gyne Special Issue 3
Journal for Practical Gynecology and General Medicine • Vol. 10, March 1989

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CU SAFE 300: A new concept in intrauterine contraception

Result of a one year comparative study to determine the effectiveness an acceptance of two intrauterine devices, developed by means of basic research, having copper surface areas of 300 mm^2 and 250 mm^2.

Karl H. Kurz*, Peter A. Meier-Oehlke

Modern, bioactive intrauterine devices (IUD's) are effective means of reversible contraception. The high efficiency, and cost-effective, long-term action of the currently used IUD models, are partly offset by the relatively high rates of expulsion and side effects that lead to early removal, mostly because of bleeding and/or pain. Some IUD users suffer side effects, but do not give up intrauterine contraception because of the incompatibility of other contraceptive methods or objections to other methods on personal grounds. It is understandable that such women are often regarded as „contented" users but they do not recommend the IUD to others. This is of special significance in developing countries where reversible long-term methods have a high value. Further, a complicated insertion technique contributes to a poor distribution of IUDs, as does, for example, the breaking-off of the control threads or a retaining arm, because of excessive holding strength during removal of an IUD.

*IRIR, International Research Institute of Reproduction, Kaiser-Wilhelm-Ring 22, D-40545 Düsseldorf, Federal Republic of Germany.

Effectiveness – Safety

The goal of a more than 10 year long basic research programme was to develop an IUD model exhibiting the following characteristics:

- ◆ Simple insertion and removal.
- ◆ Optimal safety and high efficiency.

It can be assumed that the size of the surface area of the copper wire guarantees on one hand effectiveness, while influencing the safety on the other. The surface area of the plastic body and its design is fundamental to the safety of the IUD, its stay in the uterus, its easy removal, and (together with an insertion tube of small diameter) for its simple insertion without the use of aids such as a plunger and sterile gloves.

The following methods were used in data gathering and for the development of the IUD:

- ◆ Cavimetry (determination of the longitudinal and transverse dimension of the uterine cavity **in vivo** (1, 2)
- ◆ Retentiometry (3)
- ◆ Ultrasonography
- ◆ X-ray (Hysterosalpingography).

The flexible plastic body, developed according to data obtained from these measurements and compatible with the uterine cavity, was gradually improved until a model was achieved which displayed the following properties:

1. The absence of an injurious anchoring mechanism.

2. A small surface area (170 mm^2).

3. A fundus seeking, anti-expulsive mechanism of the transverse arm.

4. A single, knot-free, control thread embedded in the shaft.

The CU SAFE IUD with a copper surface area of 250 mm^2, used in the first phase, showed a high safety and a high acceptance. This was particularly true for those women who had used other, widely distributed models, some for only a short time, before being fitted with the CU SAFE 250 IUD.

In the last few years, however, the trend of increasing the copper surface area (380 mm^2 for the Tatum T, and 375 mm^2 for the Multiload model) has continued. As a result, a further decrease in the rate of unwanted pregnancies was achieved and the IUD's could remain longer in situ. It was therefore decided to test a

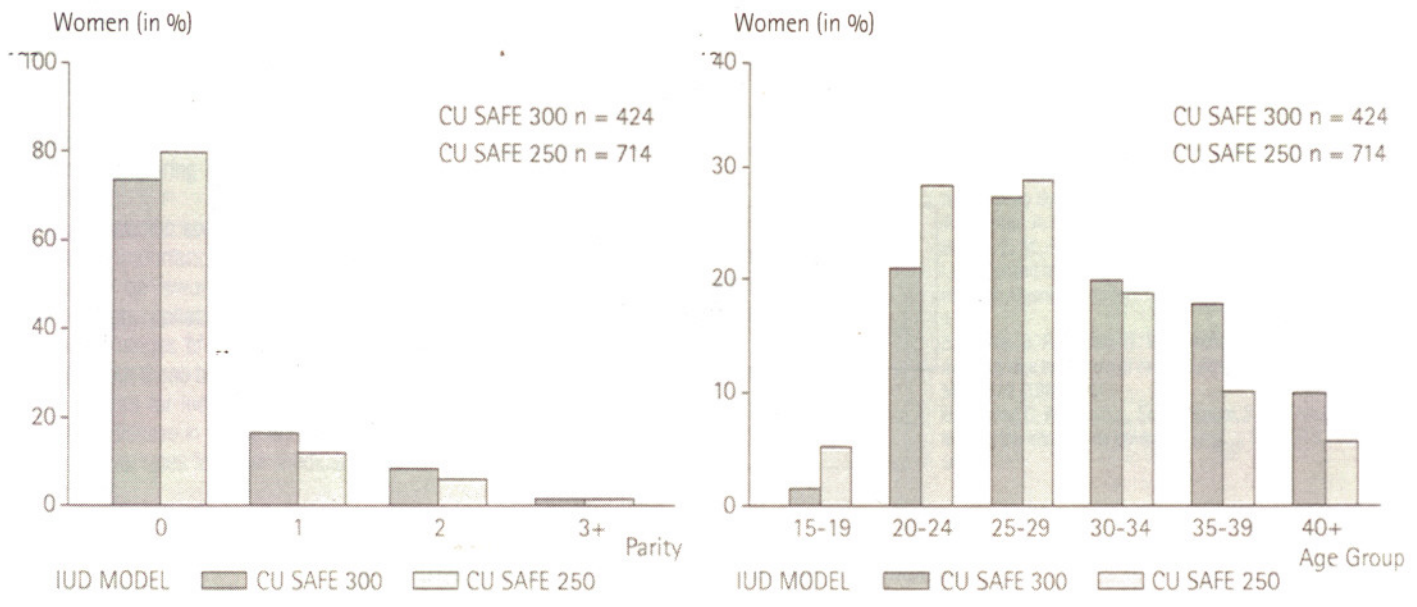

Fig. 1: Parity and age distributions of the participants.

Table 1: Results of the one year comparative study performed by two physicians

	CU SAFE 300		CU SAFE 250	
Number of women	424		714	
Controlled months of usage	4 306		7 644	
	Events	**Rates**	**Events**	**Rates**
Pregnancy	2	0.56	4	0.63
Expulsion total/partial	1	0.28	5	0.78
Removal (medical reasons)				
Bleeding	20	5.57	17	2.67
Pain	7	1.95	4	0.63
Infection	0	–	4	0.63
Other medical reasons	5	1.39	8	1.25
Removal (non-medical reasons)				
Wish to become pregnant, no nedd, etc.	10	2.79	25	3.92
Total	45	12.54	67	10.51
Continuation rates		87.5		89.5

Study CU SAFE 300-insertions n = 465; number lost to follow up n = 41*
Study CU SAFE 250-insertions n = 772; number lost to follow up n= 58*

* mostly moved

CU SAFE IUD having a copper wire surface area of 300 mm², especially, with regard to its efficacy and its safety. At this stage, the safety of the insertion procedure and the removal technique of the CU SAFE IUD had already been proved.

Initial experiences

The results of an ongoing study, at the end of the first year after insertion, are demonstrated and compared; the CU SAFE 300 IUD (Standard) was inserted in 424 and the CU SAFE 250 IUD in 714 women.

The personal wish for intrauterine contraception, together with a verbal and written informed consent, signed by both the user and an assistant, established the basis for participation in this study.

Two doctors working independently from each other inserted in total: CU SAFE 250 (n = 772) and CU SAFE 300 (n = 465) in the corresponding number of women.

After insertion each woman was given a calendar on which the menstrual bleeding, additional bleeding, pain and other events were to be recorded. This meant that the details given at follow up could be appraised objectively.

In accordance with Tietze and Lewitt, women were excluded from the study who after the insertion of a CU SAFE 250 (n = 58) or a CU SAFE 300 (n = 41) did not return for a follow up examination.

After the premature removal of a CU SAFE 300 or CU SAFE 250 IUD because of bleeding and/or pain, 38 women requested the immediate insertion of a CU SAFE 200 IUD (CU SAFE SPECIAL).

Figure 1 shows the age and parity distribution. Nulliparity was prevalent in the age groups 20-24, 25-29, and 30-34, and mirrors the emancipation of women in the industrial Federal Republic of Germany. This trend can increasingly be seen in threshold and even in some developing countries.

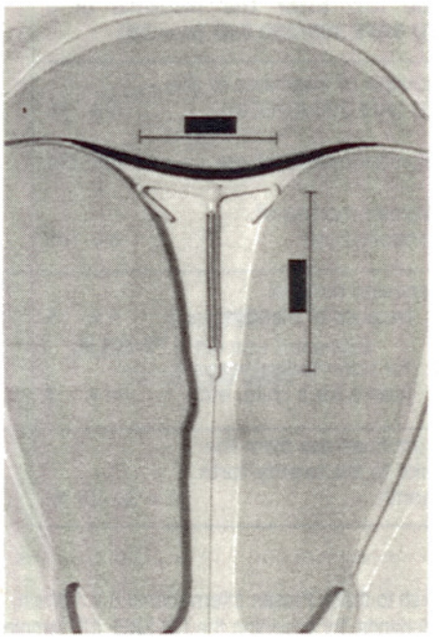

Fig. 3: Model of the uterus with the CU SAFE IUD in situ.

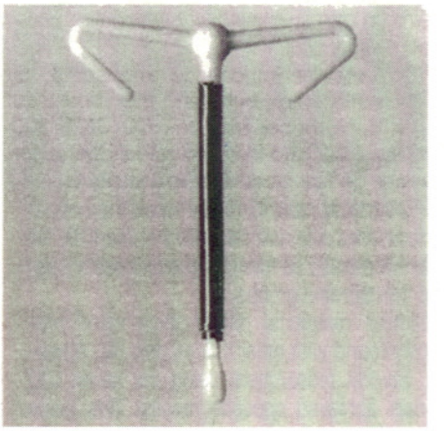

Fig. 2: Form and configuration of the CU SAFE 300 IUD.

The number of insertions and the controlled months of use, as well as the total number of failures, expulsions, and the „events" that led to the removal of a CU SAFE 300/250 IUD are given in Table 1, together with the cumulative event rates and the continuation rates at the end of the first year of use.

Table 2 shows the number of women, who after the removal of a CU SAFE 300/250 IUD (mostly because of bleeding) wished to have a CU SAFE 200 IUD inserted, as well as the remarkable results of this parallel study.

Discussion

The pregnancy (failure) rate of the CU SAFE 300 is somewhat, though not significantly, lower than that of the comparison model which has a copper surface area of 250 mm². The high efficacy of both IUD's corresponds with that of other models having a relatively large surface area of copper; 375 mm² (Multiload 375 IUD) and 380 mm² (T CU 380 IUD).

This high efficiency is all the more noteworthy, when one considers that the majority of users (at the time of insertion) were in their highly fertile age of 20 to 29 years.

The low failure rates are probably due in part to the extremely low rates of expulsion, which themselves can be attributed to the uterine fundus seeking mechanism of the device. To our knowledge, such low rates of expulsion have not yet been achieved by any other IUD models.

The relative increase in rates of events/removals, because of bleeding and pain, of the CU SAFE 300 (Standard) as compared to those of the CU SAFE 250 are noticeable. These results confirm the relationship between the increased release of copper ions and the closer spacing of the copper coils on one side, and the increasing irritation of the endometrium due to elementary and ionised copper on the other, particularly effective in the proliferating regeneration phase.

The CU SAFE 300/250 IUD's were „readily removed" from women with continuing blee-

ding problems, less often from those experiencing pain; in the meantime it had become clear that the available CU SAFE 200 IUD (Special) was a very compatible replacement IUD.

The high acceptance of the CU SAFE 200 IUD (Special) after removal of a CU SAFE 300/250 IUD, given in Table 2, confirms the aforementioned reciprocal relationship between the copper surface area size and the safety of the IUD. No difference could be found in age and parity specific comparable groups.

Similar reciprocal relationships were previously found with other IUD models (4). However, several researchers using the same IUD models achieved opposite results. This issue will probably only be resolved by undertaking multicentre, comparative studies.

Of particular importance appears to be the relationship between the increased amount of copper from the CU SAFE 300 IUD and the zero infection rate in the upper female genital tract and lower pelvis.

Table 3: CU SAFE 300 and T CU 380 A IUDs: cumulative event rates per hundred users at the end of the first year

	CU SAFE 300 IUD*	T CU 380 A IUD **
Number of women	424	1 051
Controlled woman-months of use	4 306	9 804
Pregnancy (intra-extra uterine)	0.6/0	0.9/0
Expulsions (total/partial)	0.3	5.8
Removals		
Medical reasons:		
Bleeding/Pain	7.5	11.1
Infections	0.0	not categorized
Other medical	1.4	3.5
Non-medical	2.7	3.0
Continuation rates	87.5	75.7

* IRIR, International Research Institute for Reproduction, Düsseldorf, Germany, Unpublished data, 1988.
** The Population Council, New York, USA. Published in Fertility and Sterility 36: 159, 1961; Data from the first year of a four year study. Age and parity groups in both studies are comparable.

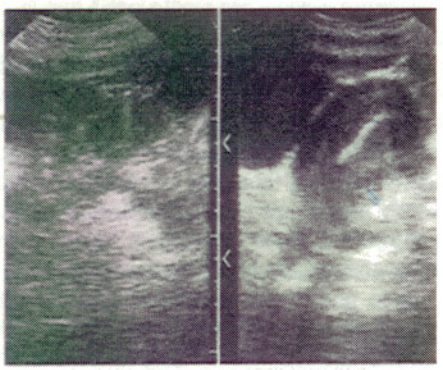

Fig. 4: CU SAFE IUD in situ (Ultrasonography).

These important results give credence to an ancient use of copper, still practised in developing countries; for example, for infected wounds and for trachoma caused by Chlamydia trachomatis (this agent is considered to be the most important cause of female infertility today). The more copper on the IUD the more it adversely influences, both directly and indirectly, the motility of the potential germ carrying spermatozoa; this may also explain the absence of infection in the present CU SAFE 300 IUD study and the relatively low infection rates given in publications when comparing coppers IUD's to wholly plastic IUD's.

Country specific social factors are probably of additional importance. However, in this study, one should be aware of the age related, relatively high, cohabitation frequencies and numerous changes of partners. New research has found both these behavioural patterns to be primary factors for increased rates of sexually transmitted disease in young age groups (5, 6).

The removal rates for other medical reasons, for example ovarian cysts or vaginal discharge, as well as for non-medical reasons, such as the wish to become pregnant, are not significantly different.

During the follow up examinations, the users of the CU SAFE 300/250 IUD were asked for their opinion of the IUD and the number of people who they had informed about the IUD. After six months of use the CU SAFE IUD was given an average mark of 1.8 (1 = very good, 2 = good, 3 = satisfactory, etc.) and on an average had been recommended to five people.

Summary

When using intrauterine contraception, the majority of expulsions, and removals for medical reasons occur within the first year. The results from this study, after one year of use of the CU SAFE 300/250 IUD's, and the high continuity rates prove that higher „safety", and an increasing acceptance is possible with intrauterine contraception. The safer methods of insertion and removal, related to the CU SAFE IUD's, available to the medical personnel are additional to this. All the aforementioned is of particular significance for the medical or paramedical personnel, and for the fertile couples, also in developing and threshold countries, wish to be able to decide, freely and responsibly, upon the number and time of birth of their offspring, in the way advocated by the United Nations charter on human rights.

Table 2: Women who wished an immediate insertion of the CU SAFE 200 IUD after the removal of a CU SAFE 300/250 IUD (n = 38)

Number of insertions of the CU SAFE 200 (SPECIAL)	n = 38
Women-months of use	n = 336
Women-months of controlled use	n = 145
Renewed removal a. because of bleeding	n = 5
b. for non-medical reasons (desire for a child, etc.)	n = 3
Continued use from the third to the twenty-forth month	n = 30 (79 %)

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We wish to thank Prosan International B.V. Arnhem, The Nederlands, for providing the CU SAFE IUD samples.