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Postpartum hemorrhage : with special reference to prophylaxis

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POSTPARTUM HEMORRHAGE WITH SPECIAL
REFERENCE TO PROPHYLAXIS

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INTRODUCTION

Postpartum hemorrhage is one of the causes of maternal mortality and morbidity in this country. As early as 1839 the dangers attendant on postpartum hemorrhage were recognized as constituting a serious problem. In his book "Principles of Midwifery" Burns says, "Of all the incidents to which a pregnant woman is exposed, none is more alarming or troublesome than uterine hemorrhage. This has been called flooding, and from the frequency of its occurrence it must be extremely important to every practitioner."⁶

During the century that has passed since 1839 the basic problems attendant on postpartum hemorrhage have remained troublesome enough that in 1939 Reich can still say "The occurrence of excessive blood loss during and after the third stage of labor might appropriately be termed, because of its serious consequences, obstetrics' public enemy number one; for no other accident or complication has such potential dangers or is encountered so frequently."²⁹

Postpartum hemorrhage is generally defined as a blood loss of 500 c.c. or more during the third stage of labor. However, this definition does not cover all of the problems necessary for the prognosis and method of treatment which we must consider if we are to reduce the present incidence and mortality during this stage.

Typical of such considerations are the following:

1. Relationship of weight to blood loss
2. Prenatal care
3. Adequate supervision of the third stage of labor.

Let us consider these factors in the above order.

The importance of the relationship of weight to the blood loss is stressed in the writings of such men as Pastore²⁴ and Randall.²⁸ It is a well-known fact that one woman may lose an amount of blood with no apparent ill effect, while others may die from the same loss.³⁸ For instance, one of the patients in the University of Nebraska series examined for this study, lost between 750 and 1000 c.c. of blood and died. Yet several others lost the same amount or more and lived. A computation of blood loss in relation to the weight of the patient on a percentage basis would give a more accurate index from which to work. The results of Pastore's research show that a hemorrhage of one percent of the body weight should be classified as postpartum hemorrhage. In the case of a woman weighing 150 pounds the amount necessary for hemorrhage would be 600 c.c.²³ To accurately determine the cases of postpartum hemorrhage it becomes necessary to measure the blood loss during delivery. A measuring technique should be used for statistical study in all teaching institutions.

The prenatal condition of the patient, with very complete blood studies, is absolutely necessary in making a correct evaluation of consequent blood losses. This fact is known and very generally accepted by the medical profession.

There is also a rather wide-spread belief that at the time of confinement a woman can stand the loss of a considerable amount of blood with relative impunity, and fortunately blood losses during labor do seem to be attended with less harm than at other times. As mentioned above the fact that most women will stand rather large losses without showing alarming reactions may result in giving those doing obstetrics a false sense of security, which may end seriously. Concomitant with this sense of security there may be a certain amount of carelessness and lack of supervision of the third stage of labor. Blood loss should be minimized in every labor and no effort should be spared to accomplish this result.⁴⁵

For an effective summary of the objectives of the present study, we turn to Fortin. First, he points out the normal state when he says, "The reproductive functions of the human female are usually attended with some loss of blood, and we have been taught that this is a physiological necessity. A bloodless delivery is as abnormal as an excessive bleeding."¹⁶ Second, he contends that

a serious or fatal postpartum hemorrhage should almost never occur. If the obstetrical patient has adequate prenatal care and intelligent attention during the stages of delivery, she should be comparatively free from the dangers attendant on postpartum hemorrhage.¹⁶ And third, it must be added that obstetricians and other physicians doing obstetrical work need to do much careful study if Fortin's contention is to become a reality. Therefore, it is the object of this study to consider first, the incidence; second, the physiology; third, the etiology; fourth, the prophylaxis; fifth, the diagnosis; sixth, the treatment; and seventh, the morbidity and mortality.

INCIDENCE

I have taken the records from the obstetrical department of the University of Nebraska College of Medicine and attempted to analyze the records of hemorrhage in relation to the total number of deliveries. Although there will be some inaccuracy from the individual estimation of the actual amount of blood loss, this research will give a generalized idea of percentages. In this institution the loss of 500 c.c. or above is considered as postpartum hemorrhage, but the actual amounts are estimated, not measured. The intern or resident attending the delivery has the responsibility of estimating the actual amount lost in each case as it arises.

The figures taken will cover the period from June 20, 1932 to June 21, 1939 inclusive. During these years there were 3,263 deliveries, of which 1941 were multiparous and 1322 were primiparous. The total number of deliveries listed as postpartum hemorrhage cases was 108. This gives a percentage of 3.3 of the total deliveries. Comparison of these findings with those of other institutions reveals the fact that the percentage of hemorrhage cases in the Nebraska College of Medicine is relatively low. Pastore at Cornell gives a percentage of 5.4,²³ Peckham and Kuder²⁷ at Johns Hopkins give 6.14, and the Chicago Lying-In Hospital reports 2.4 percent. Tucker and Beneron, in an outpatients service, has an

incidence of 4.2 percent.³⁴ This last percentage is cited by some authors as being due to the low number of the patients receiving analgesia and anesthesia during labor. Our low figures may possibly be explained by the fact that losses were not measured, and as Pastore has pointed out by actual experiments, there is a tendency to underestimate losses over 450 c.c. It is rather hard to evaluate the cases since there is considerable variation in the number of excessive blood losses from year to year. In giving these figures I have taken records from June 20 of one year to June 21 of the next.

	Hemorrhages	Total Deliveries
1932 to 1933	25	583
1933 to 1934	9	492
1934 to 1935	11	409
1935 to 1936	8	411
1936 to 1937	13	419
1937 to 1938	30	446
1938 to 1939	12	503

These figures show no definite relation to the total number of deliveries; yet it is evident that they vary greatly from one year to the next. The total number of hemorrhages from 1932-1933 and 1937-1938 probably give a more accurate index of the actual picture.

The total amount of blood loss was listed in three groups which were: 500-750, 750-1000, and 1000 c.c. and above. There has been some laxity in listing the actual

amount of hemorrhage until the year 1935 to 1936, and from then on it is listed consistently. Files showing the records of the years preceding these were examined, but the amounts were not regularly enough placed on the records to make them of any statistical value.

	500-750	750-1000	1000 and above
1935-1936	4	4	0
1936-1937	5	6	1
1937-1938	15	8	5
1938-1939	<u>7</u>	<u>3</u>	<u>1</u>
Totals	31	21	7

One in two hundred cases, or .5 percent of the 1,779 deliveries from 1935-1936, had hemorrhages of 1000 c.c. or above. Of the same group 1.28 percent showed a blood loss of 750-1000 c.c., and 1.74 percent showed a 500-750 c.c. loss.

PHYSIOLOGY

The understanding of the normal physiology of placental separation is an important adjunct to the necessary conduct of the third stage of labor. If the attending physician knows the normal, he will be better fitted to ascertain abnormal conditions and trace the causes thereof.

The physiologic process by which, following delivery, the puerperal uterus is reduced to about one twentieth its size and subsequently is reduced to its normal non-pregnant size, is known as involution.¹⁰ This follows the separation of the placenta and has much to do with blood loss, even though it may come somewhat later than the period usually considered the third stage of labor.

The placenta has remained firmly attached to the wall of the uterus during the first and second stages of labor due to the large size of the wall and intrauterine pressure. During this time the size of the placental site is almost as large as the placenta. Following delivery of the child the uterine cavity is greatly reduced in size due to evacuation of its contents, the pressure of the abdominal viscera, and its own contraction and retraction. This reduction in the size of the uterus results in an increase of the muscle wall to several times its distended thickness.¹² Then, since the site of placental attachment diminishes in size, the

placenta also increases in thickness; but due to its inability to contract as much as its own attachment, separations result in places.² The placenta, as was stated, is somewhat rigid and is not affected by subsequent contractions. The resultant physiological action is a shearing off at the most loosely attached portions. The decidua basalis is the point of normal division. It is more easily divided at the central portion than at the periphery. With the separation of the more loosely connected central portion, there forms a retroplacental hematoma. The mechanical effect of the hematoma as a wedge to help materialize further separation is much disputed, and some disregard its action in this role. They seem to believe that it is the result of, rather than the cause of, separation.³⁹ Beck states that the collection of blood behind the placenta acts to help separate it from the uterine wall. The fluid is uncompressible, and further contractions of the uterus force it laterally.² This gives a shearing effect on the marginal portions of the attachment where it is most closely adherent. The central portion of the placenta as it becomes separated from its attachment tends to bulge into the uterine cavity. Further contractions, plus the weight of the blood collected behind it, and gravity, cause it to migrate into the lower uterine segment. As it moves

downward, it pulls or strips the membranes off the wall of the uterus. Following this manner of separation there is usually a gush of dark blood from the vaginal orifice. Davis states that the process of placental separation is rather rapid, and little time is consumed in this phase. The time used in the third stage, in case of separation, is to obtain expulsion. A good deal of voluntary action on the part of the patient is needed to finally deliver the placenta. It is believed that contractions of the abdominal muscles and levator ani are the elements which come into play for forcing the separated organ out of the lower uterine segment and vagina.¹²

ETIOLOGY

We often think of postpartum hemorrhage as a distinct entity, forgetting that with few exceptions the causes producing hemorrhage are present in every delivery. Only in instances where these etiological factors become exaggerated does excessive blood loss occur. It is very difficult to consider the specific causes of such postpartum hemorrhage efficiently enough to form the basis for a sound prediction as to the seriousness of the condition and when it may be expected to occur. There are many etiological factors which can be related to this entity, and in trying to find the most important of these causes one sees a varied emphasis placed on them by different authors. The fact that opinions are so diversified as to the relative importance of various causes would tend to substantiate the contention that one specific cause is not to be found.

Randall²⁸ and ter Kuite³⁴ state that the most important cause is mismanagement of the third stage, and Calkins⁸ has shown that proper management has lowered his average blood losses to 222 c.c. This is an important reduction from the averages of from 400 to 600 c.c. given by other authors on this subject. It was found that faulty management of the third stage increased the average measured blood losses from 200 to 400 c.c.³⁰ So by these figures it can be seen that if there is one

etiological factor to be attacked, here is where we may at the present time gain the most gratifying results.

The records I have studied from the University of Nebraska agree with Peckham and Kuder²⁷ in showing an increase in the incidence of hemorrhage in the primiparous patient. His figures show percentages of 6.49 in the primipara and 5.72 in the multiparous woman. The ratio of primipara to multipara in the cases of hemorrhage were fifty eight to forty five in the obstetrical department of the University of Nebraska College of Medicine. This leaves five patients who did not have their parity listed on the charts. These figures are not so impressive as they stand, but when one takes into consideration the fact that only 40.5 percent of the hospital admittances to the obstetrical department were primiparous, it lends to their importance. However, in these patients we also see that of the fifty eight primiparas thirty four, or 58.6 percent, had either an episiotomy, forceps, or both. Since it has been shown that operative obstetrics increase the incidence of hemorrhage, we may suppose that the parity and its relation to increased blood loss is lessened from this standpoint. Pastore states that parity has little effect as a cause of postpartum hemorrhage.²⁶ Calkins, in his review of seven hundred cases at the University of Kansas, agrees.⁸

In reviewing the cases at the University of Nebraska hospital, it is seen that there are several associated causative factors. These causes, listed in order of their importance with reference to frequency of occurrence are: episiotomy 37; forceps 26; lacerations 16; retained placenta 8; manual rotation 6; induced labor 4; caesarean section 3; premature separation 4; version 2; and low implantation 1. The above figures, although not accurate enough for statistical treatment, will show an increase in the numbers of postpartum hemorrhages with or following operative obstetrics. It will have to be taken into consideration that, in individual cases, there may have been a combination of these operative procedures.

In the statistical studies of Pastore²³ it was found that there was an increase with operative obstetrics and an average increase of 100 c.c. with episiotomies. Peckham and Kuder²⁷ found an operative incidence of 6.86 percent in their study of 19,290 consecutive cases. Sherrick³³ also listed this as one of his nine etiological factors of postpartum hemorrhage.

The total duration of labor has little effect on the incidence of excessive bleeding. However, an increase of the second stage of labor over ninety minutes gave a forty percent rise with a fifty percent increase if the third stage lasted more than thirty minutes.²³ This is

confirmed by Peckham and Kuder²⁷ who found that prolonged labor, especially in the third stage, increased the amount and number of hemorrhages. A study made with particular attention to the type of labor pains also gave some interesting data in relation to postpartum hemorrhage. In this study the pains were classified in relation to their frequency, intensity and duration. The conclusions were not definite in relation to pain in the multipara, but in the primipara where the incidence was higher we see a definite relationship. In the primiparous patient the poor pains were attended with larger blood losses, and this was the case whether considering frequency, intensity, or duration. Infrequent pains were followed by a fifty percent increase in the blood losses over those cases where the pains were close together. The short pains also had an increased percentage over the longer pains. In the case of intensity, we see the most important change. Here it was found that there was 100 c.c. difference in the average between moderate or strong pains on one hand and weak pains on the other.

Uterine atony must be incorporated with these studies because of its relation to the type of pains. Atony is listed by most of the authors as a cause of increased bleeding. Uterine atony can be divided into two separate

divisions--primary and secondary inertia. Primary inertia may be defined as failure of the uterus to institute initial contractions; secondary inertia is the failure of the uterus to continue contracting. The latter is the most frequent and important of the two types in the study of hemorrhage. Uterine atony was the predisposing factor in 81.1 percent of the patients included in the statistics of Peckham and Kuder.²⁷

In a small group of patients surveyed by ter Kuite, he finds, as does Pastore, that the use of ether increases the amount of bleeding. Of all the agents used, nitrous oxide was associated with the least number of hemorrhages and with decreased blood losses.³⁴ The use of analgesia and anesthesia are generally accepted factors in the increase of bleeding in obstetrical deliveries. It is here that the use of oxytocics is forced upon the obstetrician in the routine hospital practice because of the demand of the patient for a relatively painless delivery. Sherrick³³ and Calkins⁸ both list analgesia and anesthesia administered in large quantities as a predisposing cause. The use of drugs which give generalized sedation and amnesia or anesthesia, would necessarily cause the uterus to contract less forcefully; and lessened contractile powers are a proven cause of increased bleeding, since successful hemostasis is dependent on closure of the maternal sinuses.

Overdistension of the uterus by large babies, multiple pregnancies, associated hydramniotic or pathological growths within the uterus itself will predispose to postpartum hemorrhage. An average increase of 100 c.c. blood loss is seen with over distension.⁹ Several authorities list overdistention as a cause, and in one case it is stated that the amount of hemorrhage is directly proportional to the weight and length of the baby.²³ Here again the essential cause would be uterine inertia due to an abnormal stress and strain placed on the individual fibers by distension, so that following delivery their contractile powers are diminished.

It is well known and generally accepted that lacerations are an important factor in this entity. There is not one of the authors who does not list them as a factor in increased blood loss. Although its 5.87 per cent of atony compares slightly in importance with the 81.1 percent of atony, it is often a cause of an unsuspected loss.²⁷ This type of hemorrhage is prolonged and late, with slow oozing, rather than the gushing type of blood loss. Unobtrusive losses of this type may be more dangerous to the life of the patient than the sudden gushes of blood which are more easily recognized. Certainly it will lead to increased morbidity and possibility of infections, so it should always be kept in

mind. If the tear happens to be through one of the larger vessels, we will have the gushing, pulsating type of blood loss which must be controlled at once.

Other causes which may be listed are improper placental separation, retained placental fragments, local uterine pathology, anemia and abnormal blood states, precipitate labors, abnormal placental sites, idiopathic and placenta previa.²⁷ Hemorrhage from the latter source is due to its location in a relatively non-contracting portion of the uterus.

PROPHYLAXIS

Under this heading must come the most important discussion, since prevention should be the uppermost factor in the minds of the practitioner. In considering prophylaxis, many extraneous factors come within the focus of attention.

Calkins believes that 90 percent of postpartum hemorrhages can be prevented, and that 90 percent of the moderate losses can be reduced to a minimum. He also states that of these only 10 percent should lose in excess of 300 c.c. of blood in the third stage of labor. He maintains that the separation of the placenta can be ascertained sooner than is commonly done and that it should be immediately expressed. Through his own methodology he has reduced the average measured blood loss to 179 c.c.¹⁰ Here is an excellent goal toward which every young obstetrician should work.

In most instances authors agree that the prevention of hemorrhage begins with the prenatal study of the obstetrical patient. Particular attention to specific entities such as anemia, foci of infection, and a previous history of postpartum hemorrhage will help lower the incidence and amount. In the cases of anemia and foci of infection, these should be eliminated if possible before delivery. In the latter instance the attendant should be more watchful. In cases of suspected multiple pregnancy

or hydramnious, it is a good practice to have the patient typed before delivery and donors obtained, because the incidence is known to be much higher in such individuals³ Although it is stated that fibroids will predispose to excessive bleeding, some have found through statistical study that this is not the case. The presence of fibroids, however, may cause increased distension and thus exert deleterious influence. In any instance it would be well to let their presence be a stimulus for careful watch during the last stage of labor.

In the third period careful watch should be made to determine undue relaxation of the uterus, since this will predispose to abnormal bleeding. The fundus should be watched carefully to prevent the occurrence of concealed hemorrhage, which may make itself known only by sudden collapse of the patient.¹² In the University of Nebraska hospital it is mandatory that an attendant shall be with the patient for at least one hour following delivery of the placenta. During this time the fundus is watched carefully, and undue relaxation is eliminated by massage. If, however, massage proves insufficient, the use of oxytocics is indicated. The blood pressure, pulse, and respiration are checked every fifteen minutes for indications of systemic reaction to excessive blood loss.

Proper management of the third stage of labor is one of the most important prerequisites in prevention of, and prophylaxis against, postpartum hemorrhage.²⁸ It is also generally agreed by the several authors that the physiology and pathology of the third stage must be thoroughly understood before one can competently handle it.

Since the proper management of the third stage is to be the best place for attack in the reduction of postpartum hemorrhage, it will be considered under the heading of prophylaxis. Randall sums up what we may consider improper management of the placental stage by stating, "This consists of efforts to expel the placenta from the uterus before the normal mechanism of placental separation has taken place."²⁸ Burns, as early as 1839, said, "When the placenta is rashly extracted immediately following the delivery of the child, we often find that the uterus does not contract properly, and the vessels pour out blood plentifully."⁶ Recognition of the dangers is not new, but subsequent correction has been slow and is in need of re-emphasis.

Following the second stage of labor, the uterus must accommodate itself to the marked diminution of the size of its contents, and until it has done this it usually will not resume its normal contractions and retractions. These uterine reactions will finally result in the separation

and expulsion of the placenta. To attempt during this time to expulse the placenta from the uterus will only interfere with the normal mechanism of separation and this will predispose to increased and excessive blood losses.²⁸ This should serve as a warning to those who have a tendency to hurry the normal separation and gamble the life of the mother against a few minutes of time.

Since Calkins' technique has produced such desirable results, I believe that it can be accepted in its entirety. It is as follows: "Immediately after the delivery of the baby, the hand is placed on the abdomen; the uterus is held very gently with the fingers behind and the thumb in front and with no attempt to massage the organ unless it shows signs of relaxation and flaccidity. As soon as it changes from a discoid to a globular shape and a trickle of blood appears from the vagina, the organ is vigorously massaged until it becomes firmly contracted and then, by squeezing and gentle downward pressure, an attempt is made to express the placenta. Should the placenta not come out readily, no further attempt is made to express it and no further massage is instituted until some sign of enlargement or flaccidity appears, or there is an increase in bleeding from the vagina. Immediately after the delivery of the placenta, the uterus is again massaged to obtain firm contraction, and the hand is kept constantly

in contact with the uterus for a period of one hour, or until such time as the attendant assures himself that there will be no further tendency toward relaxation or flaccidity. One cubic centimeter of solution of pituitary is administered hypodermically immediately after the delivery of the placenta--never before."¹⁰

Some of the signs of separation of the placenta are given below and may help the attendant ascertain when this has taken place. Immediately following delivery the uterus assumes a discoid or flattened shape. When the placenta is separated it assumes a more globular shape and should be expressed soon after this. Immediately following this separation it is pushed into the lower uterine segment. This is evidenced by contractions of the organ, an anterior posterior flattening and elevation of the uterus in the abdomen. The cord and membranes may be seen to advance through the introitus of the vagina. At this time a soft distension of the lower uterine segment may be palpated. Usually there is a gush of dark blood from the vagina with the separation.²⁸ If slight pressure is made on the fundus the cord will advance, and if separated will not be drawn back when the fundus is released.

The use of anesthesia and analgesia should be kept at a minimum during delivery as these will give, in most

instances, an increase in the amount of blood loss. Pastore,²³ Beecham³ and others believe that accurate measurement of blood loss will further help in the study and hence prevention of excessive hemorrhages. There is a general tendency to underestimate losses above 450 c.c., and overestimate those losses below 150 c.c.; so there is a lax attitude when treatment is most needed. If actual measurements are taken, they will reveal an increased incidence of postpartum hemorrhage.²³

It has been repeatedly shown that there will be an increase in the bleeding following the delivery of the placenta if the fundus is pushed deeply into the pelvis. This is primarily due to partial obstruction of the venous drainage from the wall of the uterus. If the fundus is gently pressed, the placenta may be exteriorized without excessive trauma. There is too much trauma if the placenta is roughly pushed out of the vagina by pressure downward on the fundus. The proper method is to squeeze the uppermost portion of the body of the uterus with very little downward pressure.

For those engaged solely in hospital practice, the work of Adair and Davis¹ may have an important effect on the future management of the third stage. If, as is shown in the physiology of placental separation, separation is due to sudden reduction of the placental site surface

area, then the more rapidly this takes place the better chance we have for complete separation. In this case there should be less likelihood of portions of the placenta remaining attached and thus interfering with the third stage. In order to accomplish the immediate contraction of the uterus following delivery of the baby, .2 mgm. of ergonovine is given intravenously. This is given as the head is delivered and as the anterior shoulder comes into view. If twenty to thirty seconds are allowed at this point for the drug to act, the delivery can then be completed. Almost immediately, the uterine musculature reacts, separating the placenta cleanly from its attachment and pushing it out into the lower uterine segment and vagina. The advantage of this method is a marked reduction of blood loss and freedom of complications of the third stage and accompanying postpartum hemorrhage. There have been some cases of placental retention but not often enough to cause excessive trouble.

The use of oxytocics has gained a peculiar status in the prevention of postpartum hemorrhage. Moir stated that the use of oxytocic drugs were justified first in preventing hemorrhage; second, to check hemorrhage already present; and third, to hasten involution.²¹ If we use this as a criteria, oxytocic drugs could be used

most anytime we desired them. In surveying the literature, one finds that they are of infinite value both in prophylaxis and treatment. In the former we are almost forced to their use by the universal demand on the part of the expectant mothers for a relatively painless delivery. The use of analgesia and anesthesia causes excessive blood losses due to their effect on the uterine musculature causing some relaxation and less efficient contractions. The contraction and retraction of the uterine muscles should be at their maximum effect in order to properly close the gaping uterine sinuses.

The proper use of oxytocics will shorten the third stage of labor and decrease the blood loss. However, contraction zones in the lower uterine segment may give rise to an incarcerated placenta which is wholly or partially separated. In those instances there is some trouble in extracting the retained member and consequently a chance of more bleeding due to the associated trauma!² Williams, in his text, states on the other hand that they have been giving ten obstetrical units of pituitrin following the delivery of the child. Contrary to previous beliefs the incidence of manual removal has decreased from one percent in 1935 to .2 percent in 1939. Of almost as great importance is the fact that this was accompanied by a proportionate decrease in tamponade of the uterus.³⁹

Fortin recommends that one c.c. of pituitrin extract be given at the onset of the third stage, since it has reduced his cases of postpartum hemorrhage by 2.7 per 1000 cases and has shortened the third stage on the average to four minutes. He has compared the results of 2200 women by giving 1100 of them one c.c. pituitary extract at the onset of the third stage, and 1100 following the delivery of the placenta. During this experiment he found no difference in the blood losses, but he found a 5.5 percent reduction of hemorrhage in normal cases and a 6 percent in the operative cases with pituitary extract given prophylactically.¹⁷

In refutation to the contention that the third stage has been reduced to four minutes by the use of pituitrin administered at the beginning of this stage, Calkins points out that he too has succeeded in reducing the time to four minutes. He administers the pituitrin at the end of the third stage and attributes the time reduction to a new management technique.¹⁰

DIAGNOSIS

The most essential factor in the treatment of postpartum hemorrhage is undoubtedly early recognition. The best method of early recognition of the cause of excessive bleeding is to consider events as they occur during the third stage in chronological order. For this purpose the outline of Pastore and Stander will serve. The third stage may be divided into three phases and the causes discussed under each heading. The diagnosis itself is usually rather simple unless the bleeding is internal and consequently concealed. However, the differential diagnosis of the source is most important in reaching a decision concerning the proper treatment.²⁶ It is also important that the actual amount of blood lost is known, and for that purpose it should be measured.

I. Before Complete Separation

A: Perineal, vaginal or cervical lacerations

Here the most important factor is simply inspection of the birth canal to discern if there are lacerations. Usually the fundus will be found to be hard on palpation, and the bleeding is red and pulsating in character if there is a severe laceration. The vagina should be inspected when well-lighted and exposed, special care

taken to inspect around the urethra and pubic rami.²⁸ The inspection of the cervix should be systematic and proceed from one point around to the starting point. If the lacerations are not visualized, they may be found by palpation with proper aseptic technique. If operative procedures are done without full dilation, cervical tears should be suspected with excessive bleeding which is not subject to variations in amount with uterine contractions.

B. Partial Separation of the Placenta

This may give excessive bleeding in a placental separation of the Duncan type, since the maternal surface is exteriorized first. The bleeding of a Schultze type usually follows the time of the placental separation.

II. During Expression

A. Delayed expression of separated placenta

This has been discussed elsewhere. Here we have a damming back of blood with a mechanical block to proper contraction, since blood continues to accumulate during the time the placenta is left in place. When the placenta is followed by clots, one knows he has waited too long for expression. More dangerous yet is the fact that bleeding of this type is concealed and not recognized.

B. Faulty expression of the placenta

This occurs when the placenta is roughly expressed from above by pushing down on the fundus. If the fundus is grasped in the hand and roughly squeezed to express the placenta, there will be bleeding recognized by its being more forceful than that of uterine contraction. This point has been discussed under Prophylaxis.

III. Following Expression

A. Uterine Atony

This bleeding is of the venous type and is darker in color than the blood coming from laceration. This bleeding is also subject to uterine movements. The first concern in those attending the delivery is the condition of the uterus, and the hand placed on the fundus will reveal a softened uterine musculature.

B. Prolapse of Fundus into Pelvis

There is a venous obstruction with inevitable back pressure and filling of the maternal sinuses, and then bleeding occurs. This type of bleeding is profuse and continuous, and it is not subject to uterine contractions.

C. Perineal, Cervical, and Vaginal Lacerations

These were discussed under the first divisions.

D. Special Abnormalities

Placenta previa should be diagnosed previous to delivery. Other abnormalities are premature separation of the placenta and uterine fibroids. Retained placental tissue may be diagnosed by inspection of the placenta following its expression. Placenta accreta is rare, but in this case bleeding occurs when attempts are made to remove it manually.²⁶ The diagnosis is made through an attempt to remove the placenta manually. When there is no line of cleavage, but a tendency to tear away in fragments, removal should be discontinued immediately.³¹

TREATMENT

When the subject of treatment is raised, one immediately thinks of the use of oxytocics, but there are causes which must be eliminated before their use is justified.

In the case of lacerations, the treatment is to immediately repair them.²⁵ The bleeding points should be ligated separately and the muscle sutures should be placed first; then the mucosa can be closed. This may give a little more difficulty, but will insure the elimination of bleeding points.²⁶

With uterine atony, massage should be instituted at once. To do this the fingers should be placed posteriorly with the thumb anterior. If the fingers are then moved in a rotary manner with very little downward pressure there will not be excessive trauma. This method will suffice in most instances, but in the cases in which bleeding continues we must resort to more drastic methods. The most important use of oxytocics is when the bleeding is profuse and not controlled by massage. One c.c. of pituitary extract can be given intramuscularly, or three drops intravenously, for immediate uterine contractions, regardless of the possible systemic reactions of the patient.¹² Adair and Davis¹ in later work found that Pitressin and Pitocin given intravenously in doses of one to three minnim, and five to eight minnim gave

immediate uterine contractions with almost identical reaction curves. However, they favor the use of Pitocin, since there are no systemic reactions such as pallor, nausea, vomiting and oppression, as was seen with the use of Pitressin. They found no difference in the contraction curves with the use of either Pitressin, Pitocin, or Pituitary extract. Gardiner and Bradbury,¹⁸ found that the initial contractions begin within twenty to thirty seconds, and the average duration of the drugs was in most instances thirty minutes. Procedure may be supported by the use of one of the ergot preparations which give longer action, but which take longer for the initial reactions. The ergot preparations give a resultant increase in tone, followed by an increase in the frequency and amplitude. The action of these drugs becomes apparent in from twenty to thirty minutes, reaches a maximum in fifty to sixty minutes, and then gradually recedes at the end of two hours.

Ter Kuite³³ in a study of 500 cases has shown that Ergonovine is more favorable and efficient in the prevention and control of hemorrhages than Ergotamine Tartrate. This drug can be given intravenously and has a prolonged action. Due to the fact that it can be given in intravenous therapy and gives an immediate and sustained action, it may replace the pituitary fractions.

The usual dosage is .2mgm.²⁸ If it is desirable to have a more prolonged action of the uterine musculature, it may be given orally every three or four hours as is deemed necessary. However, extensive and continued use may give ergot poisoning.

When bleeding is occurring from an atonic uterus which still contains the placenta, it may become necessary to remove it manually. However, in all instances the Credé method of removal should be tried first.²⁸ It is only in the instances of failure of placental separation that this maneuver should be used, however, since it is attended with considerable trauma. It is also necessary that the uterus be firmly contracted before attempts are made to express material, because of the increased possibility of causing an inversion of the uterus.¹⁴ In the case of an atonic uterus, as was mentioned above, oxytocic units may be given intravenously to obtain contraction. Since the attendant will be rather hesitant in trying a manual removal of the placenta, we should each have a criteria established for this. Peckham and Kuder²⁷ state that if the placenta has not been exteriorized in one hour, and manual expression is of no avail, manual removal is indicated. The above holds true if there is no excessive bleeding occurring in the meantime.

Manual removal of the placenta is a major surgical procedure and should not be done unless with the strictest aseptic care.¹⁴ It is better to make necessary preparations for aseptic work speedily than to have the patient die or have the serious complication of puerperal infection follow attempts to stop bleeding. Once the hand has been inserted into the uterus, it should not be withdrawn until the placenta has been entirely separated from the uterine wall and is ready to be delivered.²⁸ According to Douglas¹⁴ the proper method of separation of the placenta from its attachment is to loosen it from below, upward toward the fundus. The movements of the hand within the cavity of the uterus usually cause the necessary stimulation for contractions. In some cases however, it may be necessary to pack the uterus following removal of the placenta, or occasionally following delivery of the placenta by the Credé method.

In cases needing a uterine tamponade, the general consensus of opinion is that the gauze is tightly packed into all corners of the uterus so that there will be no spaces left open into which bleeding can continue unseen. The need for the highest possible aseptic technique must be stressed again here. There are many contrivances and special tubings for this purpose, but the individual treating the case can make his choice of these. In some

cases it may also become necessary for a second packing, and this should be done if the occasion calls for it.

Randall²⁸ and Brodhead⁵ advocate five percent Iodoform gauze for the packing, since it has a bacteriocidal effect and also cuts down the stench which originates in uterine packs. Various authors disagree as to the time a pack should be left in place. Consequently, the individual physician must use his own judgment. This, it may be stated, is the governing factor in all attempts of treatment. Randall²⁸ advises the removal of the gauze in one day, while Brodhead⁵ recommends that it should remain in place four days. Tamponade may also necessitate occasional catheterization due to pressure on the bladder and urethra.⁵ In cases which continue to bleed in the face of tamponade and proper oxytocic treatment, hysterectomy is to be considered.²⁸

Placenta accreta is fortunately an uncommon occurrence, and there are only one hundred and six cases reported in the literature. The general opinion is that a recognized placenta accreta should be treated by immediate hysterectomy without attempts at manual removal.³¹

Beck, in his text, sums up the treatment of retained placental fragments rather quickly by advising manual removal under strictest aseptic conditions.² Douglas, on the other hand, offers a more conservative method of

handling this condition. He believes that some can be expressed from above and that it should be tried before the uterus is invaded.¹³

We now come to a phase of the subject which has been somewhat neglected. I find that in the 108 cases of listed postpartum hemorrhage at the University of Nebraska hospital, in only thirteen instances has transfusion been resorted to. If Beecham is to be recognized he believes that above all other things transfusion and early packing are the things to be used at the first signs of excessive amounts of blood loss.³ Previous to this time this would have been rather impossible, due to not having suitable donors when needed. But now, with the plasma and blood banks, this situation is reversed and should be used extensively to lower mortality and morbidity from hemorrhage and related puerperal infection. Even in cases where blood is not available, the use of intravenous fluids may prevent circulatory collapse and death, since this is the immediate need. Blood should be given as soon as it becomes available and has no contraindications in view of the previous fluids given.

The typing and subsequent treatment of the patient with blood transfusion is of paramount importance, and it is becoming more and more an every day procedure.

The results seen are excellent and at times seem miraculous in the treatment of postpartum hemorrhage.⁵ Schumann took his stand on transfusions by stating that any operative procedure during the third stage of labor should be accompanied by transfusion.³¹

Again considering the use of transfusion in the University of Nebraska Medical College, we see that they have been more often given for other causes than for actual hemorrhage. The following entities were listed with the use of transfusions: Caesarean section, Rheumatic heart, Pelvic abscess, Bronchial pneumonia, manual rotation, premature separation, retained placenta, with manual removal;² epistomy and cervical lacerations, episiotomy and anemia. Thus in ten of the thirteen cases treated with transfusion, we see conditions not actually associated with hemorrhage. There were four cases with hemorrhage of 600-750 c.c., four of 750-1000 c.c., and two of 1000 c.c. and over treated with blood transfusions.

Transfusions are again important in lowering the morbidity from associated infection. Pastore²³ and ²⁴ has shown a definite increase in infection which is directly related to the hemaglobin and cell volume decrease following delivery. In those instances where it is impossible to do cell volume computation, the drop in the hemaglobin can be easily calculated and should be a governing factor in the use of transfusions.

MORBIDITY AND MORTALITY

In postpartum hemorrhage the most important cause of morbidity is the occurrence of infection. Although the statistical evidence varies in different institutions, there is a general increase. Stander, in "Williams' Obstetrics,"³⁹ shows an incidence of 8.3 following all deliveries, while following postpartum hemorrhage there is an increase to 27.3 percent. Pastore²⁴ has found that if the cell volume is above 40 percent on the third day postpartum, the percentage of infection is 4.5. In contrast to this, those with a cell volume of 30-40 percent showed infection and increased temperature in 6.5 percent of the cases, and with those below 30 percent the incidence was 31 percent. This shows that the lower the cell volume falls the more likelihood there is of infection and this demands an increased hospital stay. Pastore has also shown that the morbidity is related to the hemaglobin percentage, which is in turn dependent on the blood loss and weight of the patient. Since hemaglobin determinations are more easily made by those in general practice, I will give Pastore's figures as related to infection. Of eleven patients with a febrile course, only three had a hemaglobin of 70 percent or over. In contrast to this, it has been shown that of sixteen patients with an afebrile course,

only seven had a hemaglobin percentage below 70.

The prognosis of postpartum hemorrhage is very good. In most instances there is a low mortality rate, but a high morbidity. The present mortality can be lowered if proper treatment is instituted when needed. In Williams' text, Stander³⁹ has shown a decrease in five years of from .1 percent to .019. Certainly if this is done in one institution it can be done in others. Peckham and Kuder at Johns Hopkins, have shown a death rate of .104.²⁷ In the University of Nebraska series there have been three deaths in the 3,263 cases. This gives a percentage of .92 of the total obstetrical admittances. On the other hand, if the figure is calculated from the 108 cases of postpartum hemorrhage which occurred, we find a percentage of 2.77.

In the United States Bureau of Labor's survey of maternal mortality in fifteen states, it was shown that the mortality was 15 percent.⁴⁰ It is also shown that of the 4,188 women who died after reaching the third trimester, 21 percent had an associated postpartum hemorrhage. This is where the statistical number of deaths are attributed to other entities--such as puerperal infection. Bell,³ who has with the aid of others drawn up statistics from seven cities on the Pacific Coast, has a rate of 15 percent. Postpartum hemorrhage

was the third greatest cause of death, succeeded only by abortion and septicemia. Davis made the statement that postpartum hemorrhage accounts for 10-12 percent of the maternal deaths each year. Again in 1939, he states that there has been a progressive reduction in the maternal death rates the last five years, yet the deaths from hemorrhage have been little affected.¹²

SUMMARY

Although postpartum hemorrhage is associated with a rather low mortality, it is very important in the consequent rise in morbidity. The problem has been much discussed, but there has been little change in the fundamental phases in the last century. The most important portion of the problem is to lower the incidence in order that the morbidity be lowered. Although postpartum hemorrhage is only one of the many problems to be attacked it must be considered, since the desire of the obstetrician is to get the patient back to normal.

The most important aim is prevention of postpartum hemorrhage rather than its control and treatment. In order to do this, it becomes necessary to accomplish the following: First, and most important, is the proper management of the third stage of labor. To accomplish this the placenta should be exteriorized as soon as it is separated, and this should be done with the least possible trauma. To fortify the proper management, it is a good procedure to administer one of the oxytocic principles either at the beginning or at the end of the placental stage. This latter is to be the choice of the individual obstetrician. At the present time it would seem that ergonovine is the drug of choice. Second, the pregnant woman should have the best possible prenatal care. Attention should be given to elimination

of foci of infection, and anti anemic therapy. Third, the use of anesthesia and analgesia, although desirable from the maternal standpoint, should be kept to a minimum. Finally, those with previous history of hemorrhage, multiple pregnancy, or overdistension, should be typed and every attempt made to prevent excessive bleeding.

In order to lessen the incidence, it is necessary also for those managing obstetrical patients to thoroughly understand the physiology and pathology of the third stage. Since there are many etiological factors, the primary causes must be recognized and treated.

The definition of postpartum hemorrhage as generally accepted at present is inadequate for proper prognosis and treatment. The definition should be, as Pastore has stated, one percent of the body weight. Even this is not totally sufficient, since the prenatal condition, the rate of blood loss, and the subsequent hemoglobin or cell volume, must be a factor in our judgment of excessive blood losses.

CONCLUSION

1. Postpartum hemorrhage should be defined as a blood loss, following delivery, of one percent or more of the body weight.
2. The most important item in postpartum hemorrhage is prophylaxis. In this, the first essential is proper management and understanding of the third stage.
3. The cell volume or hemoglobin should be determined following delivery, and low readings should be an indication for transfusions in order to lower the morbidity.
4. Transfusion should play a more important part in treatment of postpartum hemorrhage, since it will give excellent results.

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