one of the play centres 7 gave positive reactions to toxocaral skin tests; none of the children in the other groups tested gave positive reactions. Thus from among the total sample of 170 children 4.1% gave positive reactions (table II).

Discussion

Clearly pollution of soil with toxocaral ova is common and widespread; no region in Britain appears to be immune and the prevalence of such contamination does not vary greatly from region to region or from season to season. Evidence obtained from incubating the ova in the laboratory and from feeding them to animals indicates that toxocaral ova in soil are able to convey infection to animals, and therefore to man. The third part of this work—that is, the testing of children living and playing in the neighbourhood of parks where soil was found to contain the ova—indicates that toxocaral infection can indeed be transmitted to children playing on infected soil.

Among those with a positive reaction to the toxocaral skin test the precise place or places where infection had been acquired must remain conjectural, but the significant points are that infection is being transmitted to them and that soil is an important source of infection. The control of pollution by dogs and cats of soil in public places used by children would be one way to prevent such infection. Moreover, those playing on contaminated or potentially contaminated soil or sand should wash their hands afterwards, and particularly before consuming food. This simple measure might also be applied to those handling soil while gardening. Clearly increasing attention should be given to the hygienic control of dogs and cats to prevent them contaminating public places with infective excreta; owners should ensure that their animals are free from infection and are not a public danger.

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Medicine in Old Age

Skeletal Disease in the Elderly

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British Medical Journal, 1973, 4, 472–474

Much useful research is being carried out on bone disorders and bone physiology at present and our understanding of the relevant metabolic processes is expanding rapidly. Though this increased knowledge has greatly increased our awareness of the aetiological and therapeutic possibilities, in general it has not yet had a great impact on routine diagnosis and treatment. Two examples of these advances are worth citing—namely, the discovery of the hormone calcitonin, produced in the thyroid gland, and the advances in knowledge concerning vitamin D metabolism.

Calcitonin inhibits bone resorption and thus counterbalances the effect of parathyroid hormone. Other substances, such as glucagon and gastrin stimulate the release of calcitonin. It is not yet known, however, how important these interrelationships are in the average person—whether reduced production of calcitonin is a major factor in producing osteoporosis, or whether established osteoporosis can be effectively treated with it.

Advances in knowledge of vitamin D metabolism have been equally impressive. Vitamin D₃ (cholecalciferol) is now known to be converted in the liver to another substance (25-hydroxy-D₃) and the kidneys then convert it yet again into two further compounds (1, 25-dihydroxy-D₃, and 21, 25-dihydroxy-D₃), the first of which acts on bone more quickly than the second. These discoveries open up immense new possibilities regarding the pathogenesis and treatment of vitamin D deficiency, but it is too early yet for them to affect routine clinical practice.

Practical Aspects

The remainder of this article will concentrate on practical aspects of bone disorders as they present in the elderly. In general, patients over 75 will be under consideration, though in calculating prevalence it is convenient to use the age of 65. Mention will be made of four conditions: (1) osteoporosis; (2) Paget's disease; (3) osteomalacia; and (4) malignant disease, including multiple myeloma.

It is important to consider the frequency with which these conditions are likely to occur in an average practice. A general practitioner's list of 3,000 patients will be assumed to have 360 patients over the age of 65 (220 women and 140 men). A geriatric department serving a population of 240,000 and admitting 1,000 patients a year will be assumed to serve 80 G.P.'s.

Osteoporosis, with a liability to fracture, affects 25% of women over the age of 65, and men are probably affected a quarter as frequently as women. The incidence of Paget's disease rises to 10% by the age of 90, so an incidence of 6% will be assumed for those over 65. Men are affected more often than women. Osteomalacia, mostly occurring in women, is found in between 1 and 4% of geriatric hospital admissions (the higher figure in Glasgow and the lower figure in the south of England).

By using these figures and assumptions it will be expected that a general practitioner with a list of 3,000 will have on his list 70 patients with osteoporosis (55 women and 9 men), 20 patients with Paget's disease (about 12 men and 8 women), and that he will see a case of osteomalacia once every two to eight years. The incidence of malignant disease of bone has not been calculated but will not be high.

In the table the incidence of these conditions is compared and they are placed very broadly in order with regard to preventability, treatability, and seriousness if untreated.

Incidence	Preventability	Treatability	Seriousness if not Treated
Osteoporosis + + + Pagets + + Osteomalacia ± Malignancy ±	Osteomalacia + + + Osteoporosis ± Pagets O Malignancy O	Osteomalacia + + + Pagets + + Malignancy + Osteoporosis ±	Malignancy + + + Osteomalacia + + Osteoporosis + Pagets ±

O — + + + = rough guide to importance of each disease under each heading.

The less common conditions merit more emphasis than their incidence would suggest because they can be treated and cause more trouble if untreated; osteomalacia can be prevented and so may osteoporosis in a more limited sense. All four conditions lead to bones being fractured by relatively minor trauma so that this is not a useful way of differentiating them. The fact that fractures may easily occur in the elderly should constantly be borne in mind, however, because the absence of severe trauma and the presence of other diseases make it easy to overlook them. Thus the patient with a hemiplegia may have a fractured neck of femur on the same side, the lady with painful arthritis of the hips may fracture the neck of the femur, and the patient with cracked and painful ribs due to osteomalacia may also have angina and may be too anxious or confused to give a clear description.

Osteoporosis

Osteoporosis signifies a generalized loss of bone, the bone which remains being normal. The serum calcium, phosphorus, and alkaline phosphatase levels are not affected and there are no symptoms or signs till structural failure occurs. Recent work has established that the amount of bone in the skeleton increases till the age of 20–25, after which it very slowly declines. Women accumulate less bone than men and tend to lose it more quickly. Structural failure usually begins in women over the age of 50 and in men over the age of about 65. It shows itself in a loss of height and thoracic kyphosis due to narrowing of the vertebral bodies and a wedge-shaped deformity of the thoracic vertebrae. The lower ribs sink towards the iliac crest. The clinical features have been reviewed by Dent and Watson.¹ Fractures occur in the lower forearm in women over the age of 50 and in the neck of the femur in both sexes over the age of 70. Compression fractures occur from time to time in the lower thoracic and lumbar vertebrae, which characteristically produce severe localized backache which clears up in three to four weeks. Neurological sequelae rarely if ever occur. Probably vertebral fractures are often not recognized at the time. Recognition is made more difficult by the fact that only a minority of cases of backache can be traced to osteoporosis.²

Though osteoporosis is, broadly speaking, a benign condition, it exacts a considerable price in terms of episodic morbidity, the consequences becoming more serious with increasing age. Treatment has so far been able only to arrest the condition rather than cure it. It is possible, but not certain, that a little fluoride in the drinking water in early life may lead to the production of a better skeleton. Oestrogens have been said to prevent parathyroid-mediated bone resorption, and minor degrees of vitamin D deficiency may also have aetiological relevance. Larger doses of fluoride have been used in therapy. There is considerable debate, however, about the value of these agents in treatment and the main emphasis should be on minimizing the two factors most certain to increase osteoporosis—namely, bed rest and steroid therapy. It is in this sense that osteoporosis may be called preventable. Bed rest has repeatedly been shown to lead to a negative calcium balance.³ Hypercalciuria persists even if the legs are exercised in bed.

To prevent excessive bone loss, therefore, periods of bed rest should be kept as short as possible throughout life. The administration of adrenocortical steroids also has a powerful effect in increasing osteoporosis⁴ and this should not be overlooked

when they are prescribed. When fractures occur they should be treated promptly and analgesics prescribed to permit a speedy return to normal activity. Temporary admission to hospital may be indicated to achieve quicker mobilization. Attention to the other medical and social conditions so often present in old people will help to increase mobility and also reduce the likelihood of falls in the future. Home conditions should be investigated and hazards removed or alleviated wherever possible. Diet should be adequate and varied, especially with regard to calcium and vitamin D. A daily pint of milk is the best source of calcium.

Paget's Disease

Paget's disease affects the skeleton in a patchy, asymmetrical manner and is not generalized. Most commonly affected are the pelvis, lumbar spine, femur, tibia, skull, and clavicle. At the affected sites there is a greatly increased bone turnover. The new bone is spongy and disorganized. Expansion and deformity occur in affected bones and gross bowing may occur in the femur and tibia. It is a disease which may have phases of activity and inactivity. During active phases the affected bone is warm to the touch and the serum alkaline phosphatase level may be grossly raised. The serum calcium and phosphorus levels are usually normal. The increased circulation through the affected bone may sometimes precipitate or exacerbate heart failure but this seems to happen very little in the elderly. Pain in the affected bone may be severe, but this also is uncommon in my experience. Common practical problems stem from gross deformities and from nerve deafness due to compression of the 8th nerve by the enlarged bone. Paget's disease varies enormously in extent, sometimes only one clavicle being affected. In rare instances when the spine is affected neurological effects such as paraplegia may be produced.

Apart from simple symptomatic measures treatment is rarely necessary in Paget's disease, but recently, calcitonin (given by injection once or twice daily) has been found to be effective. It has produced relief from pain, a fall in the serum alkaline phosphatase level, and improvement in the bony appearances. Its use should be considered when pain is severe and prolonged or if there is reason to expect serious complications, such as paraplegia.

Osteomalacia

Osteomalacia is characterized histologically by failure of newly formed bone (osteoid) to calcify. The serum calcium and phosphorus levels are often, though not invariably, reduced and the serum alkaline phosphatase level is raised in 80% of cases. Iliac crest bone biopsy, which can be performed using a local anaesthetic, is the most reliable single method of diagnosis.

Weakness of the proximal limb muscles is a major manifestation and leads to difficulty lifting the feet over kerbstones and ultimately to the necessity of going up and downstairs on all fours. The gait may be rolling or "waddling" in character. This weakness can often be shown by formal neurological examination in young subjects, but in old patients the presence of multiple pathology usually prevents a convincing display. Difficulty in walking or an inability to walk is a leading symptom, however, and myopathy can be inferred from this. Bone pain—especially in the back, thighs, shoulder region, or ribs is usually present—

and the bones may be tender. The pain is worse on muscular effort. Quite often, especially in those patients seen in geriatric departments, the pain is vague and undramatic. Characteristically it occurs in several of the above sites. Fractures of the ribs are more common in osteomalacia than in osteoporosis, and possibly their significance has sometimes been underestimated. The clinical features were reviewed by Chalmers.⁵

Osteomalacia is more common after partial gastrectomy, in patients on phenobarbitone and other anticonvulsants, and when there is intestinal malabsorption. Until recently it was thought that the commonest cause in old age was inadequate diet, but recently lack of sunshine has been thought especially important.⁶ The disorder occurs more often in the housebound.⁷ When venous blood is taken to support the diagnosis the patient should be fasting and it is important to use only the minimum tourniquet pressure. The serum proteins and blood urea should be estimated at the same time because a reduction of the albumin level will lead to a lowering of serum calcium and a raised urea will cause a rise in the serum phosphorus. It is worth checking the blood count at the same time to exclude anaemia. X-ray films of the chest, lumbar spine, and pelvis are helpful, partly to exclude Paget's disease as the cause for a raised serum alkaline phosphatase and partly because the presence of incomplete fractures (Looser's zones) in the pubic rami, femoral neck, axillary border of scapula, or upper end of the humerus is virtual proof of the diagnosis. Unfortunately they are only seen in a minority of cases.

As it is curable, osteomalacia should be excluded in any old person who is bedfast or having difficulty getting about without obvious cause, or when the above symptoms are present. Bone biopsy should be done in doubtful cases and is frequently advisable.

Hence osteomalacia is a difficult condition to diagnose in hospital without bone biopsy. It is even more difficult in general practice, where it occurs much less frequently. The best plan, therefore, is to refer suspected patients to hospital for further investigation. Once diagnosed the condition is not difficult to treat. A suggested scheme is to give calciferol 50,000 units (1.25 mg) daily for two weeks followed by tablets of calcium and vitamin D (B.P.C.) in a dose of one tablet twice daily for 12 months. It is important not to prolong treatment with the larger dose of calciferol, which would be liable to produce hypercalcaemia followed by renal failure.

Bone pain usually clears and the serum calcium and phosphorus return to normal within two weeks, but it may be six to eight months before the serum alkaline phosphatase level falls to within normal limits. When treatment is begun the serum alkaline phosphatase level often rises temporarily.

REGULAR PROPHYLAXIS

To prevent a recurrence of osteomalacia and to prevent its development in housebound patients over the age of 75, it is logical to give regular prophylactic vitamin D, such as Tabs calcium with vitamin D (B.P.C.), which contain 500 units of vitamin D, or vitamin A and D capsules (B.P.C.), which contain 450 units, in a dose of one tablet or capsule daily for three or

four months during the winter. Even small amounts of exposure to the sun are beneficial and should be encouraged.

It is worth noting that osteomalacia may occur in patients with other more obvious bone disorders. Thus I have seen bone pain in a patient with breast metastases and backache in a patient with Paget's disease clear up when vitamin D was given. The serum phosphorus level was initially low in both patients. A therapeutic trial of vitamin D (for example, 50,000 units daily for not more than a week or two) is well justified in this situation.

Malignant Disease

Multiple myeloma is not rare in hospital practice. It causes bone pain often in several sites and a liability to pathological fractures. The serum calcium level may be normal or raised, the serum phosphorus and alkaline phosphatase concentrations are normal. X-ray films show clear-cut translucencies which are especially easy to recognize in a lateral view of the skull. Anaemia and renal failure may be complications and Bence-Jones protein may be found in the urine. The erythrocyte sedimentation rate is usually high and the serum globulin level considerably raised.

With modern methods of treatment including radiotherapy, melphalan, cyclophosphamide, and steroids (often in combination and given intermittently) much can be done to relieve symptoms and prolong life, and multiple myeloma should no longer be dismissed as untreatable.

Bony metastases from carcinoma of the prostate and carcinoma of the breast may cause much pain and disability. They are usually fairly simple to spot in x-ray films. They cause a rise of the serum alkaline phosphatase level and sometimes also of the serum calcium. If carcinoma of the prostate is the cause there is usually a rise of the serum acid phosphatase level. Considerable relief may be produced by appropriate drugs such as oestrogens and steroids for breast cancer metastases and oestrogens for prostatic cancer metastases.

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