easy method of identifying atrial activity and therefore facilitates the diagnosis of complex tachycardia. Reliable recording of atrial activity had previously been obtained with intraoesophageal electrodes.¹ Prolonged monitoring by this method, however, is uncomfortable for the patient and may be unsatisfactory owing to movement of the electrodes during oesophageal peristaltic activity. This technique has not been applied to ambulatory monitoring.

Ambulatory monitoring of the atrial electrogram has recently been reported by Davies *et al*, who used a specially manufactured temporary screw in atrial electrode.² Fixation of the electrode tip, however, is relatively complicated and this technique is therefore not suitable for those who are not trained in atrial pacing. In contrast, the bipolar J shaped atrial pacing wire that we used is available in most district general hospitals and specialised skill is not required to insert the lead and interpret the traces.

This technique would also be of use in elucidating arrhythmias in patients with pre-existing conduction disease—for example, bundle branch block—and in investigating patients with

suspected bradycardia. In one patient a pause of 1.9 s in the surface electrocardiogram was found to be due to two closely coupled blocked atrial ectopic beats.

We must emphasise that the presence of one to one atrio-ventricular activation during an episode of tachycardia does not rule out ventricular tachycardia as retrograde atrioventricular conduction may be occurring. Furthermore, atrioventricular dissociation may occur in the absence of ventricular tachycardia with nodal tachycardia and retrograde atrioventricular block. Formal electrophysiological testing will still be required in patients in whom diagnostic doubt remains.

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Paraneoplastic hypercalcaemia in ovarian carcinoma

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Abstract

Five patients were seen in whom a raised serum calcium concentration was associated with ovarian carcinoma (clear cell in two cases, cystadenocarcinoma in three). None showed evidence of metastases in bone. The hypercalcaemia occurred as a paraneoplastic phenomenon, but biochemical studies suggested the production of a parathyroid-hormone-like substance. One patient remained free of symptoms of her hypercalcaemia throughout.

Paraneoplastic hypercalcaemia due to ovarian carcinoma may be more common than generally recognised and present as a life threatening condition requiring urgent treatment.

Introduction

Hypercalcaemia may occur in patients with malignant diseases, usually resulting from multiple bone metastases. The multiple bone metastases are rare in patients with ovarian carcinoma.^{1 2} We describe five patients with ovarian carcinoma presenting with hypercalcaemia as a paraneoplastic phenomenon, not associated with bone metastases. Two patients had hypercalcaemia requiring urgent treatment at diagnosis and three at relapse. In only one of these patients was the hypercalcaemia asymptomatic and an incidental finding.

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Case reports

Case 1—A 40 year old woman presented with a four week history of nausea, vomiting, anorexia, and polyuria. On examination she was found to be dehydrated and to have a large mass in the lower abdomen and two supraclavicular lymph nodes. The serum calcium concentration was 3.96 mmol/l (15.8 mg/100 ml) and she was given fluids, frusemide, and mithramycin before laparotomy. A widespread stage IV ovarian carcinoma was largely resected from the abdomen, and histological examination showed a papillary cystadenocarcinoma. Her serum calcium concentration then fell to normal and she was given chemotherapy. Four months later her disease progressed and the serum calcium concentration rose to 2.68 mmol/l (10.7 mg/100 ml) (table).

Case 2—This patient aged 35, had presented in 1979 with a stage IA clear cell carcinoma of ovary. This was resected, and she remained well until July 1983, when she gave a four month history of worsening nausea, vomiting, anorexia, and lethargy. On examination she was found to be drowsy, dehydrated, and cachectic with gross ascites. Serum calcium concentration was 3.14 mmol/l (12.6 mg/100 ml) (table). Recurrent ovarian carcinoma was detected in pelvis and liver. The hypercalcaemia responded to prednisolone.

Case 3—A 69 year old woman had undergone laparotomy for a stage IIA serous cystadenocarcinoma of ovary in 1979 followed by abdominal radiotherapy. She had remained well until January 1983, when she gave a one month history of persistent vomiting, thirst, and polyuria. Subacute intestinal obstruction was diagnosed initially, but a raised serum calcium concentration was then discovered (3.49 mmol/l; 14.0 mg/100 ml). She was found to have recurrent carcinoma in pelvis and lungs. The hypercalcaemia and symptoms responded to prednisolone.

Case 4—A 64 year old woman had had a stage IIB clear cell carcinoma excised in 1981. In March 1983 she developed venous thrombosis but also complained of anorexia, nausea, constipation, thirst, and nocturia (thrice nightly). Recurrent carcinoma was found in pelvis and lungs and hypercalcaemia (3.06 mmol/l; 12.2 mg/100 ml) confirmed. The hypercalcaemia and symptoms responded to prednisolone.

Case 5—This patient, aged 54, had undergone partial excision of a stage III papillary cystadenocarcinoma in 1982. Her serum calcium concentration had coincidentally been noted to be high (2.72 mmol/l; 10.9 mg/100 ml) when she presented for chemotherapy. The con-

Results of investigations in the five patients

Investigation	Case 1	Case 2	Case 3	Case 4	Case 5	Normal range
Calcium concentration at presentation (corrected value; mmol/l)	3.96	3.14	3.49	3.06	2.72	2.25-2.50
Phosphate concentration at presentation (mmol/l)	0.70	0.81	0.80	1.20	0.80	0.87-1.45
Chloride concentration at presentation (mmol/l)	107	92	ND	104	107	95-105
Alkaline phosphatase activity at presentation (U/l)	158	130	150	140	150	30-140
Parathyroid hormone value (U/l)	<0.80	<0.20	0.16	<0.20	ND	0.20-0.60
Bone scan appearances	Normal	Normal	Normal	ND	ND	
Skeletal survey result	Normal	Normal	ND	ND	ND	
Histological findings	Papillary cystadenocarcinoma	Clear cell carcinoma	Serous cystadenocarcinoma	Clear cell carcinoma	Papillary cystadenocarcinoma	

ND = Not done.

Conversion: SI to traditional units—Calcium: 1.0 mmol/l $\approx$ 4.0 mg/100 ml. Phosphate: 1.0 mmol/l $\approx$ 3.1 mg/100 ml. Chloride: 1.0 mmol/l = 1.0 mEq/l.

centration remained between 2.70 and 2.90 mmol/l (10.8 and 11.6 mg/100 ml) until near her death, 14 months later, when it rose sharply. She remained asymptomatic of hypercalcaemia throughout.

Comment

In none of these patients was there evidence of bone metastases. Paraneoplastic hypercalcaemia occurs in 5-10% of malignancies and has been reported in ovarian carcinoma.^{1,2} Fiskin *et al*, however, found that 89 out of 159 hospital inpatients with hypercalcaemia had malignant disease, but none had ovarian carcinoma.³ Our five patients represented a high incidence in our practice, being among 70 new patients seen over 18 months. Two of the patients had clear cell carcinoma, and in the few other reports this tumour has been disproportionately represented.^{1,2,4,5} The mechanism of paraneoplastic hypercalcaemia in ovarian cancer is obscure but the biochemical findings in our patients were compatible with production of a parathyroid-hormone-like substance.

Paraneoplastic hypercalcaemia due to ovarian carcinoma may be more common than previously suggested. It is an important

association, since the symptoms of hypercalcaemia may be mistaken for intestinal obstruction (a common preterminal event in ovarian carcinoma), as exemplified by our case 3. Patients may also present afresh or with recurrence of disease and be found to have life threatening hypercalcaemia requiring urgent treatment.

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Subcutaneous terbutaline and control of brittle asthma or appreciable morning dipping

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Abstract

In a pilot study two patients with brittle asthma and two with morning dipping received terbutaline or a placebo administered subcutaneously either by continuous infusion or in injections every six hours. In two patients brittle asthma was completely suppressed by terbutaline

1 mg/day given by either method. In the two others early morning dipping responded only to continuous subcutaneous infusions of terbutaline 12 mg/day.

Terbutaline administered subcutaneously may be an effective treatment in asthmatic patients who show important diurnal variations in air flow.

Introduction

Some patients with asthma—for example, patients with brittle asthma or morning dipping¹—show considerable changes in air flow throughout the day despite maximal treatment. In a pilot study we used subcutaneous administration of terbutaline to treat two patients with brittle asthma and two with morning dipping.

Methods

We studied one woman aged 19 and three men aged 29, 35, and 44. All had diurnal variation in peak expiratory flow rate of at least 40%

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