same adverse symptoms while taking pergolide but the remaining four were able to tolerate long term treatment with pergolide. One of this last group (case 17) had suffered a rash while taking bromocriptine, which did not recur on pergolide. In all, six patients stopped taking pergolide because of side effects; four had suffered the same symptoms during previous treatment with bromocriptine (nausea in two (cases 7 and 8), drowsiness in one (case 24), and depression in one (case 13)), but two (cases 1 and 11), who both complained of nausea and drowsiness, experienced fewer problems when subsequently given bromocriptine and were able to continue long term treatment with this drug. As in our preliminary study, no patient had evidence of disturbed liver function while taking pergolide.

Discussion

Preliminary studies indicated the potential value of pergolide mesylate in treating hyperprolactinaemic states in women and men.¹⁻⁴ This long term study confirms the efficacy of a single, low, daily dose of pergolide in suppressing serum prolactin concentrations in hyperprolactinaemia. In most patients the effective dose is between 50 µg and 150 µg daily.

As with bromocriptine, and in agreement with the findings of Kleinberg *et al*,³ we noted a reversal of the reproductive disorders and reduction of tumour size during long term treatment.⁵⁻⁹ The increase in facial hair during treatment of hyperprolactinaemic men receiving testosterone replacement treatment was an interesting finding. One possible explanation is an increase in serum concentrations of dihydrotestosterone; normal men with experimentally induced hyperprolactinaemia appear to have lower concentrations of dihydrotestosterone than control subjects, and this trend is reversed by bromocriptine treatment.¹⁰ We are currently testing this hypothesis. Pergolide was no more successful than bromocriptine in suppressing secretion of prolactin in a patient with a resistant prolactinoma, though the size of the tumour decreased considerably with pergolide.

Side effects were similar to those experienced during treatment with bromocriptine, but four out of eight patients who had previously been unable to continue taking bromocriptine because of side effects were successfully maintained on pergolide. Conversely, two of the six patients who were forced to stop taking pergolide because of untoward effects were subsequently able to tolerate bromocriptine. It would thus seem reasonable to consider treatment with pergolide when treatment with bromo-

criptine has failed because of unacceptable side effects. Use of pergolide as first line drug treatment of hyperprolactinaemia will clearly depend on the results of further clinical trials, but most patients who had previously received bromocriptine preferred the convenience of a drug that need be taken only once a day.

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SHORT REPORTS

Assay of Schwangerschafts protein 1 (SP₁) as test for pregnancy

The standard biochemical test for pregnancy requires the detection of chorionic gonadotrophin, but it is insensitive and cannot be done within a few days of administration of chorionic gonadotrophin. Schwangerschafts protein 1 (SP₁) is a protein produced by the placenta and secreted into the maternal bloodstream. Early work suggested that it might be a useful marker of pregnancy,¹ but this entailed measuring the protein by radioimmunoassay, which put it beyond the range of many laboratories. An easier enzyme immunoassay is now available.² We applied this method to determining before the time of the first missed period whether a woman had conceived.

Patients, methods, and results

We took heparinised blood samples from 150 women attending an infertility clinic in Aberdeen. Seventy of the women received no treatment during the cycle under observation; 48 were treated with clomiphene citrate; 14 had ovulation induced with human menopausal gonadotrophin, and 12 were receiving bromocriptine. The remainder had undergone artificial insemination of donor semen. All patients were seen 21-32 days from their last period or,

in the case of amenorrhoeic women, from the onset of treatment. All were in the luteal phase as judged by basal body temperature and plasma progesterone assay. In some the date of ovulation was pinpointed by determining the peak concentration of luteinising hormone and by ultrasonic scanning of the ovaries. In all patients the sample was taken, as far as we could determine, six to 14 days after ovulation. Serial samples were taken from patients under close observation. If all samples were negative for the protein they were taken as a single negative; if any were positive the patient was scored as being positive.

SP₁ was measured with an immunoassay kit (Behringwerke AG).² The lower limit of sensitivity claimed by the manufacturers is 0.3 µg/l. We operated a cut off point of 0.5 µg/l.

Twenty six women yielded a concentration of the protein above 0.5 µg/l, the lowest value in this group being 1.8 µg/l. All these women were later shown to be pregnant by a standard urinary haemagglutination pregnancy test and by ultrasonography. The table shows the clinical data on the patients.

The remaining 124 of the 150 patients tested yielded negative results. None was subsequently found to have been pregnant.

Comment

Although the number of cases examined was small, our findings suggest that assays of SP₁ are a reliable pregnancy test and comparable with assays of β chorionic gonadotrophin. There were no false positive or false negative results, and the results are available on the

Clinical data on patients positive for SP₁

Case No	Treatment	Calculated day of cycle	Days after ovulation	SP ₁ concentration (μg/l)	Type of pregnancy
1	Human menopausal and chorionic gonadotrophin	22	7	5.0	Normal
2	Human menopausal and chorionic gonadotrophin	21	8	5.1	Twin
3	Human chorionic gonadotrophin	23	9	8.6	Normal
4	Human chorionic gonadotrophin	27	13	18.5	Normal
5	Human menopausal and chorionic gonadotrophin	27	13	19.0	Normal
6	Human chorionic gonadotrophin	23	10	6.8	Normal
7	AID	22	6	2.8	Normal
8	AID	21	6	3.5	Normal
9	AID	26	13	4.4	Normal
10	Clomiphene	21	8	1.8	Normal
11	Clomiphene	29	12	10.4	Normal
12	Clomiphene	22	10	6.8	Normal
13	Clomiphene	28	11	8.9	Normal
14	Clomiphene	27	9	5.2	Normal
15	Clomiphene	28	13	8.6	Ectopic
16	Nil	22	6	2.2	Normal
17	Nil	28	12	4.4	Normal
18	Nil	29	14	36.0	Normal
19	Nil	30	11	10.0	Abortion
20	Nil	28	12	7.2	Abortion
21	Nil	32	14	18.0	Normal
22	Nil	30	13	11.7	Normal
23	Nil	28	10	2.2	Normal
24	Nil	27	10	3.5	Normal
25	Nil	30	12	4.1	Normal
26	Nil	30	13	5.1	Normal

AID = Artificial insemination from a donor.

day of the test. The test does not require the use of radioactivity or expensive and sophisticated apparatus, is well within the compass of the ordinary clinical laboratory, and may be used when assays of β chorionic gonadotrophin are unreliable.

In this investigation we were unable to determine the stage of gestation by which all tests yielded positive results; this question is pursued elsewhere.³ Our positive findings occurred in samples obtained at times ranging from the time of implantation to that of the first missed period; this is well in advance of what can be achieved by ordinary pregnancy tests or ultrasound.

No false positive results occurred, though it has been claimed that a few normal men and non-pregnant women have SP₁ in their blood,⁴ as do some patients with malignant tumours.⁵ This is not a question of sensitivity, as many of the values found in non-pregnant subjects overlap values that we have found in women in early pregnancy. To some extent the difference may be accounted for in terms of methodology: other investigators have mostly used radioimmunoassay, and possibly enzyme immunoassay has less noise at the extremes of sensitivity than radioimmunoassay.

We are grateful to Dr F Dati of Behringwerke AG, Marburg, for the enzyme immunoassay kits, and to Miss Elaine Dalgarno for her secretarial help. AGA is in receipt of funding from the University of Assiut.

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Simple and effective breast pump for nursing mothers

The nutritive, immunological, and psychological advantages of breast feeding are well known.¹⁻⁴ Many mothers, however, have great difficulty breast feeding their newborn offspring directly, particularly when their infants are underweight or have some congenital malformation. Hence it is especially desirable that these mothers should provide freshly expressed breast milk to their infants, even if home duties limit their puerperal confinement.

Existing methods of expressing breast milk include manual and squeeze-bulb aspiration, laborious procedures that expose the milk to air and surface contaminants. These manual methods are often rejected as ineffective and time consuming. Modern postnatal wards are equipped with efficient but expensive electrical breast pumps that allow mothers to express their milk rapidly and aseptically. Mothers who have used these pumps successfully, however, often resort to formula feeding on returning home.

I describe a simple breast pump which is portable, easy to operate, and inexpensive enough for home use but which has the efficiency and safety features of the institutional machines.

Bristol breast pump

Water driven Venturi filter pumps, which are commonly used in scientific laboratories, provide a bench top vacuum source for filtering biological or chemical extracts. Suction pressures up to 200 mb (150 mm Hg) may be generated using a water pressure of only 1.4 kgf/cm² (27.8 psi), which is well below domestic supply pressures. Thus the evacuation capacity of a Venturi pump may exceed that of a typical 2800 rpm 1/8 hp electric pump.⁵

The Bristol breast pump (figure) is light and easy to hold and operate in one hand. The mother may freely adjust the suction pressure at the tap and the rate of suckling with her fingertip. The standard 3.7 cm (1.5 in) thread of the baby bottle eliminates the usual need to transfer the expressed milk into another bottle, and the entire apparatus may be submerged in any available aqueous sterilising solution. Informal preliminary trials have given favourable results both in the home and at hospital, where some mothers opted to use the water driven pump in preference to readily available electric machines.

Breast milk collection system. Venturi pump (a) connected to water tap via universal screw on adaptor (b), which may be left in place, and click on connector (c) (Hozelock UK, Ltd), which allows easy removal of pump between feeds. Tubing (d) transmits suction to milking apparatus, and safety trap (e) prevents backflow of water vapour. Breast cup (f) is applied to areolar skin, and evacuation of milk bottle and breast cup achieved when valve (h) is occluded by mother's finger. Expressed milk enters bottle via internal channel (g). Pulsatile sucking action is created by repeated light touch and release of finger valve.

Comment

In addition to providing natural food for a non-suckling newborn infant, an interval of breast milk expression may help overcome such difficulties as inverted, flat, or sore nipples, insufficient or excessive lactation, milk retention, and maternal or infant illness or separation. The available electric breast pumps are complex and cumbersome.