J. Reprod. Fert. (1969) **19,** 357–359

CONTRACEPTIVE MECHANISM OF IUDS

A. PAKRASHI AND G. GHOSH RAY

Reproductive Biology Unit, Indian Institute of Experimental Medicine, Calcutta, India

(*Received 23rd December* 1968, *revised 4th February* 1969)

The mode of action of intra-uterine devices (IUDs) continues to be a subject for speculation. It was Pincus (1964) who, on the basis of original experiments, first conceived the idea of hyperoestrogenism as the probable cause of the antifertility effect of IUDs. Various workers (Vorys, De Neef, Boutselis, Dettman, Scott, Stevens & Besch, 1964; Sammour, Iskander & Rifai, 1967; Bengtsson & Moawad, 1967) also considered the possibility of hormonal involvement in contraceptive action.

The accidental finding of polycystic changes in the ovaries (S. K. Banerjee & K. Mukherjee, personal communication), associated with the use of IUDs in a group of women with severe menstrual trouble, who were undergoing an operation for sterilization, appeared to support the idea of hormonal involvement. The present work was undertaken to elucidate the mode of action of an IUD in preventing fertility.

The devices were Lippes' loop and 'Antigon' and 350 women, aged 18 to 34 yr (parity—one to seven), who were known to have used an IUD for 3 years or longer, were selected for the study.

The chief symptom of most of the patients was some form of menstrual irregularity, such as menorrhagia, meno-metrorrhagia or continued spotting. Vaginal examination revealed enlarged and tender ovaries in the Pouch of Douglas in the majority of individuals with a history of prolonged use of an IUD. No such changes were observed in women with newly inserted IUDs. A soft, hypertrophied cervix with an enlarged uterus was found in most of the women. At laparotomy, the uterus and Fallopian tubes in thirty-five women undergoing tubal ligation were found to be hypertrophied and a polycystic change was observed in the ovaries, the cysts varying in size from very small to the size of a hen's egg. Those women having menorrhagia and meno-metrorrhagia and an IUD *in situ* showed polycystic ovaries in the absence of a corpus luteum. In some women without polycystic ovaries, the presence of a hypertrophied uterus and adnexae was consistent with their normal menstrual pattern. A corpus luteum was observed in some women without any menstrual irregularity although they had experienced heavy loss in previous cycles following the insertion of an IUD.

Cervical mucus was collected from women during the proliferative phase (10 to 12 days) and the secretory phase of the cycle (after 23 days) by means of a blunt polythene tube fitted to the nozzle of a syringe. The mucus showed

TABLE 1

DETECTION OF OVULATION AT RANDOM (FROM DAY 23 TO PREMENSTRUUM)

	First group	*Second group*	*Third group*
No. of patients	320	14	16
Vaginal smear	KI* } high EI† } high	KI } low EI } low	Indeterminate
Cervical mucus	Heavy ferning	Absence of ferning	Atypical to complete absence
Endometrium Histology	Anovulatory (Hyperplastic type, simple to atypical)	Secretory type	Could not be interpreted
Histochemistry	Marked alkaline phosphatase distribution in the epithelium	Alkaline phosphatase deposition in blood vessels only	Alkaline phosphatase irregular distribution

Total no. of patients = 350.
* KI = Karyopycnotic Index.
† EI = Eosinophilic Index.

TABLE 2

DURATION OF DEVICE, SYMPTOMS AND OVARIAN PATHOLOGY (FROM DAY 23 TO PREMENSTRUUM)

	First group	*Second group*	*Third group*	*Fourth group*
No. of patients	20	8	2	5
Present menstrual behaviour	Excessive and irregular bleeding	Moderately heavy bleeding	Normal regular cyclic bleeding	Mild heavy to almost normal bleeding
Duration of device	1½ to 3½ yr	1 to 3 yr	2 to 3 yr	½ to 1 yr
Ovarian changes Macroscopic	Polycystic (bilateral)	Large ovaries without cysts	Single cyst-like corpus luteum	Normal size ovaries without cysts
Microscopic	Cyst wall-granulosa and theca-layer or flattened theca layer only; hyperplastic stroma	Not examined	Typical corpus luteum	Not examined

Total on. of patients = 35.

marked spinnbarkeit (6 to 12 cm) and heavy ferning also, in the second half of the cycle. Vaginal smears taken during both phases of the cycle and stained by the method of Shorr (1941) showed a very high karyopycnotic index with typical cornified cells even in the second half of the cycle. At histological examination, alkaline phosphatase distribution in strip biopsies of the endometrium showed a proliferative type of mucosa in the second phase of the cycle with hyperplasia, oedema and absence of decidual cell reaction of the stroma associated with marked hypertrophy and increase in the number of the endometrial glands (Table 1). Where a corpus luteum was present, typical secretory changes were predominant. Microscopic examination of tissues taken by resection of ovaries during tubo-ligation showed polycystic changes with hyperplasia of the stromal cells (Table 2).

A follow-up survey for the detection of ovulation in fifty-six women for three consecutive cycles, on the basis of the criteria already described, revealed an anovulatory picture with abnormal changes in the endometrium (Table 3).

TABLE 3

FOLLOW-UP SURVEY OF THREE CONSECUTIVE CYCLES FOR THE DETECTION OF OVULATION

	First group	*Second group*
No. of cases	26	30
Duration of use of device	Newly inserted	Old cases (i.e. > 1 yr)
Anovulatory	25 in all cycles	27 in all cycles
Ovulatory	1 in all cycles	2 in 3rd cycle only; 1 in all cycles

The results of the present study strongly suggest that the presence of an IUD is associated with hyperoestrogenism which results in the suppression of ovulation and that this sequence of events is responsible for the antifertility effect of the device in women. The cause of this hormonal change and its reversal to normal is, however, not yet clear.

The authors wish to thank Dr S. K. Banerjee, Medical College, Calcutta for co-operation and M. B. Basak for technical assistance.

REFERENCES

BENGTSSON, L. P. & MOAWAD, A. H. (1967) The effect of the Lippes loop on human myometrial activity. *Am. J. Obstet. Gynec.* **98,** 957.

PINCUS, G. (1964) *Discussion on mechanism of contraceptive action.* In: Proceedings of 2nd Int. Conf. Intrauterine Contraception, p. 211. Excerpta Medica Foundation, Amsterdam.

SAMMOUR, M. B., ISKANDER, S. G. & RIFAI, S. F. (1967) Combined histologic and cytologic study of intrauterine contraception. *Am. J. Obstet. Gynec.* **98,** 946.

SHORR, E. (1941) A new technic for staining vaginal smear. III. A single differential stain. *Science, N.Y.* **94,** 545.

VORYS, N., DE NEEF, J. C., BOUTSELIS, J. G., DETTMAN, F. G., SCOTT, W. P., STEVENS, V. C. & BESCH, P. K. (1964) *Effect of intrauterine devices on the normal menstrual cycle.* In: Proceedings of 2nd Int. Conf. Intrauterine Contraception, p. 147. Excerpta Medica Foundation, Amsterdam.