of movement at the hip-joint—that is, increasing the external rotation and adduction, and diminishing (even abolishing altogether) internal rotation and abduction. Should the diminution in abduction and in internal rotation be sufficient to cause disability, then the arc of movement at the hip-joint can be restored to its normal by a subtrochanteric osteotomy of the femur—that is, the malunion at the junction of the neck and head, brought about by nature, can be counterbalanced by a second malunion of the femur in its upper third, brought about by the surgeon.

In this group come not only those patients who present themselves with a coxa vara without previous symptoms, but also those patients seen at or soon after the occurrence of slipping and in whom closed reduction by gradual traction has failed or has been deemed inadvisable.

PERSISTENT ARTHRITIS OF THE HIP-JOINT

Yet a final group remains, in which persistent arthritis of the hip follows a slipping of the epiphysis. In these patients one assumes that the blood supply of the head has been permanently damaged, so that the head of the femur undergoes partial or complete necrosis. We are familiar with this in the case of a transcervical fracture of the neck of the femur, in which it happens more commonly, because the blood channels in the ligamentum teres are more likely to be still patent in the adolescent than in the adult. Complete separation of the epiphysis must, one argues, cause necrosis of the head, unless the ligamentum teres vessels are still patent and escape damage. The importance of preserving this remaining source of blood supply is a further argument in favour of the gradual method of reduction in preference to the rapid. I have said that persistent arthritis of the hip may follow a slipping of the epiphysis. Perhaps it would be more correct to say that it may be the sequel to a slipped epiphysis that has been treated; for it is just as likely that the remaining vascular supply to the isolated head is damaged by the forcible man-handling of the limb by the surgeon at the attempt at its reduction, as that the damage is done at the time of the slipping. The slipping can only destroy the blood supply originating from the neck; the forced manipulations of the surgeon may destroy in addition the vessels of the ligamentum teres.

Persistent arthritis of the hip is easy to recognize clinically, and the *x*-ray photograph shows an old slipped epiphysis, with consolidation between the epiphysis and the displaced head, diminution of the joint space, and increasing deformity and destruction of the head of the femur. Arthrodesis of the hip-joint is recommended as the best treatment.

SUMMARY

Treatment for a slipping of the upper epiphysis of the femur may be summed up as follows:

1. When the slipping is gradual and incomplete, relief of weight bearing must be maintained until the new position has been consolidated.
2. When the slipping is rapid and complete, gradual correction should be done by skeletal traction, followed by relief of weight bearing until the new position is consolidated.
3. When the sequel to the consolidation in the new position is an alteration in the arc of movement at the hip, leading to loss of function, a subtrochanteric osteotomy is necessary.
4. When the sequel is a persistent arthritis of the hip, the hip-joint should be arthrodesed.

REFERENCES

- ¹ Key, J. A.: *Journ. of Bone and Joint Surgery*, January, 1926, p. 53.
- ² Wilson, P. D.: *Journ. Amer. Med. Assoc.*, November, 1924, p. 1749.

A CASE OF BRACHIAL EMBOLECTOMY

BY

A. GRAY BANKS, M.D., F.R.C.S.ED.

SURGEON, EAST SUFFOLK AND IPSWICH HOSPITAL

A general labourer, aged 66, was admitted to the East Suffolk and Ipswich Hospital with a double hydrocele. His cardio-vascular condition previous to operation was noted as unsatisfactory. The apex beat was in the sixth interspace outside the nipple line; a soft systolic mitral murmur and occasional extrasystoles were present; at the aortic area a systolic murmur and prolonged second sound. Marked arterio-sclerosis; Corrigan pulse. Blood pressure: systolic 220, diastolic 85. The patient said he had been under treatment for heart trouble several years before, but had not noticed anything wrong lately beyond slight shortness of breath, although his work was strenuous.

Radical operations were done under spinal anaesthesia. On the morning of the ninth day he complained of numbness and loss of power in the right forearm and hand, with pain just above the bend of the elbow. The hand and distal two-thirds of the forearm were pale and cold, with a dusky ring of injected capillaries at the upper end. The radial pulse was absent, but normal pulsation could be felt in the brachial artery, just above the elbow.

Operation.—Under local anaesthesia a four-inch incision ending at the elbow crease was made along the line of the artery, and the vessel gently mobilized, two small lateral branches being carefully preserved. A light intestinal clamp was placed on the artery two inches above the bifurcation, and an opening one centimetre long was made, one inch above the latter. There was no flow from the lower end. A pair of fine curved sinus forceps was passed down into the distal end, and an embolus three-quarters of an inch long, with rounded ends, was fished up. A little leakage then occurred from the lower end of the vessel, which was gently milked upwards in case any further clot were present, although this seemed unlikely from the character of the embolus and the short time elapsing between onset and operation. The artery was sutured with fine thread soaked in liquid paraffin; interrupted sutures piercing all the coats were used. On releasing the clamp, excellent pulsation was immediately felt in the radial at the wrist, and under the suture line. During the operation the parts were soaked with 1 per cent. citrate solution from time to time. The wound was closed with one layer of silkworm-gut sutures in the usual way, and a light splint applied to immobilize the elbow, the hand being left free.

The radial pulse remained full and regular, and the arm warm and of normal colour. The splint was removed in a few days, and the elbow gently moved only after the tenth day. When seen two months later the hand and arm were normal, and pulsation could be clearly felt along the whole of the exposed length of artery. Beyond a little shortness of breath, his heart was not giving any trouble, and he was doing his ordinary work.

SOME GENERAL REMARKS

Arterial emboli are less common in the upper than in the lower extremity, fewer than half of the recorded cases being axillo-brachial. In Danzis's¹ collected series of twenty-eight embolectomies, five were brachial and five axillary. The proportion is much the same in a series of cases published by Einar Key,² to whom, and his Swedish colleagues, we owe the pioneer work on this subject. Two interesting cases of brachial embolectomy are described by Lerman, Miller, and Lund,³ illustrating some special points in connexion with this operation in the arm.

Jefferson's⁴ case was the first published in England, and is worthy of perusal. He draws attention to the causative role of heart disease in the recorded cases. Bull of Oslo estimates that in 80 per cent. of all cases there is a diseased heart, the left side being the usual source of the embolus. These emboli are often multiple; post-operative, more frequently single.

In placing the site of the embolus it is well to remember that it tends to lodge either at the bifurcation of the brachial artery or at the junction of a large branch—for example, the profunda—with the main trunk. The exact site of the initial pain is a very important guide. Occasionally a lump may be felt in the course of the artery at the end of the pulsating area.

The general operative technique follows the usual lines of arterial surgery. The operation is best done under infiltration anaesthesia. The utmost gentleness in manipulation and the careful preservation of any small branches are essential. The wound is kept moist with 1 per cent. citrate solution to prevent coagulation. If the embolism is at the bifurcation, the incision in the artery (which need not be more than one centimetre long), must be made above the embolus; if thought to be at the junction of the profunda branch, the incision would be sited below it, and the embolus and any clot extracted distally. It may come away on releasing the clamp, or it may require to be milked out or extracted with forceps. In a late case, secondary thrombosis may be extensive, and

the radial artery difficult to clear. In one such case the radial at the wrist was opened, a cannula inserted, and the vessel flushed through with a syringe and 2 per cent. citrate solution. A continuous stitch is probably better than interrupted sutures, but, in a small artery like the brachial, more liable to tear, unless great delicacy in handling is observed. Fine waxed thread is the ideal suture.

Prognosis

As regards prognosis, the time element is the crucial factor. Key states that three-quarters of all brachial or axillary emboli do well if operated on within ten hours of onset. Early operation means less secondary thrombosis. In bifurcation emboli, the arm should be immobilized in comfortable extension for a few days, the hand being left free. The further outlook depends on the origin of the embolus or the gravity of the heart disease. Secondary fatal emboli have occurred in cases already successfully operated on for the same condition. A study of the literature shows, as might be expected, that the most favourable cases are those following operation, and without grave heart disease, the patient being still under observation—conditions ideal for early diagnosis and treatment.

REFERENCES

- ¹ Danzis: *Amer. Journ. Surg.*, 1928.
- ² Einar Key: *Surg., Gynecol. and Obstet.*, 1923; *Lyon Chir.*, 1928.
- ³ Lerman, Miller, and Lund: *Journ. Amer. Med. Assoc.*, 1930.
- ⁴ Jefferson: *British Medical Journal*, November 28th, 1925.

ETIOLOGICAL FACTORS IN HYPERPIESIA *

BY

C. W. C. BAIN, M.B. OXON., M.R.C.P. LOND.

PHYSICIAN, HARROGATE INFIRMARY

Hyperpiesia is a malady in which there is a raising of both the systolic and diastolic pressures. Two points in this definition require emphasis. First, the pressures must be sustained. It is well known that excitement will cause a rise in the blood pressures, especially in the systolic pressure; no blood pressure should be accepted as high until the examiner has satisfied himself that the patient is entirely at his ease. Secondly, in the diagnosis of hyperpiesia the diastolic pressure is more important than the systolic. The systolic pressure is liable to be affected by conditions, such as arterial sclerosis and aortic regurgitation, which have nothing in common with hyperpiesia. A patient with a diastolic pressure of less than 85 mm. of mercury is not suffering from hyperpiesia. As an instance, a patient has had a systolic pressure of 200 mm. or over for eighteen years. Her diastolic pressure has never exceeded 80 mm., however, and now, at the age of 80, she is in good health, without symptoms referable to the circulatory system.

Anyone showing a sustained blood pressure of 150 systolic and 90 diastolic should be regarded as a potential hyperpietic, and should receive treatment aimed at lowering his pressures. Should true hyperpiesia develop, both pressures will tend to rise progressively. At first the increases may not be maintained, and the pressures may vary considerably from time to time. Indeed, hyperpietic crises are liable to occur at any stage of the disease with swift, large elevations of the pressure. The height which the pressure may finally attain in any patient will depend upon the severity of the disease. Usually the systolic reaches a level of 200 to 300, and the diastolic from 110 to 160.

After a time the cardio-vascular system responds to the stress of these continued high pressures by structural

changes, which are permanent. The heart hypertrophies and enlarges to the left, the "cœur de sabot" of French radiologists. Obliterative changes take place in the arterioles; the intima hypertrophies and the lumen may become quite obstructed. This arteriolar hyperplasia is widespread, but it affects particularly the kidney, pancreas, spleen, and suprarenals. The muscular tissue of the arteries hypertrophies, while the elastic tissue degenerates and fibrous tissue takes its place. The thickening of the vessels can best be observed in the retinal fields, since these are the only small arteries that can be seen. When this second stage of hyperpiesia has been reached a raised blood pressure is necessary for the circulation to be maintained through the capillaries. Even if it were possible to lower the pressure permanently, the patient would not feel better for the change. On the other hand, a temporary reduction of the load under which the cardio-vascular system is labouring may afford a needed rest to the heart and vessels, and may postpone a breakdown.

In the third stage of the disease the cardio-vascular system wears out, and death occurs, either by the bursting of a cerebral artery, or from failure of the circulation consequent on the exhaustion of the heart. Occasionally, when the requisite head of blood is no longer forthcoming, elimination through the kidneys fails completely, and the patient dies in coma.

It is generally accepted that hyperpiesia is due to a contraction of the arterioles. The velocity of the pulse wave, or the time taken by the blood stream to travel from the subclavian to the radial at the wrist, may be twice as fast in patients with high blood pressure as in normal subjects. Yet the total velocity of the blood flow, or the time taken by the blood to make a complete circuit, is not increased at all. Using the histamine flush method devised by Weiss, Robb, and Blumgart,¹ we have confirmed their findings that the times are normal, or else prolonged if the heart is beginning to fail; they are never rapid. The acceleration of the flow in the arteries is therefore compensated by the obstruction offered by the contracted arterioles, or rather the raised pressure is itself compensatory to the arteriolar contraction.

* Read to the Section of Hydrology and Climatology at the Annual Meeting of the British Medical Association, Eastbourne, 1931.