MODIFICATION OF IUCDS AS A POSSIBLE MEANS OF PREVENTING UTERINE INFECTIONS

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It has frequently been observed that women fitted with intrauterine contraceptive devices (IUCDs) run an increased risk of pelvic inflammatory disease (PID) (Kaufman et al 1980). IUCDs are used by many million women throughout the world and PID will occur in 2 - 4% within one year of insertion. Normally, the cervical mucus acts as a barrier to the transfer of bacteria from the vagina to the uterus which is sterile. The viscoelasticity of the cervical mucus changes during the menstrual cycle exhibiting a nadir at mid-cycle which facilitates sperm penetration. It might therefore be assumed that this could be the stage at which the risk of infection would be highest. The properties of cervical mucus are not altered by the presence of an IUCD and since the device is sterile it cannot provide the means of infection. However, it has been suggested that the presence of the locating thread in the cervical canal is responsible for the increased incidence of infection in IUCD wearers (Sparks et al 1981). This work describes an in vitro investigation into the involvement of the locating thread in the transfer of bacteria together with modifications to the threads directed towards the prevention of this transfer.

The in vitro system consisted of a length of 3 mm internal diameter, sterile silicone rubber tubing filled with sterilised gel. Locating threads from Saf-T-Coil or Dalkon Shield were situated centrally along the length of the tube. The tubing was fixed to a glass support at the top end and the bottom end was attached to a glass reservoir which contained the bacterial culture. The tubes were held vertically in an atmosphere of constant humidity at 37°C. At various time intervals tubes were removed and sectioned into 5 mm lengths. The gel from each section was cultured on MacConkey agar and nutrient agar plates and incubated at 37°C for 24 hours. When the tube was filled with 2.0, 2.5 and 3.0% w/v sodium carboxymethylcellulose, E. coli was unable to penetrate the gel in the absence of a thread even after 92 hours. However, when the thread from Saf-T-Coil was present in the gel the organisms had penetrated 15 mm after 68 hours and 30 mm after 92 hours. Furthermore, the rate of penetration was independent of gel concentration. S. aureus, a non-motile organism penetrated at the same rate as the motile E. coli in the presence of the thread. The multi-filamentous Dalkon Shield thread produced similar results. When bovine cervical mucus was used penetration was 20 mm after 68 hours and 30 mm after 92 hours. Once again the penetration rate was independent of mucus viscoelasticity. It would therefore appear that the thread is directly implicated in the transfer of organisms and that this transfer could occur at any stage in the menstrual cycle.

Attempts were made to modify the surface of the threads by immerson in a water soluble silicone concentrate and drying at 100°C. When this coated thread was used alone no bacteria penetrated the gel whereas an unsiliconised and siliconised thread wound together supported penetration. It is therefore concluded that the surface nature of the thread is the crucial factor and increasing the hydrophobicity presumably prevents the adhesion of bacteria. The evaluation of these findings in vivo would certainly merit investigation.

Kaufman, D. et al (1980) Am.J.Obstet.Gynecol. 136(2):159-162
Sparks, R.A. et al (1981) Br.Med.J. 282:1189-1191

0022-3573/82/120031P-01$02.50/0