

PHYSICAL CHANGES IN CERVICAL MUCOUS IN WOMEN USING COPPER 'T'

By

GAYATRI VIJAY, ALKA KRIPLANI AND RUPINDERJIT KAUR

SUMMARY

Physical changes occurring in the cervical mucous after copper T insertion were studied in 200 women. Hundred women, who were not using any contraceptive device and had normal menstrual history were taken as controls. As compared to control group, viscosity of cervical mucous was found to be increased in the study group and volume during the SOP was found to be decreased. Cervical mucous was more alkaline during SOP in the study group, arborization during SOP was markedly decreased and there was reduction in the spinnbarkeit. In the control group 80 per cent of patients showed excellent post-coital test in comparison to only 52 per cent of study group during SOP, indicating poor sperm penetration. These findings show that the cervical mucous is rendered hostile to sperm penetration in women using Cu T.

Introduction

Copper T as an IUCD has been accepted as one of the most important methods of birth control. Zipper and Tatuni (1969) were the first to study the antifertility effect of Cu T. They proposed that several sites of action involved are:

1. Alteration in the endometrial milieu,
2. Alteration in the biochemistry of the endometrial and tubal mucosa.
3. Alteration in the physico-chemical properties of the cervical mucous and

4. Copper may adversely affect the spermatozoa.

After insertion of Cu T, the properties of the cervical mucous are altered to render it hostile to sperm penetration. The present study was undertaken to evaluate the changes in the cervical mucous during the three phases of menstrual cycle and specially during the supposed ovulatory phase (SOP), which may interfere with sperm penetration.

Material and Methods

The present study was conducted in the department of Obstetrics and Gynaecology, J.L.N. Medical College and Associated group of hospitals, Ajmer. Two hundred women using Cu T as contraceptive were studied. Hundred women

From: Department of Obstetrics and Gynaecology, J.L.N. Medical College and Associated Group of Hospitals, Ajmer-305 001.

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with regular menstrual history and not using any family planning device were taken as controls. A detailed history was taken. General and per vaginal examination were done to exclude any gynaecological pathology.

All the patients were asked to maintain basal body temperature chart to find out the approximate time of ovulation. They were examined and samples were collected during the 3 different phases of menstrual cycle i.e., post menstrual phase (PMP), from 5th day of periods to the 10th day, supposed ovulatory phase (SOP) from 11th to 15th day and premenstrual phase (PP); from 20th to 25th day of the cycle.

Method of Sample Collection: Cusco's bivalve speculum was passed and cervix visualised after the patient was made to lie in the lithotomy position. Mucous was sucked from the upper cervical canal with the help of tuberculin syringe. Various parameters noted were:

1. Volume: noted in the syringe.
2. Viscosity: by putting on a slide. Viscosity was graded as (+) where mucous was very thin, watery and clear, (++) where mucous was moderately viscous and had lost its transparency and (+++) where mucous was markedly viscous, copious, thick and turbid.
3. pH: by using litmus paper and reading the value against the comparator.
4. Spinnbarkeit: by measuring the stretchability in cms between two slides.
5. Fern pattern: by studying dried mucous under high power microscope. (-) when no arborization was seen, PL (+): arborization with only pri-

mary branching, PL (++): arborization with both primary and secondary branches and PL (+++) when the whole slide was densely covered with arborization with presence of primary, secondary and tertiary branches.

6. Post Coital test: This was done on the ovulatory day, preferably within 2 to 6 hours of coitus. (- ve): no sperm seen, (+) 1 to 5 sperms with minimal activity; test is poor, (++): 6 to 10 sperms with sluggish haphazard movements; test is fair, (+++): 11 to 15 sperms with slow migratory activity; test is good and (++++) when 16 to 20 sperms with rapid migratory activity; test is excellent.

Observations and Discussion

The age, parity, socio-economic status and time since last childbirth were comparable between the two groups.

Viscosity: Viscosity of the cervical mucous during the various phases of menstrual cycle in the study group was not undergoing characteristic cyclic variation as in the control group (Table I).

In the study group viscosity during SOP was found to be increased (Table I). Our results are supported by Elstein and Ferr (1973) who showed that the mucous after incubation with copper became viscous and could not be drawn in threads. This change in the rheologic property of cervical mucous by use of Cu T indicates hostile mucous preventing sperm penetration.

Volume: The volume of cervical mucous in the control group was maximum during SOP. This observation is

TABLE I
Viscosity of Cervical Mucous

| Phase of Cycle | Viscosity | Study Group | | Control Group | |
|----------------|-----------|--------------|------|---------------|----|
| | | No. of cases | % | No. of cases | % |
| P.M.P. | + | 7 | 3.5 | — | — |
| | ++ | 96 | 48.0 | 40 | 40 |
| | +++ | 97 | 48.5 | 60 | 60 |
| S.O.P. | + | 173 | 86.5 | 92 | 92 |
| | ++ | 23 | 11.5 | 8 | 8 |
| | +++ | 4 | 2.0 | — | — |
| P.P. | + | 1 | 0.5 | — | — |
| | ++ | 24 | 12.0 | 12 | 12 |
| | +++ | 175 | 87.5 | 88 | 88 |

supported by McDonald (1969), Devajan and Kunitake (1969), Sarees (1971) and Agarwal *et al* (1984). In the study group the volume of cervical mucous was increased in PMP, PP and decreased in SOP as compared to control group. Our findings are in agreement with those of Agarwal and Nandan (1984) but Malkani (1971) reported an overall increase in the volume of cervical mucous after the use of Cu T.

Colour: Cervical mucous was dirty white in most of the cases in all phases of menstrual cycle in the study group while in the control group mucous was clear or had whitish tinge. This alteration in colour after Cu T insertion is due to increase in the RBC and WBC content of mucous. Hafnawi *et al* (1971) and Agarwal and Nandan (1984) also found increased turbidity of the cervical mucous in Cu T users.

pH: The pH of cervical mucous in a normal fertile female is usually alkaline during all the phases of menstrual cycle (Moghissi, 1966), specially during SOP.

Our findings in the control group were also similar. In the study group the pH was more alkaline during all the phases, more so during SOP, when compared to the control group. Similar were the findings of Malkani (1971) and Agarwal and Nandan (1984).

Spinnbarkeit: In the control group normal cyclic variation was observed with maximum spinnbarkeit formation during SOP. These findings coincide with the earlier studies of Clift (1945), Moghessi (1966), Kremer (1965), Agarwal and Nandan (1984). In the study group, spinnbarkeit formation was quite low as compared to the control group during SOP and the difference was statistically highly significant ($P < 0.001$) (Table II). The difference between the two groups during PMP was statistically insignificant and significant during PP. Hafnawi *et al* (1975) and Agarwal and Nandan (1984) also reported reduced spinnbarkeit in Cu T users.

Arborization: This is an expression of oestrogen activity and the electrolyte

TABLE II
Comparison of Spinbarkeit Formation

| Phase of | Study Group | | | Control Group | | | t | P | Significance |
|----------|-------------|------|------|---------------|-------|------|------|------|--------------------|
| | Range | Mean | SD | Range | Mean | SD | | | |
| PMP | 0-5 | 2.25 | 1.25 | 1-4 | 2.36 | 1.07 | 0.48 | .10 | Insignificant |
| SOP | 1-20 | 7.53 | 3.61 | 4-20 | 11.88 | 4.95 | 4.25 | .001 | Highly significant |
| PP | 0-4 | 1.58 | 0.95 | 1-3 | 1.28 | 0.68 | 1.98 | .05 | Significant |

Variation in Spinbarkeit

| Between | Study group | | Significance |
|-------------|-------------|-------|--------------------|
| | I | P | |
| PMP V/S SOP | 28.07 | 0.001 | Highly significant |
| PMP V/S PP | 11.92 | 0.001 | Highly significant |
| SOP V/S PP | 28.34 | 0.001 | Highly significant |

depicting its presence on drying is sodium chloride. In the control group ferning was found to be maximum during SOP being (+++) in 80% of cases. This is the typical fern characteristic in different phases of menstrual cycle. Jungalwala and Chinay (1963), Moghissi (1966). Sarin (1971), Agarwal and Nandan (1984) also showed similar fern pattern changes.

In the study group, during SOP, maximum arborization was seen in only 59.5 per cent. It is clear that the fern pattern does not undergo cyclic changes after insertion of Cu T. Such reduced ferning during the ovulatory phase reflects poor receptivity of cervical mucous to sperms. Similar were the findings of Malkani (1971), Kesseru and Camacho (1972) and Agarwal and Nandan (1984). However Hafnawi *et al* (1975), in a series of 30 women, showed that despite the use of Cu T or Lippe's loop, the mucous showed positive ferning to the same extent during SOP. The reason for this is not clear.

Post-coital test: Only 20 cases in the study group and 20 in the control came for post coital test during the ovulatory phase. From the findings given in Table III it is clear that sperm penetration is definitely reduced in Cu T users. This reduction in the sperm penetration is attributed to the alteration in the physical properties of cervical mucous and due to direct toxic effect of cupric ion on sperms causing their inactivation. Elstein and Rush (1971), Hafnawi *et al* (1975) and Agarwal and Nandan (1984) also showed similar results.

TABLE III
Post Coital Test

| Group | | 0 -ve | + | ++ | +++ | ++++ Excel- lent |
|---------|-----|----------|-----|-----|-----|------------------------|
| Study | No. | 10 | 4 | 3 | 2 | 1 |
| | % | 50% | 20% | 15% | 10% | 5% |
| Control | No. | — | — | 2 | 2 | 16 |
| | % | — | — | 10% | 10% | 80% |

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