

Intrauterine device for contraception in dogs

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A new intrauterine device for contraception was tested on nine bitches. After it had been implanted, the bitches were mated but none of them became pregnant. Over a two-year period no side effects were observed, except in a bulldog bitch in which signs of oestrus persisted until the device had been removed.

THE mismating of a bitch is a common problem for dog owners. Ovariohysterectomy is the most obvious solution to avoiding unwanted pregnancies, although it is often rejected by owners. Alternatively, there are drugs which prevent the implantation of the embryo, or induce abortion, or suppress normal ovarian cyclicity.

Oestrogens prevent implantation by inhibiting the transport of oocytes in the uterine tubes and by a direct embryotoxic action (Concannon and Meyers-Wallen 1991), but they can also have two serious side effects: the increased likelihood of pyometra subsequent to cystic endometrial hyperplasia and bone marrow suppression (Olson and Johnston 1993). Moreover, they are often far from 100 per cent effective, especially when they are administered at inadequate dosage (Bowen and others 1985). Recently, an injectable preparation of a low dose of oestradiol benzoate has become commercially available for veterinary use. This drug minimises side effects, but it requires two or three injections after mating to be effective.

Prostaglandin F2 α induces luteolysis, reduces serum progesterone concentration and induces abortion, but it cannot be used before the 30th day of pregnancy. Moreover, its efficacy depends on it being injected more than once a day, because of its short half-life, and it can have unpleasant side-effects, particularly at high dosage, including emesis, diarrhoea, hypothermia, salivation, lethargy and tachypnoea.

Cabergoline can induce abortion owing to its strong antiprolactin activity, without obvious side effects (Post 1995). However, neither cabergoline nor prostaglandin F2 α are licensed in the UK for inducing abortion in dogs.

Other contraceptives include various steroid hormones which prevent the synthesis and release of gonadotrophins through feedback inhibition, resulting in the suppression of the oestrous cycle. Unfortunately, they also have side effects. They include medroxyprogesterone acetate and megestrol acetate; proligestone has been developed more recently and is thought to be less likely to cause side effects than the other progestagens (Evans and Sutton 1989).

In the past, mechanical contraceptives have been developed in the form of blocks to copulation in bitches, but they have always had a high failure rate (Concannon and Meyers-Wallen 1991). Intrauterine devices (IUD) have been used successfully in humans, even for long periods, and have proved to be a safe and effective method of contraception (Lete and others 1998, Bonacho and others 1999). Devices of this sort have always been considered impractical in bitches because of the difficulty of introducing them (Concannon and Meyers-Wallen 1991). Recently a new IUD (BIOTUMER Argentina SA) for bitches has been marketed, and this paper describes tests of its efficacy in bitches of different breeds and ages.

MATERIALS AND METHODS

Animals

Nine bitches of different breeds, sizes and ages were studied over a period of two years (Table 1). They were not chosen

at random but to provide subjects ranging in weight from 3 to 70 kg. They were all able to mate and maintain a pregnancy (they had all had litters after natural mating), and ranged in age from three to six years.

The stage of the oestrous cycle was monitored by taking vaginal smears and measuring plasma progesterone concentration. The vaginal smears were prepared from the beginning of proestrus until oestrus, and progesterone was assayed at the beginning and at the end of the oestrous cycle. The animals were selected when they were in proestrus or oestrus, so that the implantation of the IUD would be fairly straightforward. The dalmatian, great dane and beagle were in proestrus, and the others were in oestrus. Only the bulldog had undergone a hysterotomy two years previously by caesarean section, because it had 13 puppies.

The intrauterine device

The IUD was made of plastic material formed into a 'Y'-shaped body which could fit in the uterus (Fig 1a). The body was covered with electrolytic copper and had two flexible arms. Each arm had a block appendix attached at its end, to prevent the device from moving. Two nylon threads were attached to the body's lower extremity, so that it could be removed if needed. The device's contraceptive activity is due both to its mechanical disruptive effects and to the spermicidal activity of the metallic ions released by the electrolytic copper (Nagle and Turin 1997). The IUD is sterilised with ethylene oxide and supplied in a sealed plastic bag, it is available in two sizes: 'L' for multiparous bitches weighing over 12 kg and 'S' for nulliparous bitches or those weighing under 12 kg. The package also contains a cervicoscope and a cervical distender (Fig 1b, c). The small device weighs 0.8 g and the large device weighs 1.1 g.

Implantation technique

After a gynaecological examination, each animal was anaesthetised and positioned in dorsal or ventral recumbency with the genital plane on the edge of the table; the perineal region was then prepared aseptically and draped. The cervicoscope (Fig 1b) was inserted with the plastic tube used for a pen lamp turned towards the floor; a pen lamp did not provide enough light to view the cervix and a fiberoptic lamp with a flexible arm was used instead.

The IUD bag was then opened on the side of the nylon threads, because the threads had to be pulled to make the two arms of the 'Y' enter the applicator tube (Fig 2a, b). The two rubber rings on the applicator tube (Fig 1c), which made it easier to introduce into the cervix, were set 1 cm apart for small bitches, and 2 cm apart for large bitches. Having enlarged the cervix with the cervical distender, the applicator tube with the IUD inside was introduced through the cervicoscope. It was fairly easy to insert because in the applicator tube there was a syringe-like piston (Fig 1c) which was pushed (Fig 2c), so that each arm of the 'Y' fitted into the corresponding horn of the uterus (Fig 2d). The copper-covered body of the device was then placed in the body of the uterus.

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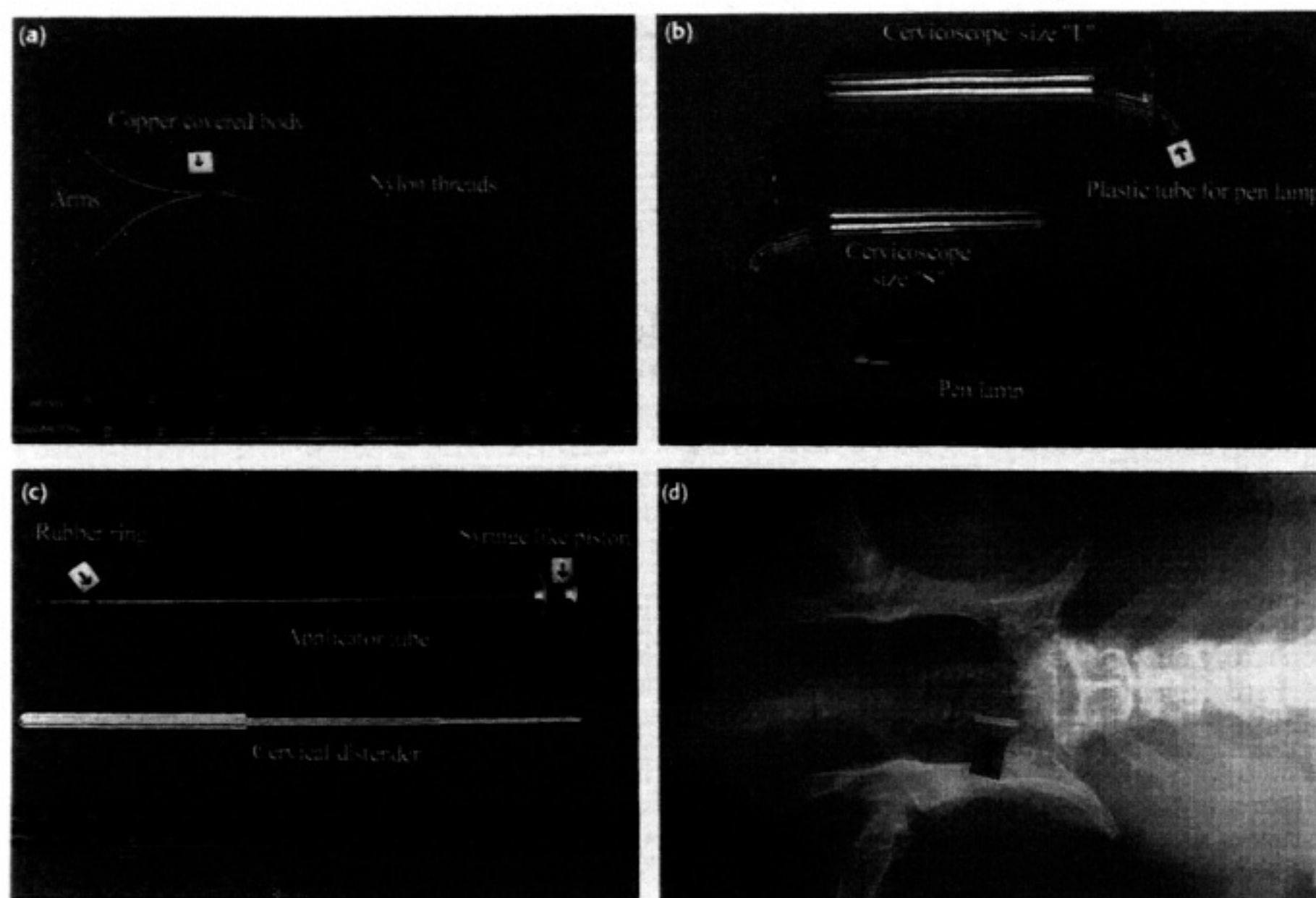


FIG 1: (a) Intrauterine device. (b) Cervicoscopes (sizes 'L' and 'S') and the pen lamp. (c) Applicator tube and the cervical distender. (d) X-ray examination; the IUD's copper-covered body is indicated by an arrow

When the applicator tube was pulled out (Fig 2e) two nylon threads protruded from the lips of the vulva and had to be cut 5 cm inside the vagina (Fig 2f). The introduction of an IUD took from 10 to 20 minutes.

Testing the contraceptive effectiveness of the IUD

The position of the IUD was checked by x-ray examination (Fig 1d), and the bitches were examined clinically and by ultrasound, and a vaginal smear was taken every 30 days to monitor the state of the reproductive tract.

After implantation the IUDs were left in the bitches for two years and they were removed after the onset of the third oestrous cycle. The manufacturer recommends leaving the IUD for at most two years because this is the effective life of the electrolytic copper.

At the first oestrus after the device had been introduced each bitch was mated to one or more male dogs four times on alternate days, in the presence of a veterinary surgeon. The chosen dogs had already proved fertile in other matings, and sperm had been collected and examined 15 days before the mating.

RESULTS

The bitches which had been fitted with the IUD were examined clinically and by ultrasound on the 15th, 20th, 25th and 30th day after mating, and none of them was pregnant. During the two years (three oestrous cycles) during which the IUDs remained in the bitches none of them showed any signs of pain in relation to their presence and there were no signs of any pathological process. However, in the bulldog the signs of oestrus persisted. Examinations by x-ray and ultrasound showed that the IUD was in the correct position, and vaginal smears and progesterone and oestrogen assays indicated that the bitch was in oestrus. On the 15th day after implantation the concentration of progesterone was 4.6 ng/ml and of oestradiol-17 β 35 pg/ml; on the 17th day the concentration of progesterone was 4.5 ng/ml and oestradiol-17 β 30 pg/ml. On the 20th day proligestone was administered, but the signs of oestrus persisted. On the 24th day after implantation the IUD was removed and 24 hours later the bitch stopped showing signs of oestrus.

DISCUSSION

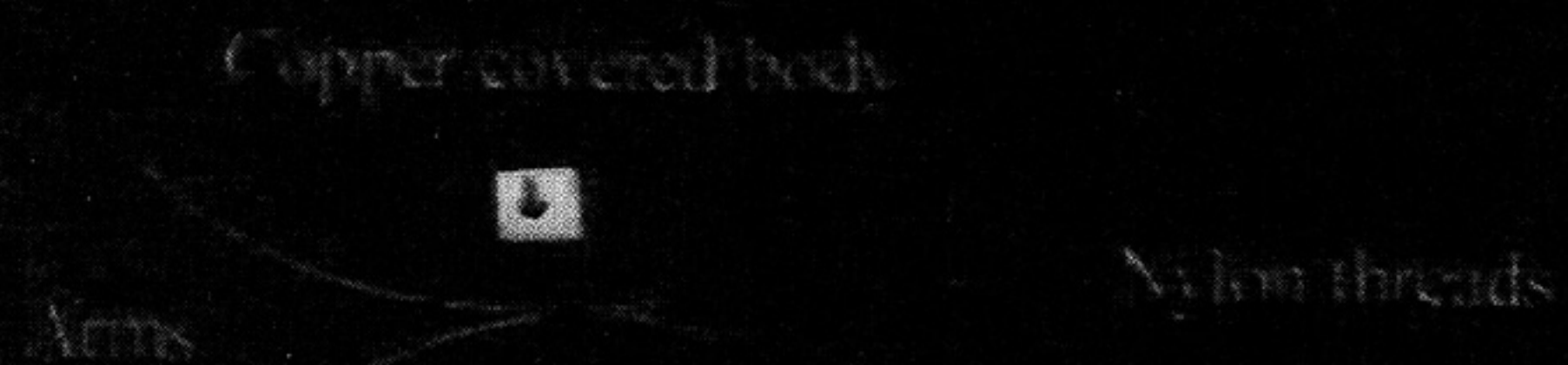
The IUD proved to be a safe and effective method of contraception, none of the bitches showed any signs of pain or any pathological process, and none became pregnant.

The persistence of oestrus in the bulldog was associated with a slightly high serum progesterone concentration on the 15th day after implantation (4.6 ng/ml) suggestive of imminent ovulation. However, the signs of oestrus persisted and a hormone assay on the 17th day showed little change. Vaginal smears taken during this period contained many superficial anucleate cells, presumably owing to the high serum levels of oestrogens. The proligestone administered on the 20th day failed to have the expected effects and the IUD was therefore removed. The rapid disappearance of the signs of oestrus suggests that the persistence of oestrus was due to the presence

TABLE 1: Breeds, weights, ages, stage of oestrus cycle and number of previous pregnancies of the nine bitches fitted with an intrauterine device

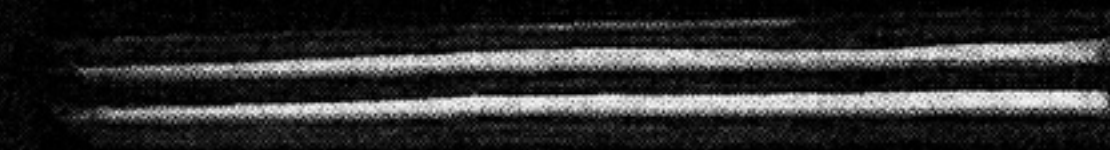
Bitch	Breed	Weight (kg)	Age (years)	Stage of oestrus cycle	Previous pregnancies
1	German shepherd dog	37	5	Oestrus	1
2	German shepherd dog	30	3	Oestrus	1
3	Bulldog	35	6	Oestrus	2
4	Yorkshire terrier	3	5	Oestrus	2
5	Yorkshire terrier	6	4	Oestrus	1
6	Great dane	70	4	Proestrus	2
7	Beagle	24	3	Proestrus	1
8	Dalmatian	20	3	Proestrus	1
9	Crossbred	14	6	Oestrus	2

(3)



(b)

Cervicoscope size "1"



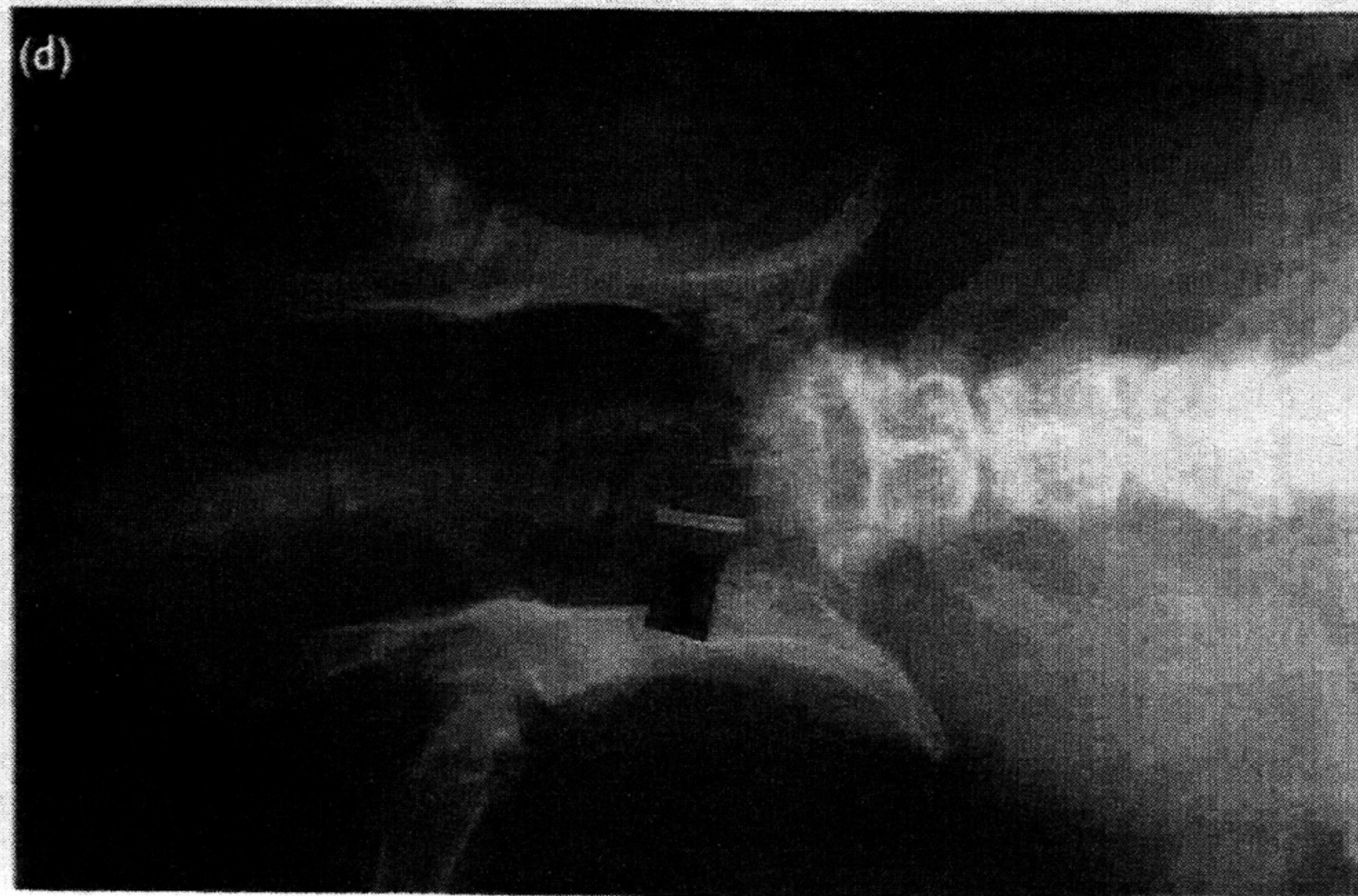
Plastic tube for pen lamp

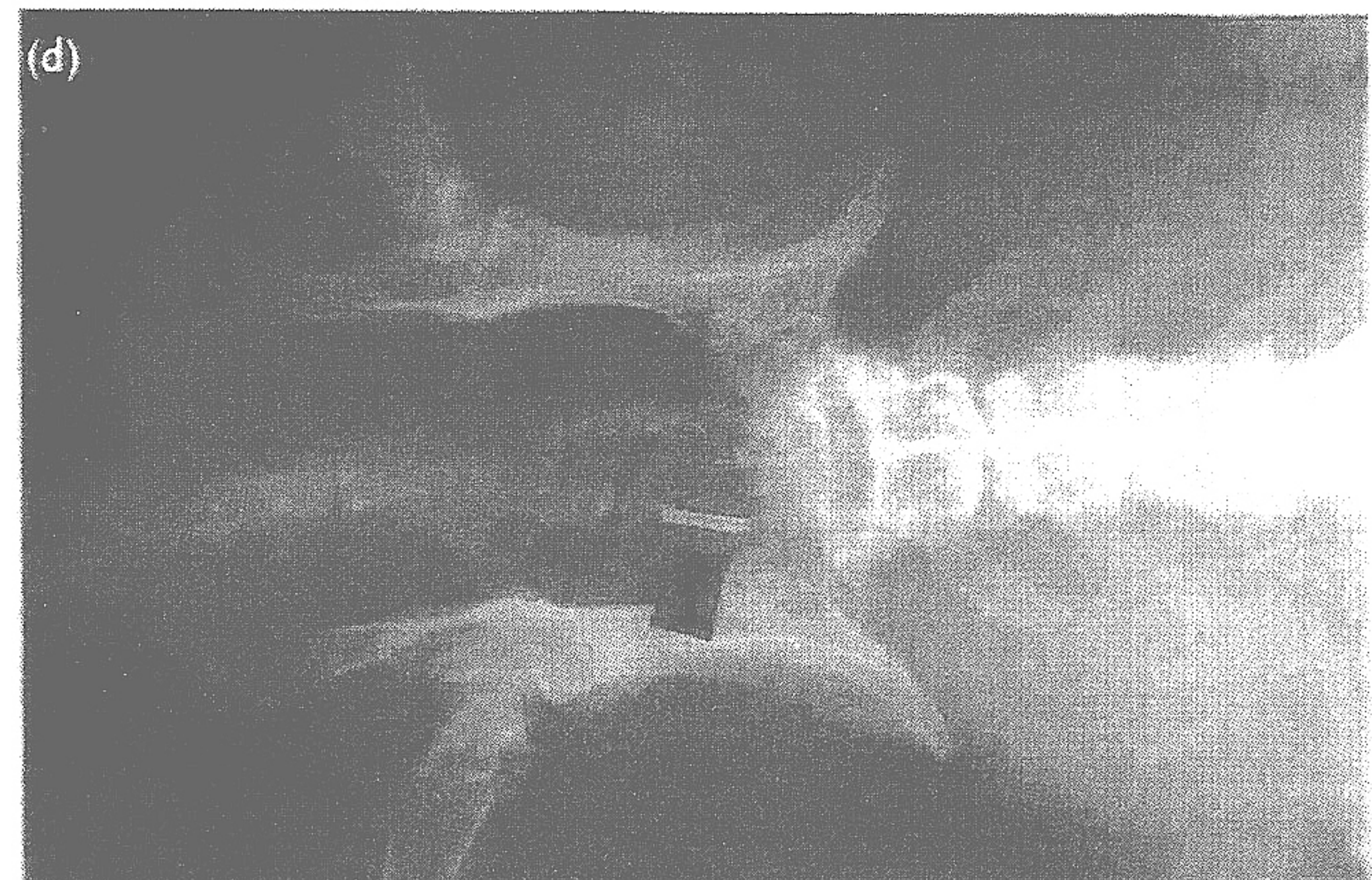
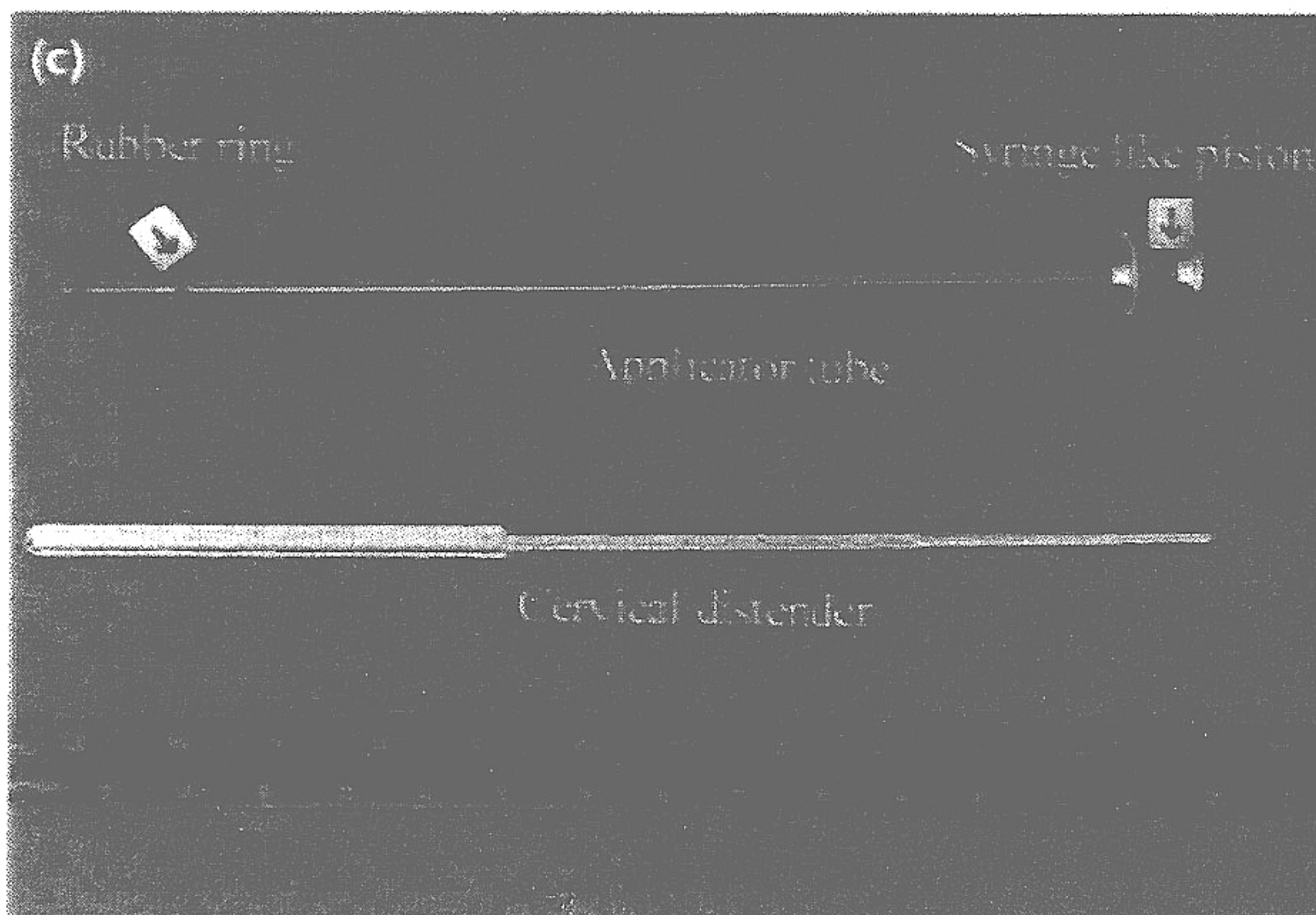
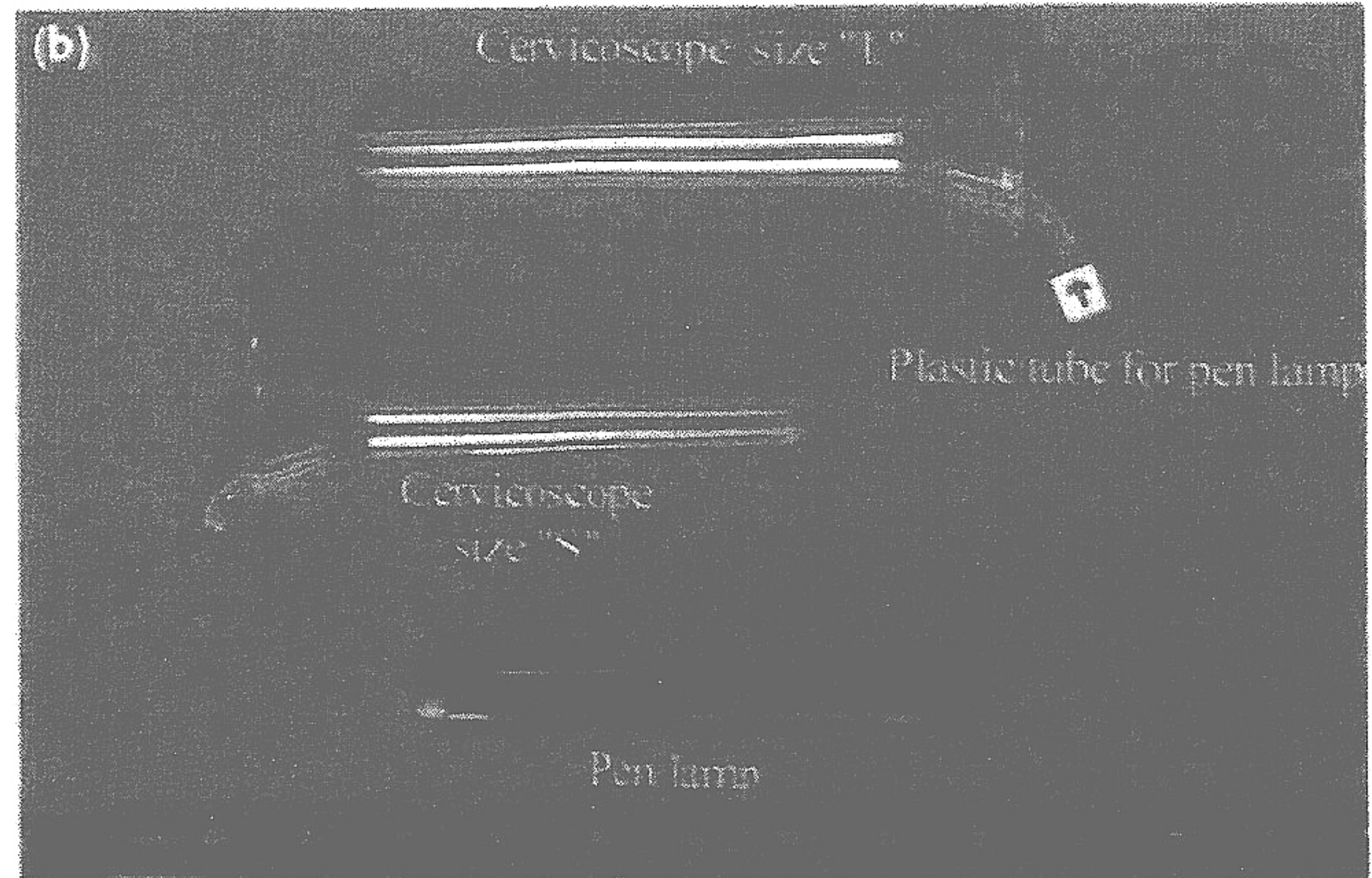
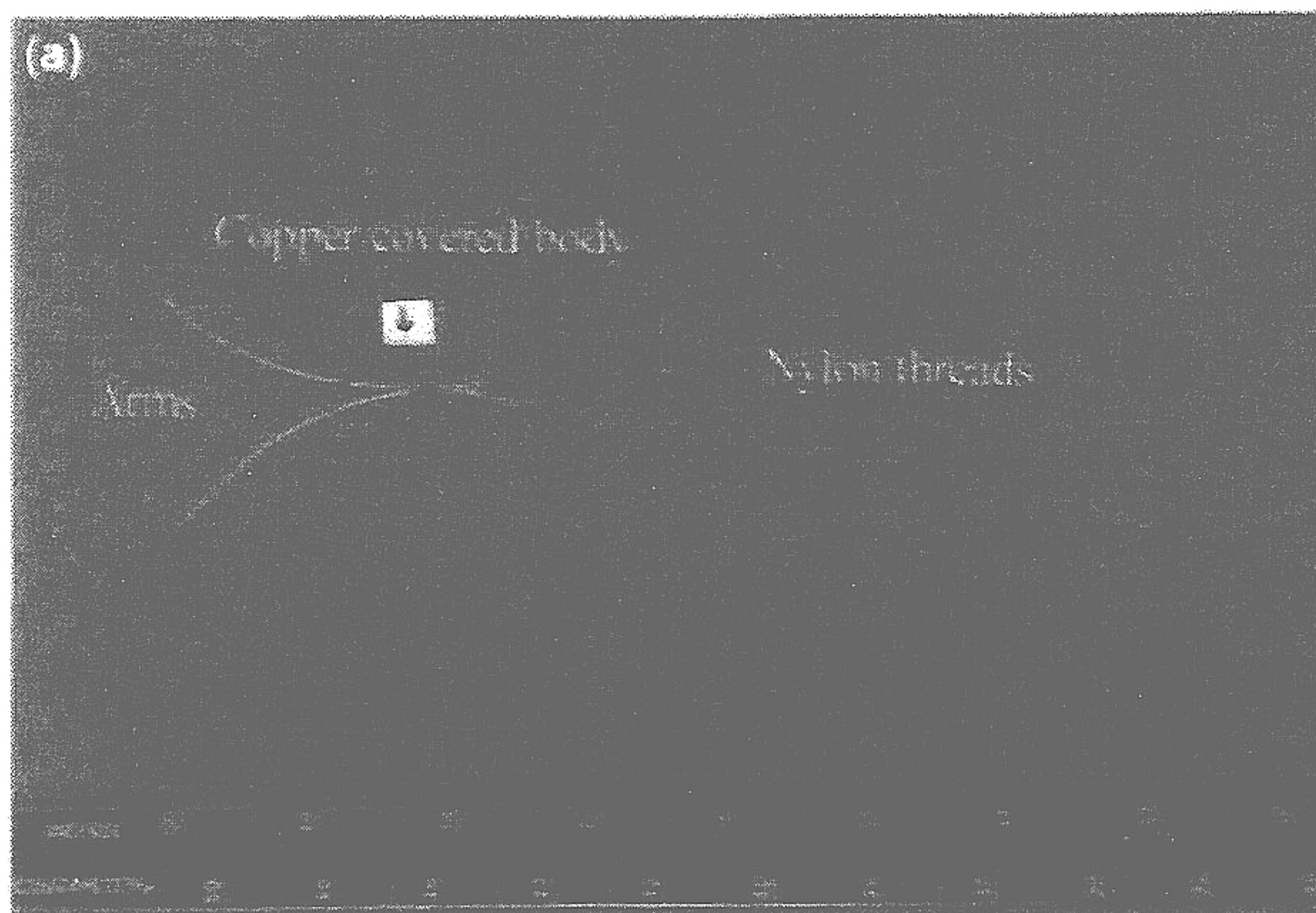


(c)



(d)





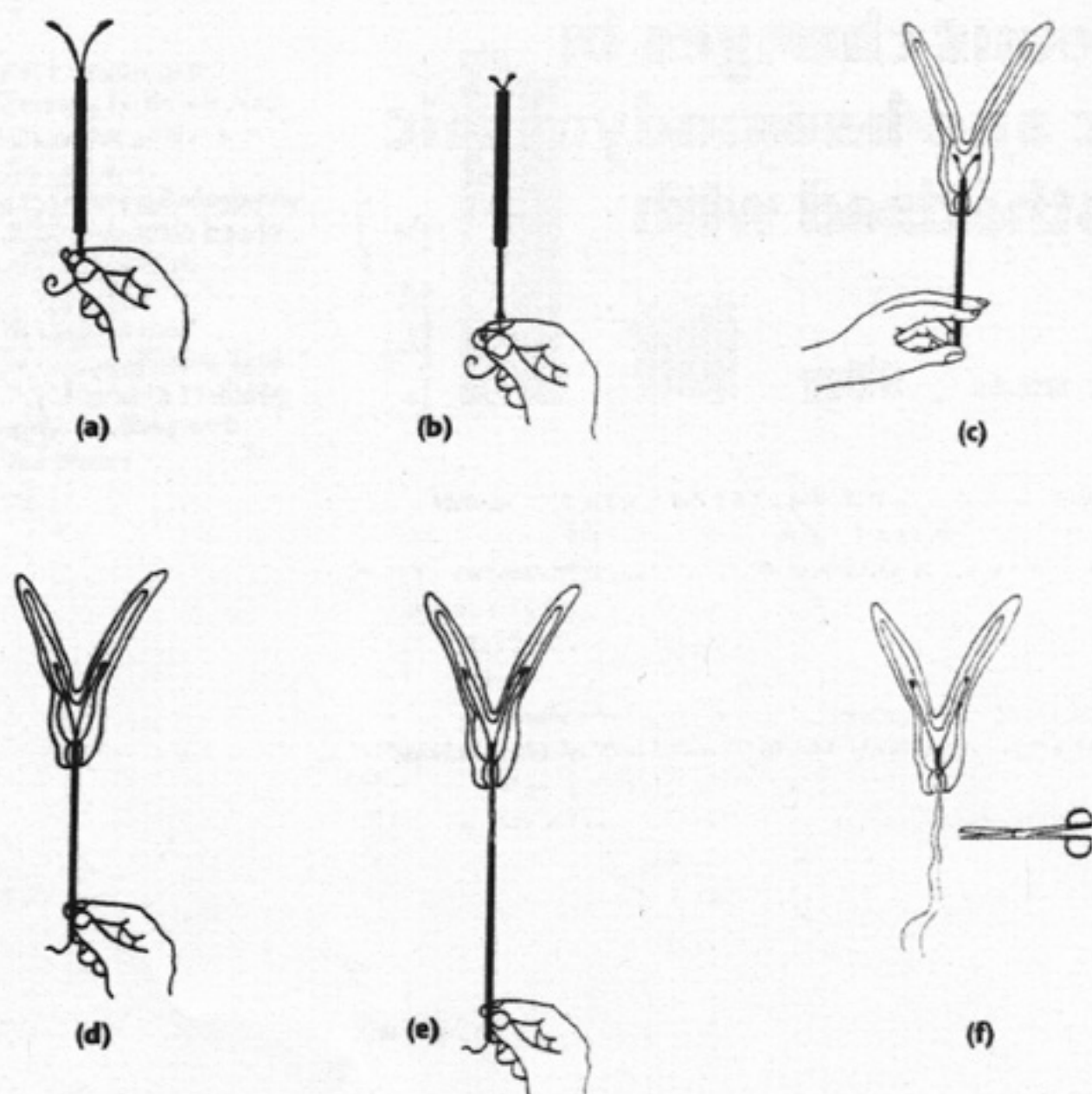


FIG 2: (a) and (b) The nylon threads and the syringe-like piston are pulled to make the two arms of the IUD enter the applicator tube. (c) and (d) The syringe-like piston is pushed, so that each arm of the IUD fits into the corresponding horn of the uterus and the copper-covered body of the device is in the body of the uterus. (e) The applicator tube is pulled out. (f) The two nylon threads protruding from lips of the vulva are cut 5 cm inside the vagina

of the IUD, which had probably produced local stimulation in a very sensitive subject. The bulldog was the only one of the nine bitches which had been subjected to hysterotomy by caesarean section.

The costs involved in the IUD technique are fairly modest, given the low price of the device itself and the short duration of anaesthesia. Moreover, it would be unnecessary for a veterinary surgeon with extensive experience with the implantation procedure to check the position of the IUD by x-ray. The device would be particularly useful for planning pregnancies in purebred bitches, and would avoid the unpleasant side effects of contraceptive drugs. A further 10 bitches have since been fitted with the IUD and after five months none has developed any problem.

The device could be improved if there were radiodense material at the ends of the arms of the IUD, so that an x-ray examination could eliminate the risk of placing it in a single horn of the uterus. However, this incorrect position should not prejudice the effectiveness of the device, which is mostly due to the spermicidal activity of the ions released by the electrolytic copper.

References

- BONACHO, L., PITA, S. & GOMEZ-BESTEIRO, M. I. (1999) Eight years with the same IUD. *Contraception* **59**, 233-236.
- BOWEN, R. A., OLSON, P. N., BEHRENDT, M. D., WHEELER, S. L., HUSTED, P. W. & NETT, T. M. (1985) Efficacy and toxicity of estrogens commonly used to terminate canine pregnancy. *Journal of the American Veterinary Medical Association* **186**, 783-788.
- CONCANNON, P. W. & MEYERS-WALLEN, V. N. (1991) Current and proposed methods for contraception and termination of pregnancy in dogs and cats. *Journal of the American Veterinary Medical Association* **198**, 1214-1225.

EVANS, J. M. & SUTTON, D. J. (1989) The use of hormones, especially progestagens, to control oestrus in bitches. *Journal of Reproduction and Fertility* **39**, 163-173.

LETE, I., MORALES, P. & DE PABLO, J. L. (1998) Use of intrauterine contraceptive devices in nulliparous women: personal experience over a 12-year period. *European Journal of Contraception and Reproductive Health Care* **3**, 190-193.

NAGLE, C. A. & TURIN, E. (1997) Contraception in bitches by non-surgical insertion of an intrauterine device (IUD). *Veterinaria Argentina* **14**, 414, 416-420.

OLSON, P. N. & JOHNSTON, S. D. (1993) New developments in small animal population control. *Journal of the American Veterinary Medical Association* **202**, 904-905.

POST, K. (1995) Induced pregnancy termination in dogs. *Theriogenology Handbook* C2. Hastings, Society for Theriogenology, American College of Theriogenologists. p 1.

ABSTRACTS

Amphotericin B in the treatment of canine leishmaniasis

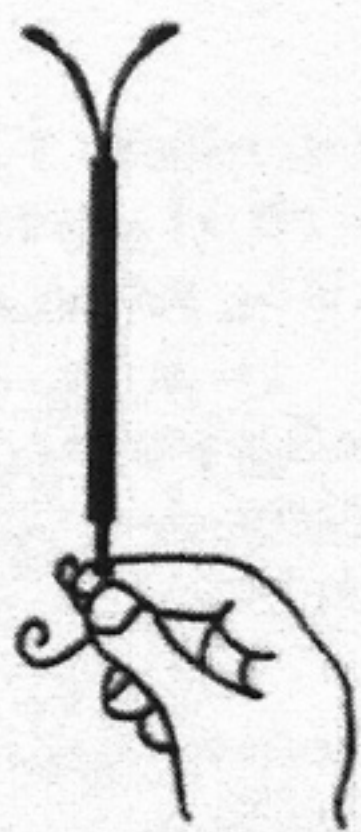
NINETEEN dogs with leishmaniasis were treated with amphotericin B in an emulsion prepared by mixing 50 mg of the drug's desoxycholate with 40 ml of sterile water and 10 ml of soya bean solution. The dogs were first infused for nearly an hour through a peripheral vein with 50 ml/kg of normal saline, followed by 10 ml/kg of 20 per cent mannitol, and the emulsion was then infused for 30 to 60 minutes by means of a syringe pump. The emulsion was given twice a week for at least four weeks at doses increasing from 1 to 2.5 mg/kg. All 17 dogs which received a total dose of more than 10 mg/kg of the emulsion were clinically cured, and 14 of them gave a negative result in a PCR test for the organism on bone marrow.

LAMOTHE, J. (2001) Activity of amphotericin B in lipid emulsion in the initial treatment of canine leishmaniasis. *Journal of Small Animal Practice* **42**, 170-175.

Dual energy x-ray absorptiometry for measuring bone mineral density in horses

FORELIMBS from 12 horses were scanned in two planes at six sites by dual energy x-ray absorptiometry, and the calculated bone densities were compared with direct measurements by Archimedes' principle. There were significant associations between the two measurements which were improved by taking into account variations in age, weight and the thickness of soft tissue. Repeated measurements had a low coefficient of variation. The x-ray technique appears to be suitable for serial in vivo measurements of the bone density of the metacarpus of horses, for example in investigations of the effects of diet or drugs on bone density, and of the density changes due to bone remodelling associated with stress fractures.

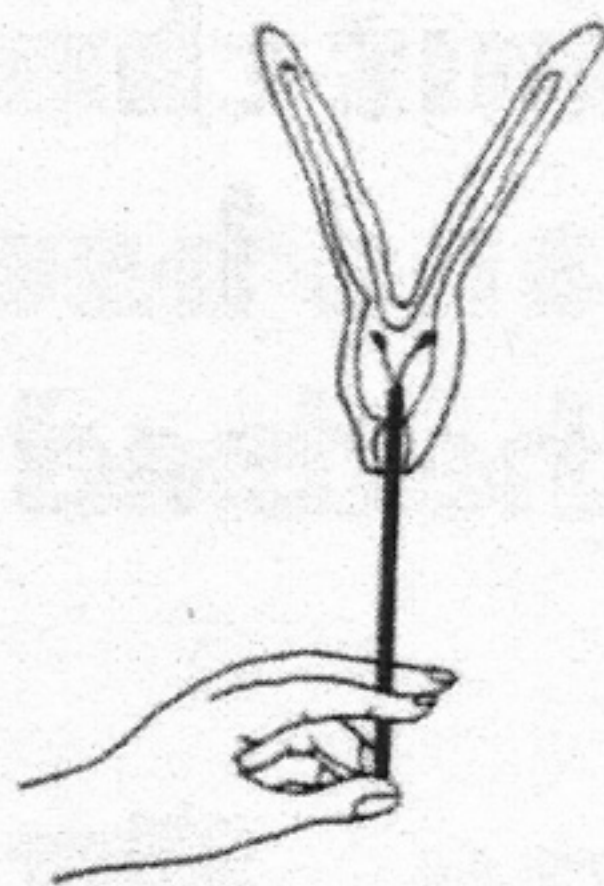
MCCLURE, S. R., GLICKMAN, L. T., GLICKMAN, N. M. & WEAVER, C. M. (2001) Evaluation of dual energy x-ray absorptiometry for in situ measurement of bone mineral density of equine metacarpi. *American Journal of Veterinary Research* **62**, 752-756.



(a)



(b)



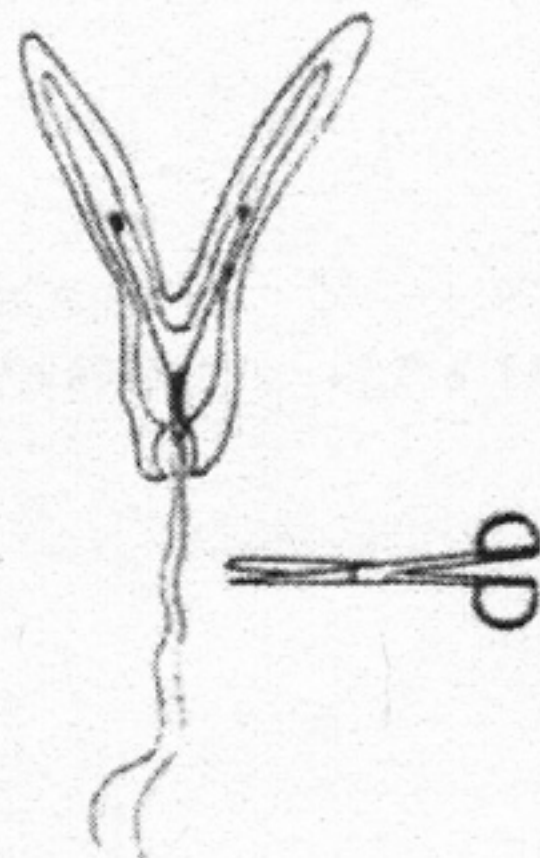
(c)



(d)



(e)



(f)

FIG 2: (a) and (b) The nylon threads and the syringe-like piston are pulled to make the two arms of the IUD enter the applicator tube. (c) and (d) The syringe-like piston is pushed, so that each arm of the IUD fits into the corresponding horn of the uterus and the copper-covered body of the device is in the body of the uterus. (e) The applicator tube is pulled out. (f) The two nylon threads protruding from lips of the vulva are cut 5 cm inside the vagina