BLOOD LOSS AT FIRST TRIMESTER ABORTION BY MEANS OF VACUUM ASPIRATION

AKADEMISK AVHANDLING

som med vederbörligt tillstånd
av Rektorsämbetet vid Umeå Universitet
för avläggande av medicine doktorsexamen kommer att
offentligt försvaras i Hörsal B, Samhällsvetarhuset,
tisdagen den 25 maj 1976 kl. 09.00

av

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med. lic.

Umeå 1976

UMEÅ UNIVERSITY MEDICAL DISSERTATIONS
New Series
No 24

From the Departments of Obstetrics and Gynaecology
University of Umeå, UMEÅ, Sweden

BLOOD LOSS AT FIRST TRIMESTER ABORTION BY MEANS OF VACUUM ASPIRATION

by

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Umeå 1976

This dissertation is based on the following papers which will be referred to in the text by their Roman numerals:

I Sandström, B., Segerbrand, E. and Solheim, F.: Vacuum aspiration at therapeutic abortion - blood loss at operation in multigravid women. Acc. for publ. in Biophysics and Reproduction, 1976.

II Sandström, B. and Solheim, F.: Vacuum aspiration at therapeutic abortion - influence of two different negative pressures on blood loss during and after operation. Acc. for publ. in Biophysics and Reproduction, 1976.

III Solheim, F. and Odeblad, E.: A preliminary note on tissue biophysics related to vacuum aspiration. Acc. for publ. in Biophysics and Reproduction, 1976.

IV Solheim, F. and Rydnert, J.: Vacuum aspiration at therapeutic abortion - effect of Cu-IUD insertion at operation on post-operative blood loss. Acc. for publ. in Contraception, 1976.

V Solheim, F. and Idahl, U.: Vacuum aspiration at therapeutic abortion - blood loss during and after operation under paracervical block anesthesia. Subm. for publ. in Contraception, 1976.

VI Solheim, F.: Vacuum aspiration at therapeutic abortion - influence of oxytocic agents on blood loss during and after operation.

INTRODUCTION

The number of therapeutic abortions in Sweden has markedly increased and was in 1975 about 33.000, with an incidence of 20 abortions per one thousand women of childbearing age (i.e. 15 to 45 years). About 25 per cent of the women were teenagers and about 50 per cent were pregnant for the first time.

The time-honoured method of terminating pregnancy in the first trimester has been dilatation and curettage (DC), commonly carried out under general anesthesia as an in-patient procedure. The degree of cervical dilatation was extensive and blood loss often considerable (8,14).

In 1958 a new method, based on aspiration of the uterine contents, was reported from China (24). The principle of evacuation of the pregnant uterus by means of suction was soon introduced into Russia and Eastern European countries (4). Various kinds of technical equipment were used and details of the operative technique were modified (9). Initially the use of vacuum aspiration (VA) was limited to the first ten weeks of pregnancy (4) but clinical experience indicated that even more advanced pregnancies could be terminated (2,23).

At present, VA has replaced dilatation and curettage for first trimester therapeutic abortion in most countries (3,15, 17,20). The less extensive dilatation of the cervix, the

rapidity of the operation, and the reduced risk of uterine perforation are considered to be the main advantages of VA over DC.

The overall complication rate seems to increase with the gestational length and this is suggested to be particularly true for uterine hemorrhage (13,18,20). Moreover, it has been pointed out that post-operative salpingitis is more frequent when blood loss at operation is large (8). Reported amounts of blood loss vary and are often not reliably accounted for, and the method by which they are determined is frequently not defined. It is likely that the magnitude of blood lost at VA is influenced by the operative performance and the variations reported may be due to the fact that opinions differ as to the ideal equipment, operative technique, anesthesia, and method of determining the blood loss.

In the present investigation the influence on blood loss of various aspects of the operative performance was studied. The blood loss was defined as the amount of hemoglobin.

It was recently suggested that the blood loss at operation was larger in primipregnancy than in multipregnancy (7). The assumed influence of previous pregnancies was therefore studied. *(I: Vacuum aspiration at therapeutic abortion - blood loss at operation in multigravid women).*

There is no general agreement about the optimal negative pressure needed at VA. In Sweden the use of a suction force of about 0.5 kp/cm^2 (49 kPa) has been normal practice (13,15, 17), while in Eastern Europe a greater negative pressure has been used (1,22,23). It has been suggested that the greater suction force reduces the risk of incomplete evacuation and increased post-operative bleeding (17). The possibility of heavy bleeding after the abortion has been one reason for in-patient operation. The post-operative blood loss was therefore determined and the influence on it of two different negative pressures was examined. *(II: Vacuum aspiration at therapeutic abortion - influence of two different negative pressures on blood loss during and after operation).*

There is no known investigation evaluating the ideal negative pressure for first trimester abortion. Studies of biophysical properties of fetal placenta, decidua and myometrium may provide a basis for the selection of adequate suction parameters. A preliminary study was initiated to obtain information on gross biophysical properties of these tissues. *(III: A preliminary note on tissue biophysics related to vacuum aspiration).*

Immediate post-abortal insertion of an IUD has obvious advantages. The rate of infection after the operation is not increased (21) but the influence on post-operative bleeding has not been evaluated. The post-operative blood loss with

a Cu-IUD inserted at operation was studied. *(IV: Vacuum aspiration at therapeutic abortion - effect of Cu-IUD insertion at operation on post-operative blood loss).*

Paracervical block anesthesia (PCB) relaxes the cervix and facilitates dilatation (16) and PCB has been used together with general anesthesia for that reason (9,13). Local anesthesia may reduce the blood loss at VA (5,12). The effect of paracervical block anesthesia on blood loss was investigated. *(V: Vacuum aspiration at therapeutic abortion - blood loss during and after operation under paracervical block anesthesia).*

Metylergometrin or oxytocin are commonly used at therapeutic abortion to induce uterine contraction and thereby facilitate the evacuation and to reduce the risk of perforation (1,8). Clinical experience further indicates that oxytocic preparations may reduce the blood loss (9,10). The influence of metylergometrin and oxytocin on blood loss at VA was studied. *(VI: Vacuum aspiration at therapeutic abortion - influence of oxytocic agents on blood loss during and after operation).*

The purpose of the present investigation was thus to study the influence on blood loss during and/or after the operation at first trimester abortion performed by VA of the following factors:

1. the number of previous pregnancies and the age of the woman

2. the negative pressure used at vacuum aspiration
3. insertion of a Cu-IUD at the end of the operation
4. paracervical block anesthesia
5. administration of metylergometrin or oxytocin at operation.

MATERIAL AND METHOD

The investigation included 729 women pregnant in the first trimester (weeks 8-13). The gestational length was judged from the first day of the last menstrual period and the size of the uterus. The women were assigned to different series which are further detailed in the papers.

Vacuum aspiration

The patient was examined under anesthesia and the size and position of the uterus determined. The cervix was dilated with Hegar dilators to 9 mm in weeks 8-10 and to 10 or 11 mm in weeks 11-13.

Steel suction tubes with a slight curvature and an opening of 8 or 10 mm near the closed tip of the tube were used. The outer diameter of the tube chosen was one mm less than the degree of dilatation. The tube was connected by a transparent plastic tube to a glass bottle and an electric suction pump (Egnell). A negative pressure of 0.5 or 0.8 kp/cm^2 (49 or 79 kPa) was chosen.

After the operation the steel and plastic suction tubes were rinsed with a known amount of saline. The aspirated volume, including the saline, was measured and inspected for part of the ovum. Control curettage of the uterine cavity was not performed.

After the operation all women were observed for 4 hours in a post-operative recovery ward. They left the hospital on the afternoon of the same day. The women were instructed to return to the clinic whenever bleeding, pain or fever occurred and for a follow-up visit four weeks after the operation.

During the four week observation period one woman with retention of parts of the ovum was treated. Eleven women were hospitalized because of endometritis and ten women because of salpingitis. The diagnoses were made with laparoscopy and clinical course. The overall complication rate was 3.3%.

Determination of the blood loss during the operation

The aspirated volume together with the saline was carefully stirred and the parts of the ovum separated through a gauze filter. Two samples were then drawn to determine the amount of hemoglobin (Hb). The Hb-concentration was determined in fingertip or peripheral venous blood of the subject at the day of the operation. Both determinations were performed spectrophotometrically (Beckman Du spectrophotometer) at a wavelength of 544 mμ (oxyhemoglobin) after adding 0.04% ammoniumhydroxide.

Determination of the post-operative blood loss

The blood lost during the immediate post-operative recovery period (4 hours) at the hospital was determined in most cases, and in some cases also that lost during the first seven days after the operation.

Vaginal blood was collected in towels[x)] and extracted with 1.25 M NaOH solution thus converting the hemoglobin to alkaline hematine which was determined as stated above (6). The volume of blood was calculated from the Hb-concentration in peripheral venous blood of the subject determined as cyanmethemoglobin.

RESULTS AND COMMENTS

Influence of the number of previous pregnancies and age of the woman (I)

The study included 129 multigravid women pregnant in the first trimester. The blood loss increased with the gestational length and was nost significantly influenced by the age of the woman or the number of previous pregnancies in the group of multigravid women.

The results were compared to those in a group of primigravidae earlier studied (7). The blood loss was the same in early (weeks 8-10) first trimester but heavier in primipregnancy in late (weeks 11-13) and at full trimester.

x) Supplied by AB Mölnlycke, Mölndal, Sweden.

According to the results in the group of multigravidae it is not likely that the disparity in blood loss between multi- and primipregnancy is due to differences in age or number of previous pregnancies. It is nevertheless possible that a more pronounced trauma to the cervical tissue at dilatation in primipregnancy partly explains the difference found in late first trimester (4,7).

Influence of the negative pressure (II, III)

One hundred and sixty-seven pregnant women were randomly assigned to two groups. In 75 cases the suction pressure was 49 kPa (0.5 kp/cm^2) and in 92 cases 79 kPa (0.8 kp/cm^2).

Blood loss during the operation was the same with the two negative pressures used. During the first four hours after the operation, however, there was a difference. With the greater negative pressure the blood loss was heavier in weeks 11-13.

Endometrial regeneration seems to be extensive by the end of the first week after operation (11). The blood loss during this period was independent of the negative pressure.

In six cases, operated upon with a suction of 79 kPa, all the aspirated material was studied histologically. There were no isolated muscular fragments, but in three cases traces of muscle fibres, attached to fragments of the basal

layers of the endometrium, were found.

On the basis of the blood loss in the two groups studied there is no support for the opinion that the greater negative pressure should be favoured. Further studies of the biophysical properties of placental tissue and myometrium may provide informations about the most suitable suction force.

Influence of Cu-IUD (IV)

The study included 306 healthy women pregnant in the first trimester. In 143 women a Cu-IUD was inserted at the end of the operation. Other contraceptive methods were preferred by 163 women and they served as controls.

Blood loss was determined during the post-operative recovery period in all 306 cases and during the first seven post-operative days in 126 cases.

The post-operative blood loss was not influenced by the insertion of the Cu-IUD. Neither was the rate of infection. It is concluded that a Cu-IUD can be inserted at abortion without disadvantage.

Influence of paracervical block anesthesia (V)

The study included 238 pregnant women. In 86 cases the operation was performed under local anesthesia (PCB) and in 152 cases under general anesthesia.

The blood loss during and after the operation was found to be smaller in the PCB group. The quality of the anesthesia was good in the majority of the operations. General anesthesia may have an inhibitory effect on uterine muscular activity (19) and thereby counteract contraction. PCB, however, relaxes the cervix (16) and, according to Bonica (2), the epinephrine reduces uterine blood flow and has a local vasoconstrictive effect on the cervix. This may contribute to the reduction of the blood loss.

Influence of metylergometrin and oxytocin (VI)

The investigation included 95 women randomly assigned to two groups. The women in group I were given metylergometrin during the dilatation of the cervix and the women in group II were given an infusion of oxytocin. In another 38 women (control group) the operation was performed without the use of oxytocics.

The blood loss at operation was the same whether metylergometrin or oxytocin was administered. Compared to the control group the infusion of oxytocin reduced the blood loss. This indicates a stimulatory effect of oxytocin on the myometrium in the first trimester. The reduction of the blood loss with metylergometrin was about 30 per cent. A larger dose of metylergometrin may further reduce the hemorrhage (9).

The post-operative blood loss was small and the same in the three groups.

SUMMARY

At vacuum aspiration for therapeutic abortion in the first trimester blood loss is found to increase with gestational length.

The blood loss is smaller in multigravid than in primigravid women and is in multipregnancy not significantly correlated to either the number of previous pregnancies or the age of the woman.

Blood loss during and after the operation is small and about the same with the two negative pressures used (49 and 79 kPa). Information obtained with NMR may help in selecting the most appropriate suction force.

Copper-IUD inserted at the operation does not increase the post-operative blood loss or the rate of infections.

Paracervical block anesthesia reduces the blood loss during and after the operation.

The blood loss during and after operation is the same when 30 IU oxytocin is infused or 0.2 mg of metylergometrin is injected intravenously.
The reduction of the blood loss during the operation is statistically significant with oxytocin but not with metyl-ergometrin.

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to:

My chief, Professor Per Lundström, for his valuable advice and stimulating criticism and support throughout the study.

My friend and teacher, Docent Bo Sandström, who initiated this study and guided me through all phases of it with endless patience. His knowledge and never failing support and encouragement made this work possible.

Professor Erik Odeblad for generous advice and stimulating co-operation.

My co-authors, Drs Ulla Idahl, Jan Rydnert and Eric Segerbrand for fruitful collaboration.

Professor Lars Bjersing for performing the histological examination.

Mrs Monica Isaksson and Mrs Mette Wallén for skilful technical assistance.

Mrs Astrid Ahlmark and Mrs Ingrid Englund for careful secretarial assistance and excellent typing of the manuscript.

FK Lennart Nyström for statistical aid.

All staff at the Department of Obstetrics and Gynecology for their patience and kind help.

This work was supported by the Medical Faculty, University of Umeå.

REFERENCES

1. Beric, B. & Kupresanin, M.: Vacuum aspiration, using paricervical block, for legal abortion as an outpatient procedure up to the 12th week of pregnancy. Lancet ii: 619, 1971.
2. Bonica, J.: in Principles and practice of obstetric analgesia and anesthesia. Blackwell Scientific Publications, Oxford, 1967, vol 1.
3. Buckle, A., Andersson, M. & Loung, K.: Vacuum aspiration of the uterus in therapeutic abortion. Br Med J 2: 456, 1970.
4. Chalupa, M.: Gebrauch des Vakuum zur künstlichen Schwangerschaftsunterbrechung. Zentralbl Gynaekol 86: 1803, 1964.
5. Cullen, B., Margolis, A. and Eger, E.: The effects of anesthesia and pulmonary ventilation on blood loss during elective therapeutic abortion. Anesthesiol 32: 108, 1970.
6. Hallberg, L. & Nilsson, L.: Determination of menstrual blood loss. Scand J Clin Lab Invest 16: 244, 1964.
7. Holmberg, N.-G. & Sandström, B.: Blood loss during vacuum aspiration in primigravid women. Acta Obstet Gynecol Scand 51: 143, 1972.
8. Johansson, E.D.B.: The effect of oxytocin on the complication rate of early therapeutic abortions. Acta Obstet Gynecol Scand 49: 129, 1970.
9. Kerslake, D. & Casey, D.: Abortion induced by means of the uterine aspirator. Obstet Gynecol 30: 35, 1967.

10. Lauersen, N.H. & Conrad, P.: Effect of oxytocic agents on blood loss during first trimester suction curettage. Obstet Gynecol 44: 428, 1974.

11. Litwak, B. & Wiktorowskaja, E.: Regeneration der uterusschleimhaut nach kunstlichem Abort und hysteroskopisches studium derselben. Mschr Geburth Gynaek 101: 55, 1935.

12. Margolis, A. & Overstreet, E.: Legal abortion without hospitalization. Obstet Gynecol 36: 479, 1970.

13. Moberg, P., Sjöberg, B. & Wiqvist, N.: The hazards of vacuum aspiration in late first trimester abortions. Acta Obstet Gynecol Scand 54: 113, 1975.

14. Nathanson, B.: Suction curettage for early abortion: experience with 645 cases. Clin Obstet Gynecol 14: 99, 1971.

15. Nilsson, C.-A.: Vacuum-aspiration of uterine contents in legal abortion and allied conditions. Acta Obstet Gynecol Scand 46: 501, 1967.

16. Penfield, J.: Abortion under paracervical block. N Y State J Med 71: 1185, 1971.

17. Socialstyrelsen MF, 1972:59, p 6.

18. Stallworthy, J., Moolgoaker, A. & Walsh, J.: Legal abortion: a critical assessment of its risks. Lancet ii: 1245, 1971.

19. Talbert, L., McGaughey, H., Corey, E. & Thornton, N.: Effects of anesthetic and sedative agents employed in obstetric practice on isolated human uterine muscle. Am J Obstet Gynecol 75: 16, 1958.

20. Tietze, C. & Lewit, S.: Joint program for the study of abortion (JPSA): early medical complications of legal abortion. Fam plan perspect 3: 6, 1971.

21. Timonen, H. & Luukkainen, T.: Immediate postabortion insertion of the copper-T (TCu-200) with eighteen months follow-up. Contraception 9: 153, 1974.

22. Vladov, E.: The vacuum aspiration method for interruption of early pregnancy. Am J Obstet Gynecol 99: 202, 1967.

23. Vojta, M.: A critical view of vacuum aspiration: a new method for the termination of pregnancy. Obstet Gynecol 30: 28, 1967.

24. Wu-Yuan-tai & Wu-Hsien-chen: Suction in artificial abortion. Chin J Obstet Gynecol 6: 447, 1958.