treated by abdominal prostatectomy. The status of the operation is therefore not a fixed one. Furthermore, any relative contraindication to abdominal surgery—i.e., obesity or a bad chest—constitutes an important indication for transurethral surgery. In this series 99% of all cases were treated by punch prostatectomy.

Discussion

Although punch prostatectomy has reduced mortality rates to a minimum, outstanding problems still clearly exist. Those that derive from a chronically distended bladder occupy a foremost place, the most serious being a bilateral pyelonephritis due to penicillin-resisting organisms superimposed on kidneys already damaged by prolonged back pressure.

With the outstanding exception of Wardill's work at Newcastle-upon-Tyne, the opinions expressed in this country on punch prostatectomy on the whole have either been unfavourable or have unjustifiably restricted the scope of the operation. This may well be due to technical inexperience. John L. Emmett, of the Mayo Clinic, in a most helpful personal letter in reply to the question of the number of operations at which a surgeon should assist before being allowed to carry out a punch prostatectomy himself, states: "This question is very difficult to answer for the reason that the manual dexterity of individuals differs so greatly. I think, however, that a man should have had experience in at least a couple of hundred cases before he can consider himself fairly well trained."

So far, little mention has been made of what to the patient is the most attractive feature of the procedure—namely, the absence of an abdominal operation. Elderly patients show a well-founded aversion to an abdominal operation, many in this series having at first refused prostatectomy on the assumption that it meant a "cutting" operation. The popular appeal of this operation is based on sound clinical experience. It is perhaps not out of place to emphasize the fact that bad-risk patients with mild dysuria and a low residual urine require a period of observation before operation is considered. Indications for operations in this group must be clear and beyond dispute.

Conclusion

The outstanding impression is the safety of punch prostatectomy and its freedom from post-operative incapacity. It is applicable to the majority of cases of prostatic obstruction. For the aged bad risk group it is in a class by itself.

In highly specialized work the surgeon is very much in the hands of his theatre and ward staff. In both these respects I have so far been particularly fortunate.

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OSTEITIS FIBROSA DISSEMINATA

BY

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Osteitis fibrosa disseminata is a regional fibrocystic disease of bone with distinct and characteristic features. Its aetiology is obscure. No familial or hereditary tendency has been noted (Lichtenstein, 1938), but its segmental distribution suggests that it may have its origin in a congenital abnormality (Adams *et al.*, 1940). The condition may be a sequela of icterus gravis neonatorum in which the liver fails to store and utilize vitamins (Braid, 1932, 1939). An embryological defect, with an associated endocrine condition (Albright, *et al.*, 1937), and an abnormality in the region of the hypothalamus or walls of the third ventricle (Shallard, 1940) are also postulated as causes. The common features of the disease, the bone changes, may be the response of bone marrow to various stimuli—inflammatory, neoplastic, metabolic, or simple mechanical (Freund and Meffert, 1936). Trauma is common in childhood, and perhaps is too often present in the patient's history to be only of accidental importance; yet the disease cannot be produced experimentally by trauma (Freund and Meffert). Local bone changes, starting in childhood from various centres in the same bone, may be due to osteoclastic absorption and hydropic degeneration of the fibrous bone marrow as a consequence of the augmentation of pressure due to impaired venous flow (Freund and Meffert).

Symptoms and Signs

The condition first makes itself evident in childhood or adolescence, usually by fracture or bony deformity, and no extraskeletal changes may be found. Braid observed from birth an infant who showed typical bone changes at the age of 2 years, and a second child who had the first of a series of fractures at the age of 1½. Both these patients suffered from icterus gravis neonatorum, and Braid states that at the age of 2½ years her female patient showed enlargement of the breasts and had a menstrual period, which lasted nine days. McClune reported bone changes in a 1-year-old infant, who also had icterus gravis neonatorum, in whom menstruation began at the age of 3½ years, and who was sexually mature at 4. Cutaneous pigmentation was seen in all three patients. There is no difference in the frequency of the sex incidence of the disease (Adams *et al.*, 1940); but endocrine dysfunction occurs typically in the female, and Albright described a further seven patients, four of whom were females, with the syndrome of osteitis fibrosa disseminata, areas of pigmentation, and sexual and somatic precocity.

Sex abnormalities in males are usually absent, although one case is recorded in which there was atrophy of the testes without any changes in the secondary sex characteristics. The general health is not affected and pain is conspicuously absent.

The Bone Changes

The bone lesions are the cardinal and sometimes the only features, and are responsible for the deformities and fractures which may be the first sign of the condition. Any of the skeletal bones may show the disease, but it is commonest in the lower limbs, where the ilium, femur, and tibia are most often affected. Bowing of the extremities is well marked, as in patients reported by Braid (1932, 1939) and by Murray *et al.* (1946); and kyphosis and

The Ministry of Health points out that patients in hospital for any length of time may accumulate substantial sums by way of benefit or pension from the Ministry of National Insurance or National Assistance Board. These sums, together with any cash handed over by the patient on admission, should be banked and a separate banking account maintained if necessary. A separate ledger account should be kept at the hospital for each patient who has money to his credit in this account and debited as cash or its equivalent is issued to the patient or purchases made on his behalf. Payments can also be made to relatives out of the account at the written request of the patient. In the case of mental patients for whom no officer has been appointed to act in accordance with paragraph 4 of H.M.C.(48)24, B.G.(48)22, a certificate should also be obtained from a medical officer that the patient understands the nature of the transaction. Any interest accrued to the patient's bank account may be placed to the credit of the committee's or board's endowment account for the benefit of patients' amenities generally. The accounts relating to these transactions should be under the control of the chief financial officer and should be submitted to the auditor.

anterior bowing of the sternum have been described by Braid.

Braid also noted that in her original patient the bone disease did not attack the epiphyses, and it has since been found that they are constantly and characteristically spared, but the diaphyses are involved to a variable degree. Typical of the disease, too, is its regional distribution in bone, some bones showing patchy decalcification and others being completely normal. Deformities may also occur in the skull in the form of bony swellings, as in the case recorded below, or there may be asymmetry of the face (Coleman, 1939); tallness, due to delayed union of bone, is described by Shallard. The cystic areas of the affected bone vary greatly in size and density, and spontaneous fracture usually takes place through the site of a large cyst. These cystic areas, states Coleman, are clean-cut and involve the medulla and cortex, in some regions expanding the shaft of the bone and everywhere entirely replacing the normal bony architecture, with areas of increased density either associated with the cysts or appearing as irregular speckling; the cortex may be eroded as thin as paper. Freund and Meffert state that the internal moulding and resorption, instead of leading to the formation of lamellar bone, produces fibrous bone marrow and fibrous, porotic, spongy bone. The cortex is thin and expanded, owing to the encroachment on its endosteal surface, the periosteum playing no part in the pathology.

Macroscopically, the marrow spaces are wide and are filled with a yellow, white, or grey fibrous tissue, and the cavities with fluid of gelatinous material, forming true cysts or merely spaces filled with fibrous tissue (Adams *et al.*, 1940). Microscopically, dense fibrous-tissue cells replace normal bone and form irregular trabeculation throughout; osteoid tissue is common and indicates bone regeneration, which is occurring simultaneously with bone destruction; the cystic cavities are lined with compact fibrous tissue, and nests of foam cells can be seen (Adams *et al.*, 1940). Conclusive diagnosis of the different forms of non-generalized osteodystrophy is not always possible, however, from examination of a few slides.

The skull often shows osseous defects. Marked thickening of the base of the skull is characteristic, while the vault has a finely granular appearance. Shallard (1940) states that hyperostosis is most evident at the base of the skull, and that the mastoid cells and accessory sinuses may be completely obliterated by dense bone. In the vault the bone changes resemble those of early Paget's disease, with its bony thickening, multiple areas of rarefaction, and preservation of the inner table. Cystic rarefaction of the occipital protuberance is described by Garlock (1938).

Other Changes

Cutaneous pigmentation is not always present, but it has been recorded in so many cases as to suggest that it has a common exciting factor with the bony pathology. It may occur anywhere in the body, including the scalp, where it may be missed at examination (Albright); if the skull is involved in the bony pathology its distribution may be bilateral. The serum calcium and blood phosphorus are normal, but the plasma phosphatase level may be raised. The blood count is normal. Urine calcium excretion is normal.

Prognosis and Treatment.—The prognosis is relatively favourable; but multiple fractures and skeletal deformity are prone to produce serious incapacity. It is generally slow, and the course is benign. Treatment is confined to preservation of function and, if necessary, to correction of deformities.

Case Report

The patient, a male cine-projectionist, aged 25, had spent five years in the R.A.F., the last 3½ years overseas. His only complaint was: "My mother states that the lump on the back of my head has increased in size."

He had been employed as an electrician during his Service career and was carrying out routine duties, which included P.T., drills, and parades, but no strenuous course or heavy lifting. During the whole of his Service years he had not had any illness other than occasional colds in the head and influenza.

Previous History.—The patient's mother writes: "The lump on his head first became apparent at the age of 10 years. The right side of the head, at the back, appeared to be developing faster than the left side. A bulge appeared a year or two later on the left side of the forehead. He had a bad fall downstairs when 4 years of age, and also in childhood had bronchitis; otherwise he was always healthy, with no aches or pains. When he returned recently after 3½ years overseas, the lump at the back of the head seemed to have gone further down and to have spread across the top of the back of his neck to the left side. I am definite that the lump was only on the right side before, and was about a quarter its present size and going only half-way down on to the neck." There is also a history of fracture of the right humerus at the age of 15, brought about by very slight trauma. The patient was sitting at a table with other children playing a game which involved placing the elbows on the table, crossing the arms, and pushing the apposed hands of their playmates. It was merely this light pressure, applied by a girl, which fractured his arm, and he remembers at the time being struck by the fact. At the hospital at which he was treated no mention was made of any other complication when the fracture was radiographed. The bone healed in six weeks, and he then continued with his work as a cine-projectionist. He has never suffered from headaches or from ear or eye trouble. He has one sister, who is alive and well, but no brothers; his father and mother are also alive and well. There is no similar trouble in any member of the family.

On examination the patient looked fit and well; height 5 ft. 8 in. (1.73 m.), tongue clean. The teeth, except the lower incisors, canines, and first premolars, were removed five years ago for caries. Nothing abnormal was found in heart, lungs, or genitalia. The left frontal region protruded forward, causing slight left exophthalmos. Protrusion was also present over the whole of the occipital bone to the size of half a melon, more pronounced on the right side. The tumours were hard to the touch. No abnormal swelling or deformity was seen in limbs.

Clinical Findings

A radiograph of the skull revealed a large fibrocystic tumour over the whole of the occipital bone (Fig. 1). Both parietal bones show areas of decalcification and the outer table is raised in places with blister formation, and in other areas there is hyperostosis. The frontal bones show spotty decalcification, and there is a fibrocystic swelling in the left frontal bone, with

FIG. 1

distortion of the left frontal sinus. The sphenoidal sinus is almost completely occupied by a tumour mass, and the mastoid air cells are obliterated. The inner skull table is normal. Radiographs revealed fibrocystic disease of the shaft and lower end of the humerus, with some cyst formation and trabeculation (Fig. 2). The cortical bone is seen to be eroded, and is especially thin at the junction of the middle and lower thirds of the shaft, where the bone is slightly expanded. All other bones are normal.

FIG. 2.

Radiography of the abdomen disclosed considerable calcification of abdominal lymph glands. No renal calculi or gall-bladder calculi were seen; the dye test was normal. Vision is 6/6 in both eyes, and the hearing normal.

Blood Findings.—June 3, 1946: red cells, 5,880,000 per c.mm.; white cells, 8,600 per c.mm. (neutrophil polymorphs 76%, lymphocytes 18%, monocytes 6%). June 17: serum calcium, 12 mg. per 100 ml.; blood inorganic phosphorus, 1.3 mg. per 100 ml.; plasma alkaline phosphatase, 18 King-Armstrong units; blood cholesterol, 200 mg. per 100 ml. July 2: serum calcium, 12 mg. per 100 ml.; blood inorganic phosphorus, 3.8 mg. per 100 ml.; plasma alkaline phosphatase, 14 King-Armstrong units. (Rapid rise of inorganic phosphorus noted.) Aug. 9: serum calcium, 10 mg. per 100 ml.; blood inorganic phosphorus, 2.6 mg. per 100 ml.; plasma alkaline phosphatase, 6.75 King-Armstrong units. (All estimations checked owing to variation from previous readings.)

Urinary System.—June 3: reaction, alkaline; albumin, sugar, and protein (Bence-Jones method), nil. Aug. 9: blood urea, 32 mg. per 100 ml.; urea clearance, first hour 64% of normal, second hour 84% of normal (indicating only fairly good kidney function.) Urine calcium with known diet was within the range of normal. Faeces calcium, with known diet, also normal.

Discussion

Osteitis fibrosa disseminata has been described under a varied nomenclature, such as polyostotic fibrous dysplasia, osteodystrophia fibrosa unilateralis, osteitis fibrosa localisata, osteodystrophia fibrosa cystica generalisata, multifocal osteitis fibrosa, fibrous osteodystrophy, regional fibrocystic disease (Horwitz and Cantarow, 1939).

The possibility that icterus gravis neonatorum is a predisposing cause of osteitis fibrosa disseminata is suggested by Braid and elaborated by her in her record of two cases. McClune also reports this association. But whether the resulting bone changes are due to liver damage with consequent loss in vitamins, as Braid suggests, or whether the jaundice produces its effects elsewhere—as it does, for example, in the basal nuclei—are interesting speculations, as is the part played by haemolysis and anti-agglutinins on various organs. Braid states that Buchbinder and Kern produced rarefaction and cortical thinning and relatively wide medullary spaces and cysts in bones of puppies in which they had procured an obstructive jaundice; and they also brought evidence to show that there is some alteration in parathyroid function in obstructive jaundice. Braid, using the rabbit test in one of her patients, was, however, unable to demonstrate an excess of parathormone in the blood.

The blood changes in osteitis fibrosa disseminata frequently show a conspicuous alteration in the plasma phosphatase, which is often raised, while the blood calcium is

at the upper limit of normal. Periodic variation in the phosphatase level in the same patient, as reported by Braid, by Garlock (1938), and in the above case record, would also seem to be typical of this disease. Smith and Maizel state that a high plasma phosphatase is found in active rickets and is probably derived from hypertrophic cartilage cells and osteoblasts, which Robinson has shown to be the source of the enzyme, the phosphatase level slowly falling to normal with healing of the disease. They state that in scurvy, on the other hand, the plasma phosphatase is low, since the picture is one of cessation of bone growth and ossification is in abeyance—the phosphatase rising, however, with treatment of the condition and calcification of the haemorrhages, finally falling to normal with the absorption of these calcified areas. It could therefore be submitted that raised and normal plasma-phosphatase readings coincide with, and are respectively indicative of, active and quiescent phases of the disease.

The difficulty in distinguishing the disseminated form of osteitis fibrosa from the generalized osteitis fibrosa cystica of Recklinghausen is a very real one, and Shallard instances many patients in whom exploration of the neck proved negative. In Recklinghausen's disease there is an osteoporosis of the whole skeleton, with cyst and bone-tumour formation, a raised serum calcium, lowered blood phosphorus, a raised plasma phosphatase, and an excess of urine calcium, with possible stone formation and an association of the condition with an adenoma of the parathyroid gland. Non-typical cases of Recklinghausen's disease have also been reported; Weissenbach *et al.* (1939) state that parathyroid adenomata are not always present. Decort *et al.* (1942) found a hypocalcaemia, with normal, and later raised, readings for plasma phosphatase; and Marti (1938) records a case which was cured after the removal of a normal parathyroid. That the disease may become quiescent is recorded by Pagniez *et al.* (1938), and Ostling (1939) reports a spontaneous cure in another patient. Neither the blood chemistry nor the parathyroid changes would thus appear to be constant, and the condition may be quiescent at the time of examination. It is therefore essentially the extent of the bone changes and the age of the patient which are the diagnostic features. The fact that a raised blood calcium is not found in osteitis fibrosa disseminata, with its more localized bone changes, suggests that there is no adenoma of the parathyroid, and it may be surmised that the difference between the two conditions is that produced by minor or major disturbances of the parathyroid.

In both diseases there arises the question of the exciting factor of the abnormal parathyroid metabolism. That other endocrine glands can affect bone pathology is shown, for example, by the arrest of the bone changes in osteomalacia following removal of the ovaries; it may also be surmised that the temporary hormonal imbalance of the climacteric, which sometimes has a marked effect on the endocrines controlling carbohydrate metabolism, may also upset normal parathyroid activity and cause the bone changes found in Paget's disease. The anterior part of the pituitary gland is closely connected with normal growth of bone, and the association of Albright's syndrome with osteitis fibrosa disseminata points to this area as the seat of the trouble in this disease. There is no evidence about the cause of the parathyroid abnormality in Recklinghausen's disease—whether it is primary in the gland itself, as suggested by the cure which follows removal of the adenoma, or whether it is merely a more catastrophic alteration of parathormone balance in an older patient.

The skull changes in the case here reported have several points of interest. They form a prominent feature of the

disease and are more pronounced than those in cases previously recorded, and both base and vault are involved. The exophthalmos of the left eye is due to the frontal-bone growth displacing it forward; Albright described a similar instance. No involvement of the inner table of the skull is seen and the pituitary fossa appears to be normal. The cyst-like spaces and trabeculation and expansions of the occipital region and the "blister" appearance on the surface of the parietal bones show the results of an active phase of the disease. The hyperostosis in the vault is similar to that of early Paget's disease; while the solid replacement of the mastoid cells and the surface growth in the sphenoidal air sinus would seem to conform to the osteitis fibrosa of the creeping periostotic type of leontiasis ossium described by Lawford Knaggs. Had the disease in the present case involved the maxillary sinuses and, more typically, the facial bones, it might have been considered a definite example of leontiasis ossium. Cases of leontiasis ossium with involvement of other skeletal bones have been described ("Osteitis Fibrosa Generalisata as a Complication of Leontiasis Ossium and Coxa Vera": *Sei-I-Kai M.J.*, abstract section, Dec., 1936, 55, 1).

Finally, it may be thought that, instead of the fibrocystic diseases of bone being classified according to the region involved and the extent of the bone changes, many of them may be regarded as part of an abnormal parathyroid activity induced by alterations in the factors governing its metabolism and with trauma or vascular conditions playing a localizing part.

Summary

A case of osteitis fibrosa disseminata showing involvement of the skull and the right humerus and associated with certain blood changes is reported. It is suggested: (a) that the condition is one of endocrine abnormality in which the parathyroid hormone is dissociated from the normal endocrine balance; (b) that abnormality in the region of the pituitary or hypothalamus is the exciting cause and this may be due to haemolytic disease of the newborn; and (c) that the fibrocystic diseases of bone may be interrelated and their causal factors found in the different influences affecting parathyroid metabolism.

Previous history of icterus gravis neonatorum may be sought and a check made of the maternal Rh. Prolonged observation of the patient may reveal that the fibrocystic diseases of bone have periods of recrudescence and intermission.

I wish to thank Air Vice-Marshal Sir Andrew Grant, Director-General, Medical Services, for permission to publish the records of this case.

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OCCUPATIONAL DISEASES OF THE LENS AND RETINA*

BY

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This paper deals only with the diseases of the lens and retina that occur amongst glass and furnace workers, welders, and others exposed to excessive radiation at their work.

Radiant Energy and its Effects on the Eye

The visible rays occupy only a small portion of the radiation spectrum. The whole range of electro-magnetic radiation extends from the long electro-magnetic waves used in wireless and industrial high-voltage currents to the short gamma rays emitted from radium, uranium, and also during nuclear disintegration of atoms. Next to the electro-magnetic waves are the infra-red rays, which are generated by heated bodies (metal, glass, etc.) and are a source of danger to the eyes in foundries, glass factories, etc.

The long infra-red rays are mostly absorbed by the cornea. The short infra-red rays are transmitted through the cornea and are absorbed by the lens; a small part of these rays, however, reach the retina. The infra-red rays when absorbed by the tissues of the eye cause an increased activity in the tissue cells, and with it an overheating of the tissues. The cornea, which is air-cooled, suffers from no ill effects. The lens, on the other hand, when overheated through absorption of the short infra-red rays, undergoes marked changes, resulting in the formation of cataract. This form of "heat cataract" is found amongst glass-blowers, chain-makers, and foundry and furnace workers. The iris and ciliary body also absorb a good deal of the short infra-red rays; the heat generated in these tissues, however, is lost to the circulating aqueous.

The visible rays of the sun pass through all the media of the eye and on reaching the retina set up a series of biochemical changes which the brain interprets as vision. An excessive exposure of the eye to the sun rays may cause pathological changes in the eye.

The short and the long ultra-violet rays are absorbed by the cornea and the ocular conjunctiva, and only a very small amount of ultra-violet rays reaches the aqueous and the lens. The short ultra-violet rays set up biochemical changes in the conjunctiva and the cornea which manifest themselves "after a latent period" of several hours as a conjunctivitis or a keratitis. These ultra-violet rays are present in high quantities in welding arcs (gas and electric welding), and are responsible for the "arc eye" which is extremely common amongst welders.

The x rays and gamma rays are of very short wavelength; they penetrate the tissues of the eye and have a direct action on the lens, causing the formation of a cataract. Vascular changes are also set up in the iris and the ciliary body.

Occupational Eye Diseases due to Radiant Energy

In the past glass-workers have been known to develop cataract. In glass-bottle making the finisher was exposed to the undiminished glare of the furnace or tank of molten glass. The infra-red rays emitted by the molten glass were

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