quoted eight cases, four of which were his own. One of these four proved at necropsy to have had an aneurysm of the right posterior communicating artery which had burst; two others were probably vascular in origin, since in one case there was amnesia and in the other paraesthesiae; and the last of the four—a healthy young woman of 27—was a case of right permanent hemianopia as a result of idiopathic migraine, with sparing of the macula by less than 10 degrees and otherwise a clean-cut vertical edge above and below. She was re-examined six weeks later, but there was no alteration. The ages of these four patients varied from 15 to 67 and all had had proved intracranial vascular catastrophes.

Peter (1938), quoting Charcot and others in their description of cases of persistent quadrantic and hemianopic scotomata following migraine, remarks that other cases have appeared in the literature from time to time; while Adie (1930), drawing attention to permanent hemianopia in migraine, migrainous epilepsy, and spontaneous subarachnoid haemorrhage and their probable interrelationship, describes seven cases in which there was probably a subarachnoid haemorrhage. Dixon (1947), in drawing attention to the frequency of strokes in young adults, mentions four cases of field defect in young people associated with a probable intracranial haemorrhage.

Comment.—In this brief review of the literature 63 cases are mentioned, of which 14 seem to be of true idiopathic migrainous origin, and 49 have been associated with intracranial haemorrhage—a ratio of 2:7. It seems likely, therefore, that many more cases of migraine than appear in the literature would show permanent field defects, that sooner or later a number of these would show other signs of intracranial haemorrhage, embolism, or thrombosis, and that the relationship between migraine, epilepsy, and subarachnoid haemorrhage is closer than has been recognized. Attention is also drawn to its greater frequency in women.

Summary

A case of permanent quadrantanopia subsequent to 20 years of repeated attacks of idiopathic migraine is described.

The probable site of the lesion—at first functional, later organic—is discussed.

A review of the literature revealed only 13 other cases.

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The National Corporation for the Care of Old People has appointed a committee to make recommendations on grants for old people's homes and their welfare services in Scotland. Sir Hector, Hetherington, Principal and Vice-Chancellor of Glasgow University, is chairman of the committee, and the other members are: Dr. A. Greig Anderson, Dr. A. D. Briggs, Dr. R. W. Craig, Miss Grace Drysdale, Prof. Ferguson, and Mr. H. L. F. Fraser. Offices are to be opened at 2, St. Andrew's Square, Edinburgh.

PHLEBOTHROMBOSIS DECUBITI AND PREVENTION OF PULMONARY EMBOLISM

BY

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The assumption that pulmonary embolus is an unavoidable accident is no longer tenable.—J. FINE.

In this article no attempt will be made to describe and discuss the prevention of phlebothrombosis by early ambulation, exercises and massage, or the administration of anticoagulants. Moreover, much as I should like to express my views on the relationship of posture to venous thrombosis, I am anxious to avoid becoming involved in controversies concerning the merits and demerits of Fowler's position. This does not imply that I fail to appreciate that the prevention of phlebothrombosis is an ultimate goal of the combined professions of medicine and nursing. On the contrary, it is because this goal cannot be reached without a numerically enhanced nursing service, including specially trained masseurs, far better laboratory facilities, an unlimited supply and unbridled use of expensive drugs, and, above all, more and better hospital facilities, that I propose to concentrate on how to grapple with the problem as it presents itself in average hospital and private practice in Britain to-day.

We are faced with the fact that, except in a few clinics that are accorded facilities not vouchsafed to any but a mere handful of the profession, there is not one iota of evidence that pulmonary embolus is less frequent to-day than it was ten, fifteen, or twenty years ago. It is for this reason, while continuing to preach the gospel of the prevention of phlebothrombosis instead of sitting with folded hands awaiting the medical millennium, that I propose to concentrate on measures to forestall pulmonary embolism which the clinician himself can inaugurate and carry out if he has the energy and determination to do so.

Fatal pulmonary embolus is always disconcerting. Those in attendance rightly cannot smother a conviction that the visitation should not have occurred. Little wonder that generations of conscientious workers have sought to rid the practice of surgery and gynaecology of a scourge. I envisage (a) the early detection of phlebothrombosis, and (b) the removal of the clot from the femoral vein before it has moved to the heart, as the two limbs of a Colossus astride a subject of fundamental importance to every surgical practitioner.

Early Diagnosis

The temperature chart shows unexplained repeated slight elevations. As the condition is more prone in those past the meridian of life and the highest incidence is between ages 50 and 60 (Fig. 1), if the patient has undergone an operation about a week previously, more particularly if that operation was one of herniotomy, hysterectomy, resection of the rectum, prostatectomy, cholecystectomy, or

FIG. 1.—The age incidence of fatal pulmonary embolism. (A. W. Allen's and other statistics.)

ressection of the rectum, prostatectomy, cholecystectomy, or

for perforated appendicitis, and decidedly if the patient has been nursed with a pillow placed beneath the knees, the well-trained clinician's thoughts should reflexly turn to the veins of the lower extremities. While it is true that the fewer the symptoms caused by phlebothrombosis the greater the danger of pulmonary embolism, it is equally true that the majority of cases of phlebothrombosis decubiti remain undiagnosed until pulmonary embolism has occurred, *because the lower limbs have not been examined*. When all those in attendance are alert to the dangers of clotting in the veins of the legs, when the nurse reports a slight pain in the calf and, in relevant cases (especially between the third and seventh post-operative days), the clinician undertakes routine examinations to exclude phlebothrombosis, then, and then only, is real progress in the prevention of pulmonary embolism likely to occur.

Have the bed-clothes turned up (not down) and display the whole of both lower extremities. Observe the limbs for swelling, which may be slight, fullness of the veins, and a cyanotic tinge.

In suspected early cases proceed as follows:

1. Apply finger-tip pressure over each saphenous opening, and with a stroking motion run the finger down the course of each femoral vein, seeking a segment of unilateral localized tenderness.

2. Let the patient draw up the knees and lie quietly, relaxing the muscles. Begin by palpating the feet for tenderness, especially the medial aspect and behind the internal malleolus (Payr, 1930). Next gently squeeze the calves and then palpate the whole of the thighs systematically, the object being to seek a localized area of muscular rigidity combined with deep tenderness (Frykholm, personal communication).

3. Palpate deeply in the popliteal spaces, noting if there is tenderness here, after which ask the patient to lower the legs on to the bed.

4. Homan's sign. With the knee extended, dorsiflex the foot. Pain in the calf is a positive sign of considerable significance.

5. Compare the femoral pulses. When the femoral vein contains clot the beat of the artery alongside it is usually perceptibly weaker.

If as a result of this thorough examination the diagnosis of femoral thrombosis is reasonably assured, the advisability of exposure of the sapheno-femoral junction should receive every consideration. Removal of clot and interruption of the femoral vein will forestall many pulmonary emboli.

Femoral Thrombectomy

Femoral thrombectomy is not a new procedure. Thirty years ago Sir Carrick Robertson, of Auckland, New Zealand, successfully removed a thrombosis from the femoral vein of Mrs. Bates. In Germany, before the 1939-45 war, Kulenkampff carried out the operation many times. In the U.S.A. in recent years femoral thrombectomy has frequently been undertaken; indeed, in a number of American surgical centres the resident and nursing staffs are trained in the early detection of phlebothrombosis decubiti, and the reports on large series of cases of thrombectomy are highly satisfactory.

Anaesthesia.—I have experienced but little difficulty in carrying out the operation under local analgesia. When, as is sometimes the case, there are gelatinous adhesions between the femoral artery and vein, their separation is painful. In these circumstances, and when the patient is very nervous or grossly obese, local analgesia may be supplemented with a small intravenous injection of thiopentone.

The Incision.—A transverse incision* about 4 in. (10 cm.) long 1 1/2 in. (1.25 cm.) above the saphenous opening has proved adequate.

* Since this was written, A. W. Allen gives good reasons for choosing a vertical incision.

Operation

The inferior lip of the incision being retracted, the saphenous vein as it passes through the saphenous opening is identified and divided between haemostats. After the fascia that constitutes the edges of the saphenous opening has been slit vertically, employing the stump of the saphenous vein as a guide, the femoral vein can be quickly exposed with but little disturbance to it. That this great vein is filled with clot may be apparent at once, but clots cannot be felt unless they are of the most solid character. Employing a Watson Cheyne dissector, the femoral vein is isolated for a distance of about 3 in. (7.5 cm.), exercising gentleness for fear of displacing the clot.

The first aim is to clear the circumference of the upper end of the common femoral vein sufficiently to pass a sling (a narrow strip cut from a sheet of corrugated rubber) around it. Once the sling is in action (see Fig. 2) there is no fear of displacing the clot towards the heart, and the process of freeing the femoral vein and identifying the superficial and deep branches and other radicles can proceed apace. A sling is passed under the superficial femoral vein at the lower end of the wound. Ideally another sling should be passed under the deep femoral vein, but I have omitted this step in most of my cases. Neither the upper sling nor the lower sling is put into action at this stage. The haemostat on the stump of the saphenous vein, which has served well first as a guide and later as a tractor, is removed and the sealed mouth of the vessel is prised open (Fig. 2); scissors are introduced and the common femoral vein is slit for about half an inch.

There is no need to become apprehensive regarding a possible haemorrhagic cascade: if the vein contains much clot there will be no bleeding at all; if it contains loose clot the very thing we want is to let the femoral vein bleed and sweep out the clot. Haemorrhage can be brought under absolute control with the slings. Be assured that with the slings in position the surgeon is complete master of the

FIG. 2.—Femoral thrombectomy. Bisection of the saphenous vein.

FIG. 3.—Clot being expressed from the femoral vein. Some of it is often extruded spontaneously.

situation at any moment. When present, clot is expressed from the distal end of the vein (Fig. 3). By the delicate use of Desjardin's gall-stone forceps a long wormlike clot can often be extruded without breaking it, or at any

FIG. 4.—Clot extractor for use with a suction apparatus. (Made by Hawkins, Ltd.)

rate not fragmenting it. The same procedure in extracting clot from the proximal end is undertaken. If free bleeding occurs the sling is tightened and the next step omitted. A glass tube or, better still, my pattern clot extractor (Fig. 4) connected to a sucker is passed up the common femoral vein into the iliac vein (Fig. 5). Smaller clots can be expeditiously removed by its agency. Ideally there should be bleeding from both ends of the vein. In my experience, when a considerable amount of clot has been extracted it is seldom realized from the distal end.

FIG. 5.—Clot extractor in use.

encouraged to move it from the beginning. Even should there be a clot above the point of interruption of the vein the motive power that sweeps the clot to the heart is lacking, and consequently the danger of pulmonary embolism, at any rate from the iliac vein on the side operated upon, is greatly reduced. In recent cases, with the object of preventing further intravenous clotting, I have ordered the administration of dicoumarol for a week.

More Remote After-treatment.—On the third day the patient is sat out of bed, unless other considerations negative this. Before he gets up, flexible adhesive plaster, with the sticky side outwards (which permits its easy painless removal), is applied from foot to groin, so as to support the whole limb firmly.

Sequelae are surprisingly few. Astounding to relate, there is less swelling of the limb than is observed in cases of thrombophlebitis followed by spontaneous recovery. In the latter case the accepted practice is to keep the patient strictly at rest with the limb elevated for six weeks. Compare from the patient's point of view this tedium with vein interruption and sitting out of bed on the third day. Certainly there is some swelling of the limb, which continues for weeks or months; consequently it is usually advisable for the patient to wear a crêpe bandage for six months.

Less Straightforward Cases

Occasions will arise where the femoral vein is explored and clot within it is not discovered. In these circumstances it is usually advisable to explore the contralateral side, although this step requires the conviction that one is acting in the best interests of the patient. On other occasions when the patient has had a pulmonary embolism and, as always, another (probably fatal) one is feared, and there is no clear guide as to which femoral vein to explore, a most onerous decision has to be made—whether (a) to explore one femoral vein and, if that be fruitless, to explore the other, or (b) to tie up the inferior vena cava.

Ligation of the Inferior Vena Cava

The first case of therapeutic ligation of the inferior vena cava was carried out by Trendelenburg in 1911. The patient had pelvic thrombosis due to puerperal sepsis. After the operation there was dramatic improvement.

Reports of successful ligation of the inferior vena cava in cases of thrombophlebitis of the pelvic veins, and when the patient has had one pulmonary embolism and another is feared, are scattered through the surgical literature of the period between the two world wars. Contrary to what might be thought, this procedure is not a desperately formidable undertaking. It is of course essential that the ligature be applied below the level of the renal veins. To divide the inferior vena cava between ligatures appears to be a better practice than simple ligation; this would prevent late cutting through of the ligatures.

These points were brought out in and this was the impression to be gained from a paper by Wakefield and Mayo, who in 1934 were able to collect 19 cases with recovery of 15. In two instances the patient died as a result of the operation: one fatality occurred on the 23rd day, and was due to the ligature cutting through the vein; in the other case the ligature had been tied above the right renal vein.

During the past few years so much confidence has accrued in America in this to many of us still desperate expedient that in 1947 Veal *et al.* of Washington were able to present 30 cases of their own. In 28 of these the operation was undertaken on account of pulmonary embolism. Of the three deaths following the operation, two occurred in patients suffering from cardiac disease and one was due to pneumonia. It should be noted particularly that no further embolism occurred in any of the cases. So it comes about that there is reason to believe that ligation of the inferior vena cava is a practical proposition likely to save life when employed in appropriate cases at the right time. The difficulty is to be sure that the procedure is indicated. When facilities exist, intravenous injections of diodone into an exposed saphenous vein and subsequent radiography will display information regarding thrombosis of the great veins of the pelvis. The technique of the procedure is set out by Stowers and Grossman (1946).

This is not the place to enter into the technique of ligation of the inferior vena cava. It suffices to say that the operation is well within the competence of the average general surgeon, and the best surgical approach appears to be an extraperitoneal one, very similar to that of exposure of the lower end of the ureter.

Ligation of the inferior vena cava does not produce more than slight disability—oedema of the lower limbs—and this usually passes off in time.

Conclusions

At the present time in Britain there are but few surgeons who have carried out femoral thrombectomy; indeed, the operation has received less attention than pulmonary embolectomy. The latter is a heroic measure requiring

special facilities, special instruments, and special skill. Femoral thrombectomy requires none of these things.

The indications for femoral thrombectomy are: (1) when pulmonary embolism has occurred and mercifully the patient is yet in a fit condition to withstand operation, and (2) when phlebothrombosis decubiti has been diagnosed with some precision.

To endeavour to stimulate surgeons, house-surgeons, and practitioners to undertake a careful clinical examination for phlebothrombosis in relevant cases is my main object in writing this paper.

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TREATMENT OF THYROTOXIC HEART DISEASE BY METHYL THIOURACIL

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While thiouracil has been employed in large numbers of cases of thyrotoxicosis, comparatively little attention has been paid to its use in the cardiovascular complications of that condition. It is the purpose here to survey this aspect of thiouracil therapy. Case histories are recounted, and these are reviewed in the light of the literature.

Patients suffering from cardiovascular disease to whom thiouracil may be administered may be grouped broadly into those in whom cardiovascular disease results from thyrotoxicosis and those in whom it originates independently. In the latter group thiouracil therapy has the same rationale as thyroidectomy has had in the past—that is, a lowering of the basal metabolic rate. It has been given with this aim chiefly to patients with angina pectoris and those with congestive heart failure.

Thyrotoxicosis is a common disorder, but few cases nowadays develop cardiovascular disease: timely operations have in so many instances remedied the condition in an early phase. Nevertheless, most of the published series of cases of thyrotoxicosis have contained several examples of such complications as auricular fibrillation. Thus Himsworth (1944) notes two cases of auricular fibrillation in 33 cases of hyperthyroidism. Grainger *et al.* (1945), reporting 29 cases of thyrotoxicosis, mentions two cases of patients with auricular fibrillation who reverted spontaneously to normal rhythm after treatment by thiouracil. Nussey (1944) mentions four cases of auricular fibrillation in a series of 29 cases of thyrotoxicosis. McGarack *et al.* (1945) reported the effect of thiouracil on 18 cases of auricular fibrillation in a series of 78 cases of thyrotoxicosis. Cookson (1945) mentions 10 cases of auricular fibrillation in 66 cases of thyrotoxicosis, and more recently Cookson and Staines (1947) reported eight patients out of 16 with

auricular fibrillation who reverted to normal rhythm. Wilson (1946) noted six cases of auricular fibrillation in 66 cases of thyrotoxicosis.

The material in the present series comprises 10 patients with cardiovascular disease associated with thyrotoxicosis—seven women and three men, whose ages ranged from 41 to 81. The longest history of symptoms was eight years, the shortest a few weeks. The increase in basal metabolic rate ranged from +14 to +55%, and the lowest blood cholesterol before treatment was 106 mg. per 100 ml. There were six cases of nodular hyperplasia and four cases of diffuse enlargement; the type of enlargement did not affect the response to treatment. They have been observed over a period of 8 to 18 months.

In four patients with established auricular fibrillation various complications caused failure in each case. There were two patients with paroxysmal auricular fibrillation, in both of whom treatment was successful. Of the two patients with hypertension and cardiac enlargement one showed only slight improvement, the other none. Striking improvement resulted in the patient with angina of effort, who was able to resume work after being completely incapacitated. One patient with premature contractions and gross diminution of cardiac reserve was much improved, and was able to do her housework.

Case Histories

Case 1.—A man aged 41 was diagnosed as suffering from thyrotoxicosis in 1940. In April, 1946, auricular fibrillation began. When seen six weeks later he showed typical thyrotoxic signs and symptoms. The thyroid was diffusely enlarged. There was no cardiac enlargement or any sign of valvular disease. Auricular fibrillation was present; the heart rate was 120 and the blood pressure 130/70. There was no cardiac failure. The basal metabolic rate was +45% and blood cholesterol 155 mg. per 100 ml. On methyl thiouracil therapy the B.M.R. fell to -10% and the blood cholesterol rose to 283 mg. Cardiac rhythm was restored to normal by 50 gr. (3.2 g.) of quinidine two weeks after starting thiouracil administration. After eight months methyl thiouracil had to be withdrawn because of granulopenia. The patient continued at work, against advice, from February to June, 1947, during which time he took sedatives, and then agreed to thyroidectomy. He has since been quite free from symptoms, the heart remaining in normal rhythm throughout.

Case 2.—A man aged 68 presented with sacral pain following an infected pilonidal sinus. On examination he was thyrotoxic, with slight exophthalmos and a nodular goitre. Auricular fibrillation was present. The heart rate was 124 per minute; the blood pressure 185/90 and there was marked arteriosclerosis. The heart was enlarged and the sounds weak; there was no evidence of valvular disease. He made steady improvement on methyl thiouracil for three months, when obvious chemosis and exophthalmos developed. He was admitted to hospital and treated with Lugol's iodine and 200 mg. of di-iodotyrosine daily; later, deep x-ray therapy to the pituitary gland was given. In two months the right eye developed an exposure keratitis and hypopyon, necessitating evisceration. After a very stormy convalescence he recovered, and eventually was discharged, still with fibrillation between 80 and 90 a minute and a blood pressure of 170/90.

Case 3.—A woman aged 46 presented with nervousness, depression, palpitations, and occasional irregularities of the heart. When seen in 1946 she was thyrotoxic and had an adenoma of the right lobe of the thyroid. There was no congestive failure; fibrillation was present at 140 a minute, with a radial pulse deficit of 16 a minute. Blood pressure was 130/80. Screening showed a typical heart of mitral stenosis. The electrocardiogram revealed auricular fibrillation with right ventricular stress. She made a good response to methyl thiouracil therapy, but on her return home various functional symptoms supervened and she decided to undergo operation.

Case 4.—A frail old lady of 81 presented with thyrotoxicosis and general slight thyroid enlargement. There was no cardiac