the recognition of an enteric communication with an abscess should direct management towards open surgical drainage rather than the percutaneous method[13] or a trial of systemic antibiotics. On the basis of these results we propose that ^{111}In leucocyte scanning should be the primary investigation in patients without localising signs in whom an intra-abdominal abscess is suspected. Although ^{111}In leucocyte scanning is a relatively new imaging technique for detecting abscesses, its ability to visualise a wide range of inflammatory and infective conditions[14–16] has resulted in its routine availability in many centres.

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SHORT REPORTS

Premature loss of bone in chronic anorexia nervosa

Most patients with anorexia nervosa eventually achieve a reasonable body weight, but some starve themselves for years.[1] After seeing two such patients with severe loss of bone we sought evidence of osteoporosis in other patients with longstanding anorexia nervosa.

Patients, methods, and results

We studied the case notes of 140 patients with anorexia nervosa admitted as inpatients. Evidence of osteoporosis was sought in those aged over 30 who had had the disease for over 10 years. We suspected osteoporosis if fracture had occurred after minimal trauma or vertebral crush fractures were seen on routine chest radiography. We studied three patients further, taking *x* ray films of the hands and vertebral column and measuring the metacarpal index. Distal forearm bone density was measured by photon absorptiometry.

Details of five patients with anorexia and bone loss

	Case 1	Case 2	Case 3	Case 4	Case 5
Age (years)	47	54	41	42	42
Duration of anorexia (years)	30	14	23	27	15
Usual weight (kg)	35	33	35	24	34
Serum calcium concentration (mmol/l)		2·49	2·34	2·00	2·51
Alkaline phosphatase activity (IU/l)			136	266	157
Luteinising hormone concentration (IU/l)				1·0	3·1*
No of vertebral fractures	2	3	2	0	2
Bone density (mg/cm²)†			490	400	480
Metacarpal index‡			0·81	0·83	0·81
Trabecular bone volume (%)§			6	9	11

*Measured after patient had suddenly gained weight, reaching 56 kg.
†Normal range (mean (2 SD)) 620 (150) mg/cm².
‡Normal range (mean (2 SD)) 0·87 (0·15).
§Normal range (mean (2 SD)) 21·6 (5·6)%.
Conversion: SI to traditional units—Calcium: 1 mmol/l ≈ 4 mg/100 ml.

Biopsy specimens of the ilium were taken and serum calcium concentration, alkaline phosphatase activity, and luteinising hormone concentration measured.

Six of the patients had starved themselves for more than 10 years. One showed no evidence of fracture and could not be traced. Two had well developed dorsal kyphosis but could not be traced, and their *x* ray films were inadequate for assessment of osteoporosis. Three showed radiological evidence of vertebral crush fractures. The table gives details of the five patients with definite bone loss (the two presenting patients and three with vertebral crush fractures). None of the bone biopsy specimens showed evidence of osteomalacia.

Comment

These five patients had exaggerated and premature bone loss. Does chronic anorexia nervosa predispose to osteoporosis, and if so by what mechanism? Three out of six patients who had had anorexia for over 10 years had osteoporosis, and two more had dorsal kyphosis suggesting vertebral bone loss. Such figures suggest an association between the two conditions. Although five patients had menstruated before the onset of anorexia, if anorectic patients never reach maturity this might cause low bone mass. Two patients, however, were well into adult life before the onset of anorexia, and recent work suggests that trabecular bone volume declines from the age of 20 or earlier.[2]

The causes of most forms of bone loss are controversial, but we suggest various factors. The first is malnutrition resulting from lack of protein for many years. The effects of malnutrition on bone are not clear. Cases of bone disease were described after the world wars, but the changes reported are difficult to assess. Recent work suggests that endosteal resorption of bone occurs in cases of severe malnutrition from lack of protein.[3] Although man can adapt considerably to a low calcium intake, it may affect bone mass, and this mechanism might have acted in our patients. At least one of them (case 4), however, drank one to three pints of milk daily. We doubt that intake of vitamin D was important in view of the lack of histological evidence of osteomalacia. A more important factor may be longstanding oestrogen deficiency. Established anorexia is associated with low concentrations of gonadotrophin and oestrogen. Amenorrhoea in our patients had lasted for 14 to 30 years, and oestrogen deficiency can be assumed for most of this time, analogous to premature menopause. Bone loss after oophorectomy is well known and has been found in young women with amenorrhoea from other causes.[4] Osteoporosis is more common among lean women.[5] Chronic increases of serum cortisol concentration, which occur in anorectic patients, might exacerbate bone loss.

Chronic anorexia nervosa may be associated with a high prevalence of osteoporosis. If this is confirmed the possibility of using oestrogen replacement should be considered. Shorter periods of anorexia in young patients could predispose to osteoporosis in later life. Finally, patients with anorexia nervosa may be a useful group for studies of pathogenesis of bone loss as the effects of age can be examined and the mechanisms concerned will usually be reversed with successful restoration of weight and resumption of menses.

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Suspected myocardial infarction: early diagnostic value of analgesic requirements

The variety of possible presentations of myocardial infarction is well known, but chest pain is perhaps the most constant of symptoms. Evidence has linked duration of pain with size of infarct,[1] and Mitchell suggested that analgesic requirements should be used as an early guide to whether infarction has taken place.[2] I carried out a study to evaluate the diagnostic potential of analgesic requirements.

Patients, methods, and results

Altogether, 217 consecutive admissions to the coronary care unit were considered for study. Reasons for exclusion (97 patients) included rapid death, muscular trauma, and chest pain apparently not due to myocardial ischaemia. Analgesia was given as intravenous diamorphine, usually after a trial of glyceryl trinitrate 0·5-1·0 mg sublingually.

Infarction was assumed (80 patients) if the criteria of Rowley and Hampton for definite or probable myocardial infarction were fulfilled.[3] The remaining patients were assumed not to have had myocardial infarction, and 40 were included in the study. Infarct size was estimated by plasma creatine kinase activity (highest of four estimations in three days), hydroxybutyrate dehydrogenase activity (highest of three estimations), and the number of electrocardiographic territories (inferior, anterior, lateral, posterior, or equivocal) showing serial changes. Significance was calculated by standard methods with a Texas Instruments TI-99/4A computer.

The group with myocardial infarction had a higher mean (SD) age than the group without (57·7 (10·3) *v* 52·1 (13·3) years) and contained a greater proportion of women (36% *v* 15%). Men were comparable with women for all variables. The groups were comparable for consumption of β blockers and cigarettes. The patients with infarction required larger doses of diamorphine (mean in the first 24 hours 7·07 mg (103 μg/kg) *v* 2·45 mg (36·7) μg/kg) and more and later injections (mean number of injections 1·66 *v* 0·63; mean time after admission of last injection six hours 48 minutes *v* 36 minutes) (table). The total dose of diamorphine required correlated poorly with variables of infarct size, wide individual variation being evident.

The time after admission of the final injection was the most useful variable: only one (2·5%) of the group without myocardial infarction required analgesia after two hours compared with half of the group with infarction. Values in patients with equivocal electrocardiographic changes and in the one or two territory groups were 5·7, 7·6, and 13·3 hours respectively; the correlation with creatine kinase activity was $r=0·40$ ($p<0·001$).

Cumulative incidence of variables of analgesic requirements (figures are numbers (%) of patients)

	Myocardial infarction (n = 80)	Non-infarction (n = 40)
No of injections in first 24 hours:		
None	16 (20·0)	22 (55·0)
One or none	39 (48·8)	35 (87·5)
Two or fewer	63 (78·8)	39 (97·5)
Dose of diamorphine (μg/kg) in first 24 hours:		
Up to 27·5	46 (57·5)	35 (87·5)
Up to 30·0	51 (63·8)	36 (90·0)
Up to 40·0	68 (85·0)	39 (97·5)
Time after admission (hours) of final injection:		
Up to 1	39 (48·8)	38 (95·0)
Up to 2	40 (50)	39 (97·5)
Up to 3	40 (50)	39 (97·5)
Up to 8	53 (66·3)	39 (97·5)
Up to 12	61 (76·3)	39 (97·5)
Up to 18	68 (85)	39 (97·5)

Comment

The results of this study were consistent with a relation between severity of myocardial infarction and amount of analgesia required in the first hospital day. One fifth of the patients with myocardial infarction, however, did not need any analgesia at all, and one patient without myocardial infarction required 20 mg diamorphine. Moreover, there seems little clinical advantage in attempting to guess the size of myocardial infarction after only 24 hours.

In the early decision of whether infarction has taken place analgesic requirements may be of greater value. This study suggests that if a second injection of analgesia is required in the first 24 hours the chances of myocardial infarction being excluded lengthen to one in eight and myocardial infarction is four times more likely. If three or more injections are needed myocardial infarction is 10 times more likely. If a second injection is required more than three hours after admission exclusion of myocardial infarction becomes a 40 to one chance and infarction is 20 times more likely. Thus if this three hour rule was applied it would indicate infarction with a specificity of 97·5% and a similar predictive value. A negative result is less reliable, the sensitivity being 50%.

These results confirm that analgesic requirement can be related to the size of myocardial infarction, but the clinical value of this is doubtful. Analgesic requirement can also be used as an early guide to the presence or absence of myocardial infarction. The duration of symptoms seems to be the most important factor, and if further analgesia is required after three hours in hospital this is highly suggestive of infarction.

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Audit of control of heparin treatment

A recent study of warfarin treatment showed poor control of anticoagulation.[1] We performed an audit of heparin treatment. The kaolin cephalin clotting time is the method of choice for measuring the effect of heparin in the United Kingdom. It is simple and convenient, standardised nationally, and effective.[2] The optimum therapeutic range is 1·5-2·5 times the control value, which seems to be little known among junior staff. Above this range there is a greater risk of haemorrhage, and below it treatment is likely to be suboptimal.[2]

Patients, methods, and results

Data were collected prospectively on 45 consecutive patients (23 men, 22 women; mean age 55 (range 24-80)) and 180 heparin days analysed. Patients received heparin via an electric infusion pump (n=30) or a paediatric burette operated by a nurse (n=15). Responses of doctors to kaolin cephalin clotting times outside the therapeutic range, as reflected by changes they made in the rate of infusion of heparin, were analysed. For 28 patients we constructed a dose response curve and calculated the infusion rate required to achieve a kaolin cephalin clotting time of 60 seconds (1·5 times control in our laboratory).

The kaolin cephalin clotting time was within the therapeutic range on