Act and provides the best possible service for the patient seeking an abortion. Delays are reduced to an absolute minimum and the problem presented by each individual patient is fully explored and assessed. The concept of a Pregnancy Advisory Clinic allows practical advice to be given on all aspects of what is initially considered by the patient to be an unwanted pregnancy; where abortion is refused, adequate follow-up service is provided.

There is an urgent need for sex education at high schools and colleges, as evidenced by the relatively high proportion of students and scholars and women under the age of 17 years who seek an abortion. This requires immediate attention by the education authorities. Another striking feature not brought out by these statistics is the number of patients who discontinue contraception for a variety of reasons without seeking advice, or who are advised by medical practitioners to do so without any alternative being suggested. This indicates that motivation of both patients and medical profession should be investigated and the situation remedied.

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**TABLE VI. OCCUPATION**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scholar</td>
<td>46 (10.1%)</td>
</tr>
<tr>
<td>Student</td>
<td>34 (7.4%)</td>
</tr>
<tr>
<td>Professional</td>
<td>38 (8.3%)</td>
</tr>
<tr>
<td>Clerical and related</td>
<td>191 (42.0%)</td>
</tr>
<tr>
<td>Housewife/unemployed</td>
<td>127 (27.9%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>18 (4.3%)</td>
</tr>
</tbody>
</table>

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**The Intra-uterine Contraceptive Device – Contraceptive or Abortifacient?**

**H. KORT, L. A. VAN DER WALT**

**SUMMARY**

Further to the investigation of the possible mode of action of the intra-uterine contraceptive device (IUCD), an assay for the α-specific subunit of human chorionic gonadotrophin (HCG) has detected endogenous chorionic activity 21 days after menstruation. In 22 proven ovulatory cycles, 7 patients wearing an IUCD had demonstrable serum HCG levels in 45% of these cycles. Abnormal menstruation was associated with the majority of cycles in which there was HCG in the serum. Subsequent luteolysis occurred in all cases. The results of this study may support the hypothesis that IUCD exerts its effect on the fertilized, implanted blastocyst, thus causing possible 'micro-abortion'. Caution should be exercised in the interpretation of HCG values in the follow-up of patients with hydatidiform mole or choriocarcinoma who are bearing IUCDs, since positive HCG levels may be due to an early, fertilized and implanted blastocyst and not to invasive tissue.


During the past decade, the intra-uterine contraceptive device (IUCD) has achieved prominence among contraceptive methods of choice. The IUCD is unique among the reversible methods of contraception in that it provides long-term reduction in fertility by a safe, simple and economical technique. Numerous hypotheses have been postulated to explain the contraceptive action of this device in all its forms. Prominent among these have been possible alterations in tubal transport, local chemotactic effects on the endometrium or a possible mechanical interference with implantation.

This preliminary study was undertaken to examine the hypothesis that the IUCD acts by preventing implantation rather than by subsequent interference. The α-specific subunit assay for human chorionic gonadotrophin (HCG) has been utilized universally to detect a viable blastocyst and in the monitoring of molar pregnancy evacuation and choriocarcinoma follow-up studies. The measurement of serum progesterone concentration in the luteal phase of
the cycle remains a relatively reliable method to establish the occurrence of ovulation.'

This study utilized these concepts in exploring the possible abortifacient action of the IUCD in contraception.

**SUBJECTS AND METHODS**

The protocol for this study was approved by the Human Ethics Committee of the University of the Witwatersrand, and informed consent was obtained from 7 women volunteers, ranging in age from 23 to 37 years. All had had IUCDs inserted at least 6 months before the commencement of the study. The volunteers had been selected at random without regard to the particular IUCD in situ. Four of these devices were constructed of inert material, while the others contained copper in some proportion. None of the IUCDs contained hormonal compounds. Table I summarizes the menstrual history of the women studied.

Initially, blood samples had been collected at weekly intervals over a 12-week period. In 2 of the subjects, samples were obtained on alternate days of the cycle over one complete menstrual cycle. In addition, these subjects were studied for 5 cycles, representing spans of 19 and 20 weeks respectively. A control group was also studied. This group comprised 10 subjects who were receiving combination oral contraceptives and 10 patients who had had total abdominal hysterectomies and bilateral salpingo-oophorectomies. Serum samples not assayed immediately were stored at -20°C until thawed for quantitation for both progesterone and HCG.

Progesterone was determined by radio-immunoassay as previously described. The major cross-reacting steroid was 17α-OH-progesterone which contributed 4% of the total activity. The method for the β subunit assay for HCG was a double antibody technique, essentially as described by Vaitukaitis et al. Standards were calibrated against the second International Standard of HCG while the antibody was purchased from the Institute of Bio-endocrinology, Canada. In our hands, this antibody displayed a potential sensitivity of 1 mIU/ml and assayable to a cross-reactivity of a negligible 2% to luteinizing hormone. To minimize the danger of false positive results, a lower limit of detection of 5 times the potential sensitivity was arbitrarily chosen. All specimens were assayed in duplicate, using control sera from commercial sources and from normal male serum as well as serum from postmenopausal women. Results were computer-derived, employing probit-log transformation plots on weighted regression lines.

### RESULTS

The 7 subjects were studied through a total of 26 completed cycles. Of these, 22 cycles proved ovulatory as evidenced by serum progesterone values of greater than 500 ng/100 ml during the luteal phase of the cycles. HCG was detectable in 45% of these ovulatory cycles. The detailed results obtained are summarized in Table II.

**TABLE II. DETAILS OF CYCLES STUDIED**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Cycles studied</th>
<th>Ovulatory cycles</th>
<th>Number of HCG-positive cycles</th>
<th>First positive HCG result (day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>21, 22, 23</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>24, 21</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>22, 23</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>—</td>
</tr>
</tbody>
</table>

The results observed in the 2 subjects who had been studied in greater detail are depicted graphically in Figs 1 and 2. Observations in subject 1 represented 5 completed menstrual cycles over a 20-week period. All cycles were ovulatory, as evidenced by the raised serum progesterone levels. No measurable serum HCG could be demonstrated during the first 15 days of the cycle. HCG was, however, detected on days 21, 22 and 23 of the second, third and fifth cycles respectively. These measurable levels of HCG coincided with elevated progesterone values compatible with the occurrence of ovulation. Menstruation in this subject was regular and normal in both amount and duration.

Fig. 2 illustrates results in a subject studied over a period of 19 weeks, representing 5 completed cycles of which only the third was anovulatory. Although HCG could not be demonstrated in the serum during the proliferative phase of any of the cycles studied, elevated levels were noted on several occasions during luteal phases of the cycles. On day 24 of the first cycle studied, the level of serum HCG was elevated to 64 mIU/ml; serum progesterone values were in keeping with ovulation. Coinciding with the onset of a delayed menstruation on day 36 of this cycle, HCG levels had fallen to less than the detectable assay limit, while serum progesterone levels

![Table I. Menstrual History of Volunteers Studied](image-url)
DISCUSSION

A possible mode of action of the IUCD has been investigated by means of an assay for the \( \beta \)-specific subunit of HCG. This method has enabled detection of endogenous chorionic activity as early as 6 days after conception. Serum progesterone was determined at the same time to indicate the presence or absence of a viable corpus luteum and, hence, presumed ovulation. Of the total of 26 cycles studied, 22 were ovulatory, as evidenced by serum progesterone levels greater than 500 ng/100 ml. In 10 of the cycles studied (in 6 different subjects) HCG was detected in the luteal phase of the cycle. In no case could HCG be detected before day 21 of a cycle. In 4 of the subjects studied, menstruation was abnormal. This took the form of delayed menstruation with or without menorrhagia. This may be a possible explanation for the menorrhagia often associated with the IUCD. None of the women studied became pregnant while wearing the IUCD.

In those cycles where HCG could be detected, values had fallen to below the detection limit of the assay at the time of menstruation. In addition, serum progesterone values had decreased to levels indicative of the occurrence of luteolysis. No correlation existed between the type of IUCD, the duration of its use and the detection of circulating HCG. Subject 1 was anovulatory throughout the period of the study and, not surprisingly, no HCG could be detected in her serum.

If the division of the fertilized, implanted blastocyst results in biosynthesis of HCG, then measurable HCG during a cycle must be indicative of chorionic activity. A subject with detectable HCG while wearing an IUCD may then have a positive pregnancy test as readily as those on no contraception. An 'HCG-like' material has been reported to occur in the rabbit blastocyst before actual implantation, while the presence of HCG in women using IUCDs has previously been suggested. This pre-implantation HCG phenomenon remains the only other satisfactory explanation for the occurrence of measurable serum HCG levels in IUCD users. It seems a re-definition of the concept of HCG-defined pregnancy will soon become necessary.

In terms of our present concept of HCG-defined pregnancy it is possible that the 'conception rate' in IUCD users approaches that of women not using contraception who are exposed to pregnancy. The IUCD may exert its effect by some unknown method of interference, locally or systemically, with the subsequent interruption of the pregnancy.

Where HCG assays are routinely employed in patients with trophoblastic disease, caution should be exercised in interpretation of results if an IUCD has been inserted. Detectable levels of HCG in the luteal phase in an IUCD user may be due to production by the 'interim' chorion, and not as a result of invasive growth.

We wish to express our appreciation to Dr R. Marcus for his assistance in the project. This study was supported in part by the Atomic Energy Board and the South African Medical Research Council.

REFERENCES