inheritance, and in the families they examined figures approaching theoretical were obtained. In other families, both other genetic factors and indeed environmental pressures such as iodine deficiency, puberty, pregnancy and viral infections, may need to be suitable before the disease manifests itself.

Experiments in the New Zealand Black Mouse strain and its hybrids are also of interest here. Mice of this strain appear normal at birth, but between four and nine months of age develop a haemolytic anaemia analogous to human auto-immune haemolytic anaemia. The first abnormality detectable is that their circulating red cells begin to give positive direct antiglobulin tests and eventually the test becomes positive in virtually 100% of the mice. The results of crossing of this type with other strains show that the auto-immune character of NZB mice is expressed in different ways, but is present in its F_1 hybrids. It is not influenced by the sex of the NZB parent and this indicates the transmission of disease to the offspring is not sex linked, and the milk factor does not seem to be involved.

How might — and I assume for the process of hypothesis — this genetic abnormality of the thyroid manifest itself in physical terms?

It could of course be a lesion leading to faulty protein structure within the thyroid follicular cell. This might lead to abnormal release of normal constituents and this continuing cellular damage might elecit the "auto-immune" response. If this is so, one might wonder why the clinical presentation is so late in life. Environmental reasons have already been proffered but it is worthwhile remembering that diseases such as Huntingdon's chorea, widely recognised by clinicians as an autosomal dominant inherited disorder, does not normally present until the middle thirties in those affected and it may be even later.

This is an attractive hypothesis, for it may also lead to an understanding of the association of auto-immune thyroiditis and of Addisonian pernicious anaemia, the latter being a disease in which over 80% of patients have antibodies to gastric parietal cells. The thyroid and the gastric mucosa have a common embryological precursor — namely the endoderm — and furthermore several similar biochemical functions — for example, the ability to concentrate iodine. It might be considered that if a biochemical defect existed in the

thyroid cell, and there are a vast number of possible defects, some of them might not only affect thyroid biochemistry, but gastric metabolism as well, the two cells sharing common pathways.

Another defect might be that instead of the thyroid being abnormal there is defective control in antibody production. I find this less satisfying; why is the "control" always lost to certain specified organs — thyroid, gastric mucosa, adrenal glands. On the tissue defect hypothesis it might be said that if the defect were in a more vital tissue — muscle, liver — this would be incompatible with life and the conception would never go to term.

The aetiology of auto-immune diseases may also be infection. Subacute sclerosing panencephalitis is a degenerative disorder of the brain, the exact aetiology obscure. Antibodies to brain were discovered in these patients and the label auto-immune attached to the syndrome. It is only recently that antibodies to measles virus have been isolated in these patients, and it may be that the virus is slowly causing brain cell damage and subsequent immune response. This syndrome may be elevated from auto-immune status to delayed infection status, a much more clearly comprehended pathology.

And so, the course is clear. Research must now be directed towards distinguishing auto-immunity as an epiphenomenon after tissue injury, from that which is more intimately concerned with the pathogenesis of specific disease. That the body can produce antibodies to its own cells is fact, but this does not imply disease, indeed the increase of lymphosarcoma in patients with intensive immusuppressive therapy, and the increase in incidence of bowel tumours in patients with multiple myeloma might suggest that immune processes play an important part in the clearing of cellular debris and the prevention of abnormal or neoplastic cells arising. A full answer must await the elucidation of the control of the immune response, its magnitude and direction, and a fuller understanding of what is so vaguely termed immunological response.

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OFFICE-BEARERS FOR THE 234th SESSION

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A LIBRARY SETS SAIL

M. F. Macnicol

Hurry down New Bond Street too fast and miss the main entrance of the Sotheby saleroomsIt is a small fronting done out in fading cream paint with the apologetic air of a second rate bookie's office. But inside the building expands into a veritable Ali Baba's cave for there is no denying the pivotal position of Sotheby & Co. in the world of fine art, of books, of the rare and the beautiful. The front entrance is, by some quirk, no more than a curious self-effacement in the centre of exhibitionist London, and the eighteenth Egyptian dynasty animal statue (circa 1320 BC) perched above the twin doorways and entitled SEKHMET appears to be having the last laugh.

To reach the book auction room situated at the rear of the building a tricky negotiation is necessary through ranks of intensely preoccupied dealers and collectors. Jade, china, the finest teak, silverware and worked ivory meet the eye. The book saleroom, in comparison, is plain indeed. It contains an ell with the auctioneer's stand, a central table with chairs grouped about it, and wooden book shelves reaching almost to the ceiling. The familiar vellum and calf bindings of the RMS collection look uncomfortable and seedy in the unaccustomed surroundings. No longer wedged together in mutual support or tucked away in gloomy corners the books show a sad state of dilapidation. Flapping covers, stripped backs and cracked spines interrupt the eye's movement along each row of shelves, while the strings encompassing each lot turn the appearance of the books into slaves waiting in the market. Sadly disused slaves they are, ready for new masters after two centuries of increasing dust and corrosion.

The sales begin "at eleven o'clock precisely each day", by which time the buyers for Rota, Dawson, Elliot, Quaritch and other firms interested in the collection have taken up strategic positions. Private collectors are present too, but do not change the atmopshere of cool professionalism that contrasts with an earlier view of a Sotheby book sale by the 18th century caricaturist Rowlandson who depicted delightfully the rivalling expressions of buyers in his day. Nevertheless there is drama enough as the price for a book slides slowly up in efficient increments — £2, £5, £8, £10, £12, £15, and so on. Sir John Kerr, the auctioneer, pushes the figures up quietly and the bidders indicate continuing interest with minimal gestures: a pencil half raised, the dip of a sale catalogue, a nod of the head. Like horns and hospitals, too much vocal bidding is frowned upon.

It is a pity that subject grouping of the books proved impossible in the sale. Instead, the listing was in alphabetical order of authors, and this meant that some rare bindings, such as the 17th century vellum enhancing the folio volume of Hooke's "Micrographia", were broken to release a text of lesser value. However the general condition of the books was so woeful, more as a result of desiccation and destructive handling than of damp that the criticism of the presentation of some of the finer volumes is unfair. Dr. Feisenberger had done a fine job.

The first section of the sale, A—F, occupied two mornings in February 1969. Bright's "Reports of Medical Cases" (1827-31) went for £1,600, a good price for a rare complete set of an outstanding medical text with superb illustrations and the classic account of Bright's disease. A similar figure was reached with Baer's "De Ovi" (1827), a very rare first edition of the discovery of the mammalian ovum. Interest in plastic surgery was shown by the £1,400 fetched by the Carpue first edition (1816) on rhinoplasty which describes the restoration of lost noses to 'two officers of His Majesty's army' by a Hindu operative method employing a forehead skinflap. £400 was paid for a Dieffenbach on a similar subject. Claude Bernard's papers on glycogen formation in the liver fetched £1,200 ("L'Origine du Sucre") and £380 went to a lesser volume, high prices to pay unless one is a collector eager to complete a set. A non medical book written by Caesalpinus in 1583 on the classification of plants sold for £1,200 and a very rare first edition by Auenbrugger, who first discussed the use of percussing the thorax as a means of diagnosis, fetched £750, a figure rather below the market value (though who can accurately predict the monetary value of the rare?). Sixteen works by the physicist Boyle averaged £100 apiece, and those of the neuroanatomist Sir Charles Bell £50 each.

The G—M portion of the sale produced its own surprises. Low prices were paid for a number of the 17th and 18th century collected works: only one of the John Hunter volumes exceeded £50 and the three sets of Galen's opera averaged £20. However £950 was reached by Guillemeau's "The Frenche Chirurgerie" (1597), of which only eight other copies are recorded, four in the U.K. and four in the U.S. A collection of Medical Dissertations submitted at Edinburgh University in the 19th century fetched £2,800 and included Joseph Black's dissertation "De humore acido a cibis orto et magnesia alba" (1754), perhaps the most important scientific dissertation ever to be submitted by a student. Hooke's "Micrographia" fetched £750, a book on the anatomy of the silkworm by Malpighi (of Malpighian tubule fame) sold for £380 and, in a later sale, a discourse on bones by Clopton Havers (thus the Haversian system in bone) drew £280. £300 apiece were received for Hewson's "Experimental Inquiries" (1771) (containing the first complete account of the lymphatic system) and Laennec's "A Treatise on the Diseases of the Chest" where he described the use of an early stethoscope. Two first editions of Jenner's findings with the Variola Vaccinae (1798) fetched £480 and £420 respectively, and two later editions (1799) yielded half that value.

In the third part of the sale the highest figure for a single book was attained with the £2,000 for Parkinson's classic account of the Shaking Palsy (1817), one of the rarest medical texts with no copy available in London, including the British Museum. Despite strenuous efforts to procure this book for Edinburgh the bidding finally rested against the name of a Mr. Campbell whose identity remains a mystery. Two 16th volumes by Vesalius fetched £520 and £300, while the collected monographs of Sir J. Y. Simpson reached the respectable figure of £400. The Society withdrew a later presentation copy of his book on anaesthesia (1849) which is of low financial value but of considerable worth to the RMS.

Runs of various journals fared rather poorly. Undoubtedly the most valuable were the Philosophical Transactions of the Royal Society of London, our incomplete set fetching £2,800. Transactions of the Royal Society of Edinburgh sold for £900 and the Proceedings of both Societies for over £500 each. Our runs of BMJ fetched £600, of Lancet £520, of the Journal of Mental Science £400 and of Practitioner £16.

Two other books in this part of the sale sold for over £200, "Die Cellularpathologie" by Virchow and "Opuscula Anatomica Nova" by Riolanus (1649). Riolanus was a persistent critic of Harvey's view on the circulation of the blood and for twenty one years subdued Harvey sufficiently to stop him from writing further on his revolutionary concept of unidirectional blood flow.

This third section of the sale in October 1969 included the largest proportion of the library, over 600 lots accounting for 5,000 books (many of which contained several titles) and 2,700 periodicals. While much of this number was dross, there were good pickings to be had, and dealers and librarians were on their toes for bargain lots. By far the largest proportion of the collection will be housed in the Middleton library, Wisconsin; Helen Crawford, medical librarian of that institute attended all three sales and came away well satisfied with a strong representation from the RMS collection. Her calculations show that, in comparison with the Aberdeen Medical Society Library sale in 1967, prices were up by 44% on comparable volumes. Excluding 16% of the total books in the RMS sale which fetched identical or lower prices than the earlier sale, the average price of the books increased 54%, and this over a matter of 2 - 3 years. Little wonder the book business continues to thrive. So far the sale has brought in almost £105,000, excluding the interest charged by Sotheby & Co. A further portion of the library has yet to be sold at the time of writing this article, and it should be remembered that some 300 books have been retained because of their intrinsic value to the Society. With the departure of the majority of our books comes a time of unparalleled financial stability for the Society, and if this means a greater exercise of imagination and enquiry is possible for its members, the departure of the Society's books will not have been in vain.

RESEARCH PROJECTS

STUDY OF THE INHIBITORY ACTION OF MARBORAN ON THE REPLICATION CYCLE OF COWPOX VIRUS

Yvonne Morris

The project undertaken involved a study of the effects of the inhibitor N-methyl isatin thiosemicarbazone (Marboran) on the replication cycle of cowpox virus in monolayers of baby hamster kidney cells (BHK).

The cytotoxic effects of Marboran on the BHK cells were studied and were found to be directly related to the time of exposure to the inhibitor with a maximum tolerated dose of Marboran of 30/UM/ml. after 7 days. This drug concentration was subsequently used to avoid the occurrence of a cytotoxic effect of Marboran masking any cytopathic effect (CPE) of the virus when both inhibitor and virus were used in conjunction.

A study of the replication cycle of cowpox in BHK tube culture yielded one-step growth curves for extracellular virus, cell-associated virus (CAV) and total virus. Infected tube cultures with no added inhibitor were used as experimental controls producing normal one-step growth curves for CAV, the virus titre reaching a maximum of $10^{-3.3}$ 24 hours after infection. The eclipse phase was found to last approximately 10 hours by which time the virus time had risen to that of the original inoculum. Maximum inhibitia of replication occurred when Marboran was introduced to cultures 2 hours post-infection, the virus titre having fallen from the normal virus growth curve value of $10^{3.3}$ to $10^{1.33}$. It was apparent from the results that, when inhibitor was used, there seemed to be a prolongation of the eclipse phase since titres took as long as 24 hours to reach the initial inoculum level of $10^{1.6}$.

From the results obtained it seemed that Marboran in some way interfered with the M-RNA responsible for the synthesis of "late" proteins which include those structured proteins necessary for viral maturation. Further support has been given to this theory by studies of the cytological changes occurring in coverslip monolayers of BMK cells when infected with (a) cowpox virus alone and (b) with virus treated with 30 μM/ml. Marboran. The development of "B" and "A" type inclusions was shown to occur in both (a) and (b). Since, therefore, the Marboran had no effect on the development of the "B" inclusions which are associated with "early" protein and DNA synthesis, the inhibitor would apparently be acting later in the replication cycle.

There is some evidence, however, that the inhibitor may act earlier. The fact that maximum inhibition occurred when Marboran was added 2 hours post-infection may be significant.

I should like to thank Dr. I. W. Smith of the Department of Bacteriology for all the help and advice given during the period of this project.

POSTERITY'S INHERITANCE MECHANISED?

Richard De Soldenhoff, B.Sc.

Practically anything written in medical journals at present concerning computers may quite safely be considered 'topical' or 'exciting' or 'relevant to the future'. The term 'computer revolution' is bandied about and we are told time and again that every practising doctor will have to acquire considerable knowledge of computers in order to make full use of their services.[1]

But in every ointment there is a fly. We must not get carried away in our enthusiasm to throw all our information at some unsuspecting programmer and say, "feed it in". The fear of being "dazzled by optimistic claims" has been lately expressed[2] but it is doubtful that much attention will be payed to it in this, the Poseidon nickel rush of medicine in the seventies.

There is great need for all medical people to fully realize the potential of this not too awesome omnivorous machine and to budget carefully and after considerable thought.[3] Medical records is a bit of a latecomer to this field, and only recently has money been placed at the disposal of experts to work this one out. It is often thought that medical records breed. They are certainly multiplying at a great rate and their retention and storage for indefinite periods of time pose great problems.[4] Piles of bulky folders take up a considerable amount of space, and, in the wards, while leafing through mounds of paper for relevant documents, much valuable information might be overlooked. The problems of record computerization are legion[5,6] and some projects have already fallen foul of them.[7] There are many ways of approaching computerisation of records but all are costly and take some time to run smoothly.

Logical thought is an absolute prerequisite and some may consider this as an advantageous part of a young doctor's training for grappling with the problems of diagnosis, evaluation and treatment.[8]

The most possible, recent suggestion for practical use and not purely academic application comes from Glasgow, where it is suggested that records over six years old be destroyed and replaced by a concise synopsis or discharge letter, now legally acceptable.[3] This offends many who plead for their retention for future research or quote examples such as the patient who returned to hospital with a swab left behind twelve years earlier.[9] Evidently one per cent of the ten-year-old notes are used in any one year and a different one per cent will be used the next year presumably. Is this on its own surely not enough to justify retention? But this problem of space seems insuperable. Computers, it is suggested, may prove to be the only answer and the question now is exactly how is the 'software' — the form of data processing and programming for such a system to be organised. In addition it must be decided which medium is to be used for long term storage of information. Punch cards are very bulky when stored in numbers and paper tape is inconvenient for quick searching or for correction of mistakes, but both of these can be transcribed to magnetic tape for storage. This can be fed into the computer very quickly (approximately eight minutes to search the whole of a two thousand, four hundred foot reel of tape) and is the most convenient way of storing years of detailed information. One magnetic tape costs less than £30 and the

American Medical Association has full information as to the date of birth, medical education and qualifications, type of practice, American board affiliations, speciality society membership and much other pertinent information on each of its 318,000 United States physician members. This is all stored on a Systems 360/Mod 40 computer using five tapes.[10] With this number of tapes it is a fairly simple matter to keep the information up to date. In addition an extra copy of all the records can be kept elsewhere in case of damage to the master-tapes.

It is by no means a swift process to change from one system to another. Some small research studies have all the 'hardware' they need at close proximity but may take up to three years to begin their study after extensive systems analysis, charting information flow, deciding on the nature of the terminals to be used and debugging (or removing errors) from programs. When all this has been done, a parallel operation of both the old and new systems would be advisable until the staff are fully educated and also to iron out the many problems which will eventually arise, evaluating and modifying continually taking place. All this, and more, offer a feasability study has been done.

Thus it should be obvious that the wheels of the computer revolution turn rather slowly, and must be continuously coated with an expensive oil. The day is not far off when medical students will, with physics, chemistry and biology, be entering their University career to a study of if not computer programming, then certainly some forms of information handling.

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MALCOLM MACNICOL, B.Sc., M.B., Ch.B., took an honours B.Sc. in Pharmacology, and ex-editor of Res Medica and as Librarian of R.M.S. was instrumental in initiating the sale of the books. He is presently house physician in the Royal Infirmary.

ALASDAIR CONN was Senior President of the Society 1969/70 and originally presented his article as a dissertation to the Society. He is an honours graduate in Biochemistry.

JOHN WALLWORK is another honours graduate in Pharmacology and was Second Junior President 1969/70. His article is extracted from his dissertation to the Society. He is also, and incidentally, business manager of this journal.

BOOKS

Human Nutrition and Dietetics. Davidson and Passmore. E. & S. Livingstone Ltd., Edinburgh.

This new fourth edition is presented in much the same way as the old edition but has the added benefits of the advances made in the knowledge of nutrition and dietetics during the past three years. The amount of detailed knowledge so presented is vast. The lucid manner in which this book relates biochemistry, disease, and therapy produces not only an outstanding text book for nutritionists and dietitians but also a useful reference book for readers from a wide variety of fields. Parts one, two and three — 'Physiology', 'Food' and 'Primary Nutritional Diseases' — contain invaluable reading for the student of preclinical, physiological sciences. Parts four, five and six provide useful references for those engaged in clinical study and practice. It is beautifully written. It has a liberal distribution of apt quotations and of sparkling wit which make it all the more readable.

P.A.

Simpson and Syme of Edinburgh. John A. Shepherd. Livingstone. 50s.

This year will see the centenary of the deaths of both James Young Simpson and James Syme, two of the most famous and influential figures of the last century; at a time when Edinburgh medical school was at its zenith.

This was an amazing period to read about. Slander and libel between eminent people flourished as an almost daily occurrence, and Syme was famous for his litigations with colleagues. 'Simpson and Syme of Edinburgh' is a most entertaining book about a quarrelsome pair and the life in the city at that time. A continuous somewhat one-sided comparison is drawn between the two men, being intermingled with university and college anecdotes. Lord Lister's early career is briefly outlined; so too is the development of anaesthesia, a topic about which many journals have recently concerned themselves.

It is sad that Mr. Shepherd did not avail himself of the hand-written dissertations of both Simpson (On the Diseases of the Placenta, 1835) and Syme (On Caries of the Bones, 1821). They were written when both men were members of the Royal Medical Society, and the Society possesses them still.

In spite of this omission this book can be recommended without question as excellent bed-time reading.

R.deS.

Notes for the Guidance of Parents of Diabetic Children. J. W. Farquhar.

Dr. Farquhar has written a splendid little book which every student ought to read for his own education and guidance. He knows from experience the problems encountered and questions asked, and forstalls them with his advice. It is very simple and comprehensive and totally readable.

Any potential paediatrician or G.P. who thinks he knows about diabetes and its management should read this book and be amazed by what he has learnt therebye.

P.G.T.

Early Difficulties with Young Families. Charlotte Himsworth. H. K. Lewis. 45s.

If you are a doctor, a health visitor or a parent, this book might not prove as dreary or as redolent of the back pages of a woman's magazine as it sounds. Written with humour and tolerance, it dissects the family situation very clearly, and shows how disturbing for children, minor parental conflicts can be. Dr. Himsworth's theme is that if small problems are recognised and treated early on then later gross behavioural abnormalities may be minimised. That an intelligent awareness of the parent's personality, of the family situation, and of the medical and social problems involved is the recipe for prophylactic psychiatry.

If you are not interested from a medical viewpoint, as a potential or actual parent you might find it a useful book.

H.B.F.

Modern Trends in Obstetrics. Edited R. J. Kellar. Butterworth. 64s.

Again edited by Robert Kellar, with solid contributions from Drs. Melville Kerr and Robertson, this is a much more vital and interesting book than its companion above. This is probably because obstetrics includes so many partially-explored fields, in which exciting work is being done and new knowledge collected.

All the present growing points are here; coagulation defects, Rhesus isoimmunisation, placental localisation by ultrasonics and isotope techniques.

Every contribution is worth reading; a rare virtue in a book of this nature.

L.C.S.

British Medical Bulletin. "Immunization Against Infectious Diseases". Volume 25, Number 2, May 1969. £2.

The issues of the British Medical Bulletin are always eagerly awaited by many medical and other research workers and some issues have an even wider appeal; the number under review should attract wide interest including that of medical undergraduates. We have come to expect that the Bulletin attracts contributions from distinguished experts in the subject under consideration and this volume is no exception.

Whilst not wishing to detract from the excellent contributions the reviewer feels compelled to remind readers, and particularly undergraduates, that artificial immunization is not the whole answer, nor indeed is it necessarily the long-term answer to the conquest of many communicable diseases; one need only recall the disappearance of plague and typhus from these islands long before immunization procedures were available to emphasise that other measures are also effective in protecting communities against infections. Similarly pasteurization of milk supplies effected a reduction in non-pulmonary tuberculosis incidence before the introduction of BCG vaccine.

Having said this we must again congratulate the contributors in presenting such a wealth of information concerning numerous vaccines in less than 100 pages; all of the papers are worth close study but those of Dr. Dudgeon on Measles and Rubella vaccines and Dr. Tyrrell's paper on vaccination against respiratory viruses were especially welcome to the reviewer.

One can confidently predict that this volume will enjoy wide popularity at a nat-

ional and international level and although its price may seem high to the medical undergraduate he would be well advised to dig into its contents regardless of how he comes by the volume.

R.R.G.

Attachment of the Young. F. V. Smith. Oliver & Boyd. 7s. 6d.

Placental though the title sounds, the author concerns himself with the mechanism and the significance of the imprinting phenomenon—why a duckling follows its mother. In effect he merely provides a review of work already done in this field. It is useful therefore for those wishing a broad grasp of the business of imprinting, for those looking for a source of references, and for those who just want to know what the word means.

M.P.C.

Modern Trends in Gynaecology. Edited R. J. Kellar. Butterworth. 64s.

This is one of the two volumes in this series edited by Professor Kellar, both now in their 4th. edition; Edinburgh is implicated in its authorage, as well as its editorship. The studies done here on ovarian tumours are focussed in print, together with an excellent account of shock, also from Edinburgh. This is not an article one expects to see in a discussion of latest developments in gynaecology, but it proves a concise and valuable account — if not revolutionary.

The promotion or the control of fertility still remains the subject of much discussion, and figures prominently in the topics included. The chapter on psychosomatic disorders must have been included merely as a gesture, for it is sketchy and unconvincing.

A good book for those whose vocation lies in the pelvis.

P.F.R.

Primer of Histopathological Technique. Geoffrey G. Brown. Butterworth. 52s.

Medical students spend most of their course in practical pathology making wild guesses over hot microscopes; the most consistently misdiagnosed feature of their slides being artefacts. The techniques used in preparing histological specimens remain the haziest of concepts in their minds.

This book explains all the mystique in a simple penetrable way. Mainly for the technician, it would however benefit any student who cares to read it, though he may not wish to go to the rather expensive extreme of buying it.

It has a regrettable lack of photographs, otherwise it is a simple and good book, guaranteed to help make histological interpretation less of a black art and more of a rational process.

M.F.O.

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