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THE TOLERANCE OF FRESHLY DELIVERED WOMEN TO EXCESSIVE LOSS OF BLOOD.*

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SOME years ago I became impressed by the fact that many women may lose considerable quantities of blood during the third stage of labor or shortly thereafter without presenting any of the clinical symptoms which are generally regarded as characteristic of hemorrhage.

In order to test the correctness of my impression, I instructed my assistants to collect and measure the blood lost at that time as a matter of routine in every labor. As the number of observations increased, it became desirable to establish a standard for differentiating between physiological bleeding and actual hemorrhage, but upon referring to the accepted obstetrical text-books and to the monographs upon the third stage of labor, I was surprised by the lack of definite information upon the subject, as well as by the contradictory statements made by the various writers. Thus, in 1886 Barnes said: "It may be useful to acquire as accurate an idea as possible of what may be considered the natural loss of blood. This standard is very difficult to fix by quantity. Women vary greatly in this respect. Some lose very freely without appearing to be any the worse; whereas others cannot bear the loss of even a moderate amount without exhibiting alarming prostration. When

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the uterus contracts normally, its substance is compressed, so that the blood in its vessels is squeezed out, much as we squeeze water out of a sponge. The quantity of blood so held in the uterus at the moment of separation of the placenta may be regarded as superfluous for the wants of the system. It may amount to 1 pound, but it is often less and occasionally more. This I call physiological hemorrhage."

While Barnes' statement is doubtless correct, it is nevertheless too broad to be useful in differentiating or indexing hundreds of observations. Nor are the estimates of other writers more helpful; as one will designate as normal a loss of blood which another would consider as a serious hemorrhage. The following figures show clearly the varying conceptions of physiological bleeding: Fabre 80 to 100 c.c., Tucker 300 c.c., Champneys 300 c.c., Commandeur 500 to 600 c.c., Tarnier and Chantreuil 600 to 700 c.c., and Ahlfeld 800 c.c.; while Polak begs the question by stating that hemorrhage did not occur in a series of 1306 consecutive labors. It must be apparent that many of these statements represent merely crude estimates, for, so far as I can gather, only the figures of Tucker and Ahlfeld are based upon actual measurements. Similar variations likewise exist in the notions as to what constitutes actual hemorrhage, its lower limit being placed at 300 and 1000 c.c. by Fabre and Ahlfeld, respectively.

The present study concerning the amount of blood lost during the third stage of labor and shortly thereafter and its clinical effects, is based upon observations made upon 1000 consecutive spontaneous full-term labors occurring in 1339 obstetrical patients at the Johns Hopkins Hospital (Histories 8161 to 9500). Three hundred and thirty-nine histories in the series were not utilized, as they included 162 operative cases, as well as 177 others in which pregnancy had terminated prematurely, or in which the patients left the hospital before delivery.

Our technic for collecting and measuring the blood is as follows: Immediately after the birth of the child a sterile douche pan is placed beneath the buttocks of the patient where it remains until all bleeding following the birth of the placenta has ceased. After the placenta has been delivered any blood contained within its membranes is allowed to escape into the pan; the entire amount is then poured into a graduate, accurately measured in cubic centimeters, and noted in the history. In this way contamination by amniotic fluid is avoided, and the entire amount of blood which has escaped during the third stage of labor and after the extrusion of

the placenta is collected and measured. This technic is very simple and satisfactory and is preferable to that employed by Tucker and Ahlfeld—the former collecting the blood in a basin held before the external genitalia, and the latter employing a complicated procedure in which the patient's buttocks rest over the mouth of a large copper funnel, which passes through the mattress, while the blood is collected in a vessel placed beneath the bed.

Before considering our observations in detail, it seems advisable to say a few words concerning the treatment of the placental period of labor; as our method differs materially from that employed by Ahlfeld. As is well known, he advocates the greatest possible conservatism, and holds that it results in a diminution in the amount of blood lost, as well as in prompter recovery of the patient. Immediately following the birth of the child, he cuts the cord and leaves the patient absolutely alone for two hours, unless excessive bleeding necessitates prompt expression or the placenta is extruded spontaneously, the latter occurring in only 13 per cent. of his cases. At the end of the period he expresses the placenta by gentle pressure upon the lower abdomen.

I have adopted a different procedure, which is as follows: After the child is born the uterus is gently palpated and the location of its fundus noted, but massage is not employed unless the uterus is boggy in consistency or the bleeding excessive. From time to time the location of the fundus is determined by palpation or inspection, and after the lapse of from five to thirty minutes it is usually noted that it has risen 4 to 6 cm. above its original location, while in some cases an indistinct swelling has likewise appeared just over the symphysis. This indicates that the placenta has become separated from its attachment, has been extruded from the uterine cavity and lies free in the lower uterine segment or upper part of the vagina. As Ahlfeld's observations have taught us that in seven cases out of eight the placenta will remain in this location until expressed by pressure from above, I have been unable to convince myself that there is any advantage in waiting a specified length of time before expressing it, and consequently, as soon as the rising up of the fundus indicates that it has been extruded from the uterine cavity, I express it from the vagina by gentle pressure upon the fundus. On the other hand, I believe that routine massage of the uterus only tends to disturb and prolong the process of separation, and should therefore be avoided; while premature attempts to express the unseparated placenta by the original Credé method frequently lead to retention of placental fragments and thus greatly increase the amount of bleeding and the

frequency of radical intervention. Consequently, I employ the typical Credé method of expression with the greatest circumspection, and only in the presence of serious bleeding, or after spontaneous separation of the placenta has failed to occur within one hour after the birth of the child.

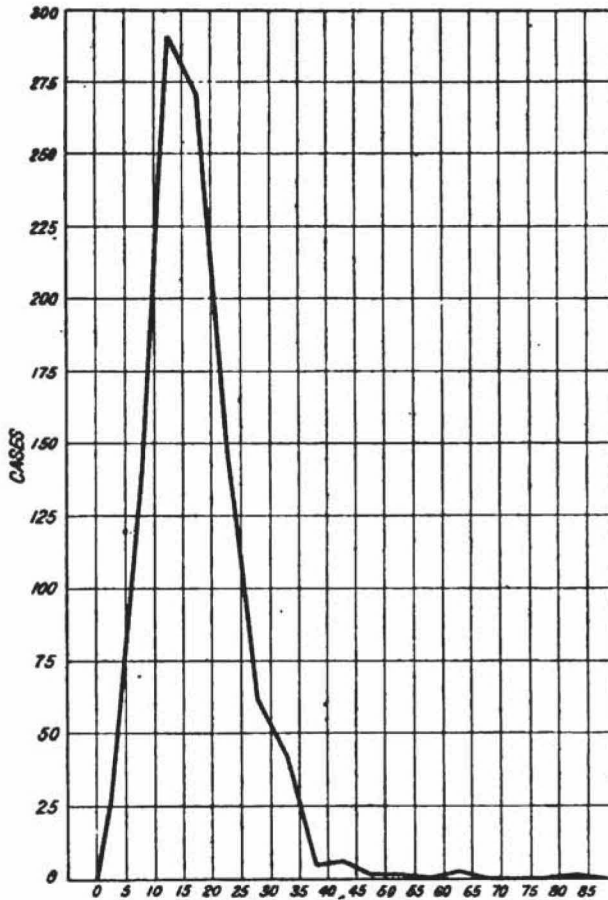


CHART I.—Showing duration of placental period in 1000 consecutive spontaneous labors.

The following figures give a clear idea of our conduct of the third stage which is apparently justified by the results to which reference will later be made.

Placenta born spontaneously.....	9 cases
Placenta expressed from vagina.....	973 cases
Placenta expressed by typical Credé.....	18 cases
Placenta removed manually.....	0 case

1000 cases

In the entire series the average time elapsing between the birth of the child and the extrusion of the placenta was 15.3 minutes,

the extremes being spontaneous expulsion immediately following the birth of the child and a difficult Credé expression at the end of ninety minutes.

Chart I (Fig. 1) gives a graphic idea of the duration of the placental period in our series of cases, and shows that the most frequent time for delivery of the placenta is between 10 and 15 minutes after the birth of the child, or somewhat less than the arithmetic average.

Upon analyzing the amount of blood lost in our series of 1000 spontaneous labors, we find that the average bleeding was 343.7 c.c. with the extremes varying from zero to 2400 c.c., the placental period having been entirely bloodless in two patients. Table I gives the incidence of the varying loss of blood:

TABLE I.—SHOWING THE VARYING AMOUNT OF BLEEDING IN 1000 SPONTANEOUS LABORS.

Quantity of blood lost, c.c.	Cases
0	2
1- 99	88
100- 199	210
200- 296	227
300- 399	148
400- 499	120
500- 599	75
600- 699	31
700- 799	28
800- 899	15
900- 999	7
1000-1099	8
1100-1199	7
1200-1299	8
1300-1399	4
1400-1499	4
1500-1749	4
1750-1999	0
2000-2249	3
2250-2499	1

1000 cases, average 343.7 c.c.

It must not be understood, however, that this average loss gives a correct idea concerning the amount of the bleeding which one is most likely to encounter in spontaneous labor, as that amounted to less than 300 c.c. in 527 out of 1000 cases. This is still further accentuated by Chart II (Fig. 2), which graphically illustrates the conditions in our 1000 cases, and shows that the most usual loss varies

between 100 and 300 c.c., and that the higher average for the series has resulted from the inclusion of the relatively rare cases of profuse hemorrhage.

These figures correspond approximately with those of Tucker and Champneys (300 to 360 c.c.) and are much smaller than those given by Commandeur, Tarnier and Chantreuil, and Ahlfeld (500-

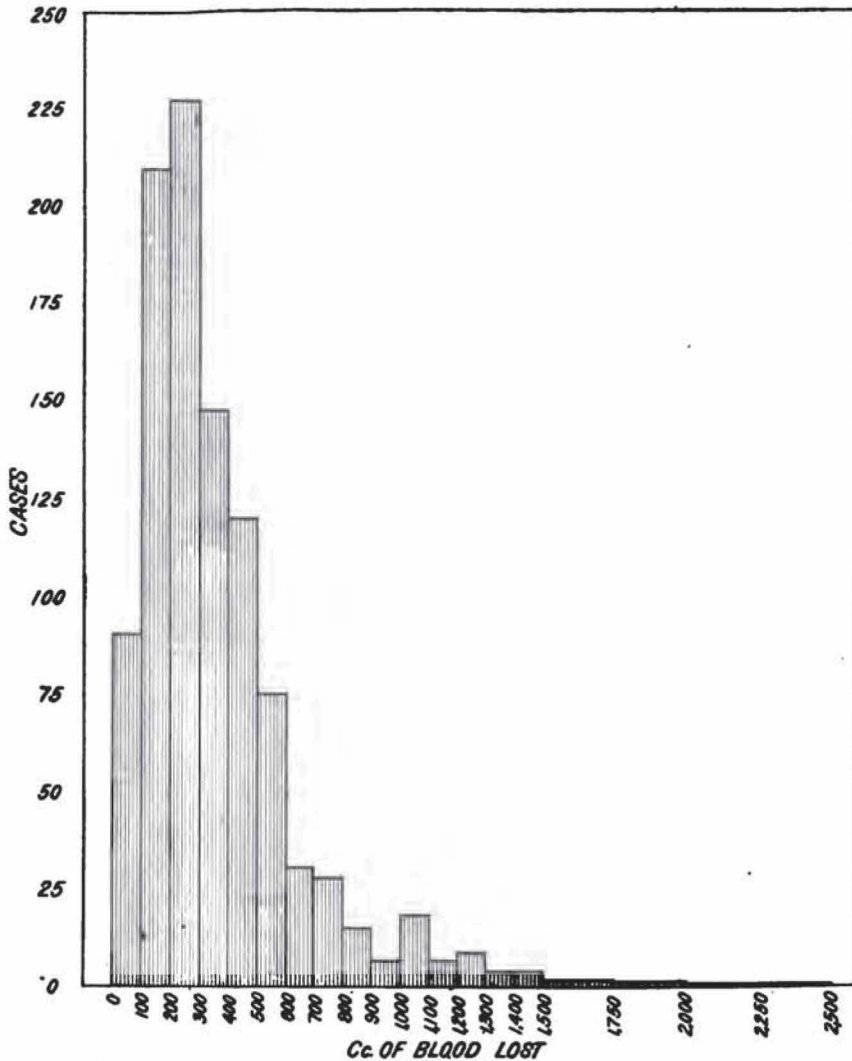


FIG. 2. CHART II.—Showing amount and frequency of bleeding following 1000 consecutive spontaneous labors.

800 c.c.). In the last 2058 cases studied by Ahlfeld the average loss was 505.1 c.c., which is 161.4 c.c. or one-third greater than in our series. Whether this is fairly attributable to the difference in our management of the placental period, I hesitate to state; but in any event it can scarcely serve as an argument in support of the view that extreme conservatism necessarily leads to a pronounced diminution in the amount of bleeding.

While such statistics may be of practical value to the obstetrician, they are of little interest to medical men in general; but, on the other hand, our observations as to the incidence of actual hemorrhage, and more particularly concerning the tolerance which freshly delivered women appear to exhibit to it, are of general significance. Upon entirely arbitrary grounds I selected 600 c.c. as the limit between physiological bleeding and postpartum hemorrhage, and our figures show that 130 cases in the series (13 per cent.) belong in the latter category. Table II shows the frequency and amount of such hemorrhages:

TABLE II.—SHOWING FREQUENCY AND AMOUNT OF POSTPARTUM HEMORRHAGE IN 1000 SPONTANEOUS LABORS.

130 women lost	600 c.c. of blood or more
71 women lost	800 c.c. of blood or more
41 women lost	1000 c.c. of blood or more
18 women lost	1250 c.c. of blood or more
8 women lost	1500 c.c. of blood or more
4 women lost	2000 c.c. of blood or more
1 woman lost	2400 c.c. of blood or more

As experience has taught me that in normal freshly delivered women serious symptoms do not follow hemorrhages of less than 1000 c.c., our interest is centered upon the 49 women who lost one litre or more. Of these, 31 lost between 1000 and 1250 c.c. of blood and 18 more than that quantity. As only one patient in the first group presented symptoms of acute anemia, we are particularly interested in the 18 women of the second group, abstracts of whose histories are given at the end of the article. Of these, 10 lost less and 8 more than 1500 c.c. of blood, the later being distributed as follows:

2 patients lost	1500 c.c. (Cases XLII and XLIII)
1 patient lost	1600 c.c. (Case XLIV)
1 patient lost	1700 c.c. (Case XLV)
2 patients lost	2000 c.c. (Cases XLVI and XLVII)
1 patient lost	2100 c.c. (Case XLVIII)
1 patient lost	2400 c.c. (Case XLIX)

While 49 hemorrhage cases, in which the loss of blood was 1000 c.c. or more, constitutes too small a material to justify the formulation of far-reaching conclusions, nevertheless I believe that their study will bring out several points of interest and importance. The only other study of the kind with which I am familiar was made in 1904 by Ahlfeld, who reported that in a series of 6000 labors postpartum hemorrhages amounting to 1500 c.c. or more occurred in 159 women,

an incidence of 2.65 per cent. as compared with 0.8 per cent. His cases were divided as follows:

132 patients lost 1500-2000 c.c.
 23 patients lost 2000-2500 c.c.
 4 patients lost 2500 c.c. or more.

with four deaths in the first group, one in the second and none in the third. Furthermore, he related the history of a patient not included in his series who recovered from a hemorrhage of 3250 c.c. without serious symptoms.

It is generally believed that patients suffering from serious hemorrhage present a succession of more or less characteristic clinical symptoms, the most important of which are: rapid and small pulse, shock, air hunger, and, if recovery ensues, a rapid decrease in the percentage of hemoglobin, together with a marked diminution in the number of red cells, which reaches its lowest point by the third day, and then gradually returns to normal. The histories given below, however, conclusively demonstrate that not a few freshly delivered women may lose excessive quantities of blood without presenting any evidence of shock, and that occasionally the extent of the hemorrhage would not have been appreciated had the blood lost not been collected and measured. Thus, only one of the 31 women who lost between 1000 and 1250 c.c. presented any immediate symptoms attributable to loss of blood, but she was considerably shocked and had a pulse rate of 118 one hour and a quarter after delivery (Case XXX). Furthermore, only four of the 18 patients losing from 1250 to 2400 c.c. caused us any anxiety; none were seriously ill and all recovered.

It is currently believed that the pulse is unusually slow during the normal puerperium, and that the readiest method of evaluating the effect of hemorrhage is by its increased rate and poor quality. Our observations, however, show that the first assumption is incorrect, and that in freshly delivered women, the second does not occur with the regularity one might expect.

In going over our 1000 cases, particular attention was directed to the condition of the pulse during the forty-eight hours following delivery, and as it was counted as a matter of routine at four hour intervals, we usually had a record of twelve counts for the period. The highest count in each case was recorded and used for statistical study, and the following table shows that most of the women at some time during this period had a more rapid pulse rate than is generally believed.

TABLE III.—SHOWING THE HIGHEST PULSE RATE DURING THE FIRST FORTY-EIGHT HOURS OF THE PUERPERIUM.

	Without hemorrhage, cases	With hemorrhage, cases	Totals
Pulse below 60.....	1		= 1
Pulse below 60- 69.....	15	1	= 16
Pulse below 70- 79.....	97	7	= 104
Pulse below 80- 89.....	273	31	= 304
Pulse below 90- 99.....	314	44	= 358
Pulse below 100-109.....	112	25	= 137
Pulse below 110-119.....	36	14	= 50
Pulse below 120-129.....	17	5	= 22
Pulse 130 and over.....	7	1	= 8
	872	128	1000

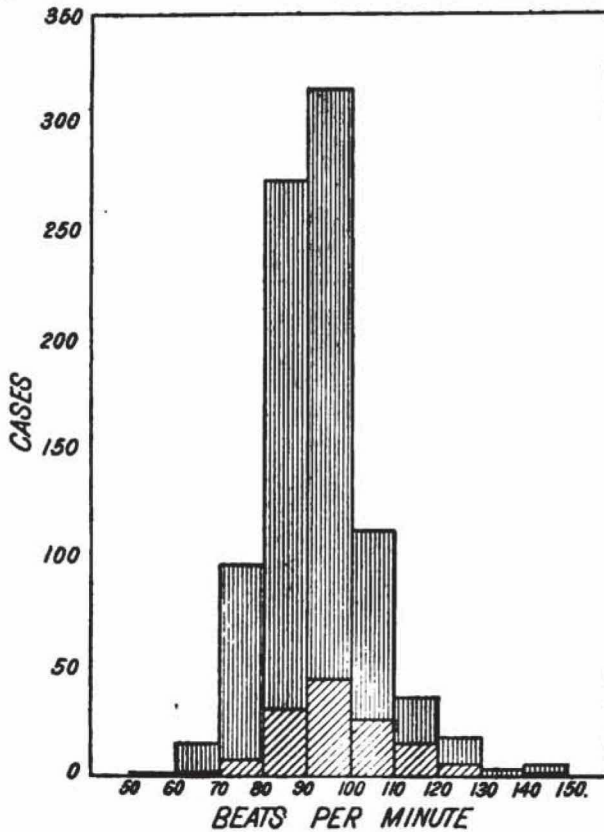


FIG. 3. CHART III.—Showing highest pulse rate during the first 48 hours following delivery in 1000 spontaneous labors. Vertical and oblique lining indicates cases with or without hemorrhage respectively.

In the two groups the average rate was 91.66 and 96.45 respectively, which apparently indicates that the average effect of hemorrhage is to raise the pulse rate by only five beats. Chart III (Fig. 3) represents these figures graphically, and clearly shows that the

pulse rate most usually encountered is between 80 and 100, irrespective of whether labor is followed by physiological bleeding or by actual hemorrhage.

Furthermore, it is interesting to compare these findings with those observed in the operative deliveries, which were interpolated between the 1000 normal labors. Of the 162 operations, 138 were not associated with hemorrhage, and these showed an average pulse rate of 101.9 which in turn was 5 beats higher than that observed in the spontaneous labors followed by hemorrhage.

From a study of these figures it seems justifiable to conclude: (1) that the pulse rate following normal spontaneous labor is higher than is generally believed; (2) that postpartum hemorrhage leads to a slighter relative elevation than would be anticipated *a priori*; and (3) that the strain of a difficult labor, necessitating operative termination, results in a greater average elimination than postpartum hemorrhage.

Professor Raymond Pearl was kind enough to study these figures from a statistical point of view, and he formulated his data in Table IV, from which he has drawn the following conclusions:

TABLE IV.—PULSE RATE IN SPONTANEOUS AND OPERATIVE LABORS.

	Spontaneous labors		Operative labors, without hemorrhage
	Without hemorrhage	With hemorrhage	
Average.....	91.66 ± .27	96.45 ± .75	101.89 ± .91
Standard deviation....	11.90 ± .19	12.61 ± .53	15.81 ± .64
Coefficient of variation	12.98 ± .21	13.07 ± .56	15.52 ± .64
Mode.....	88.48 ± 1.36	93.08 ± 1.30	91.72 ± 1.53
Median.....	91.09	95.18	98.59
Skewness.....	+ .27 ± .11	+ .27 ± .08	+ .64 ± .12

1. In spontaneous labors the average pulse rate is increased only about 5 beats in the cases with hemorrhage as compared with those without. This increase, while absolutely small, is clearly significant statistically, having regard to the probable errors. In operative labors the rate is about 10 beats higher, without hemorrhage.

2. The modal pulse rate is smaller than the average in every case; the skewness of the distribution being in the positive direction.

3. In the case of spontaneous labors the skewness is not certainly significant in comparison with its probable error.

Passing from these general statistical data to the condition of

the pulse in the individual cases of severe hemorrhage, I find it impossible to make any categorical statement concerning it, and I can only say that in many cases its rate and character during or shortly after postpartum hemorrhage in no way correspond to the quantity of blood lost, and therefore they are not necessarily indicative of the gravity of the condition. Table V gives a graphic idea of such variations.

TABLE V.—SHOWING PULSE RATE IMMEDIATELY AFTER, AND HEMOGLOBIN PERCENTAGE 3 DAYS AFTER POSTPARTUM HEMORRHAGE.

Cases	Amount bleeding	Pulse	Hemoglobin 3d day	Notes
30	1000	118.	?	Definite shock
42	1500	136	?	Pulse 84 four hours later
43	1500	90	55	No immediate symptoms
44	1600	rapid	42	Pulse 75 four hours later
45	1700	good	?	Pulse 65 four hours later
46	2000	good	38	Pulse 104, one and a half hours later (red cells 5th day 2,632,000)
47	2000	good	42	Pulse 78 three hours postpartum
48	2100	84	40	Pulse 104 one hour later
49	2400	100	38	Pulse 115 one and a half hours later (blood pressure 70 immediately after)

From these figures it is clearly evident that in certain cases the immediate clinical symptoms were not proportionate to the degree of hemorrhage, and in several instances, notably in Case XLVIII, the extent of hemorrhage would have escaped observation had the blood lost not been measured as a routine procedure. Likewise in Case XLIX, the pulse rate and the general condition of the patient gave no indication that 2400 c.c. of blood had been lost; although the fall of the blood pressure to 70 immediately after its cessation indicated profound shock, and the decrease in the hemoglobin content to 38 per cent. on the third day gave conclusive evidence of the existence of pronounced anemia.

Table V also gives information concerning the hemoglobin content of the blood on the third day, and makes it apparent that in five of the severe cases a pronounced reduction had occurred. In several instances a rapid return to normal was noted, but in others the low percentage persisted throughout the patient's stay in the hospital.

Unfortunately, routine hemoglobin examinations were not made in all of the patients losing 1000 c.c. or more of blood, but, as far as our figures go, it may be said that the hemoglobin content was not markedly lowered unless the hemorrhage exceeded 1250 c.c., but beyond that limit several marked reductions were noted. For example, readings of 40 per cent. were made upon two patients who lost 1350 and 1400 c.c. respectively, which are practical identical with those noted in patients losing from 2000 to 2400 c.c.

From what has already been said it is apparent that a certain proportion of freshly delivered women may lose from 1250 to 2400 c.c. of blood with comparative impunity, and present such slight immediate symptoms that the extent of hemorrhage might escape recognition if the blood were not collected and measured. If the usual computation be accepted that the total amount of blood in the body corresponds to one-thirteenth of the body weight, and assuming that the latter averages 130 pounds, such hemorrhages mean that the patients had lost from one-quarter to one-half of their total blood. In males and nonpregnant women such a loss would inevitably be followed by alarming symptoms of shock and acute anemia, yet they did not appear in any of the patients here mentioned, nor was their general condition so serious that the necessity for transfusion was at any time entertained.

The question accordingly arises as to how such an immunity is brought about, and why the characteristic symptoms of shock do not always develop. There can be no question concerning the actuality of the hemorrhage, as its amount was actually measured, and furthermore, the striking reduction in the hemoglobin content on the third day, as well as the marked pallor and definitely anemic appearance of the patients affords still further evidence of a serious loss of blood. Yet in many cases the pulse remained good in quality and was scarcely accelerated in rate.

The first explanation to occur to one is that so decided an increase in the total amount of blood had taken place during the latter months of pregnancy, that the amount lost by hemorrhage represented a smaller proportion of the total content in pregnant women than would have been the case in nonpregnant individuals, with the result that the fraction remaining in the body is sufficient to tide over the immediate needs. A certain plausibility is lent to such an explanation by the observations of Miller, Keith and Rountree, made in my service, that an increase in the total amount of blood actually occurs during pregnancy. I, however, do not believe that such an explanation is permissible for two reasons: First, that the

normal increase is only slight; and secondly, that the low hemoglobin content noted after the serious hemorrhages affords indubitable evidence that a large proportion of the blood in the body had actually been lost.

Some other explanation for the relative immunity must, therefore, be invoked; but unfortunately we are not in a position to do so satisfactorily. I am inclined, however, to believe that it is in some way associated with other protective processes, which develop during the last weeks of pregnancy and at the time of labor. Slemons has clearly shown that the nitrogenous metabolism at the time of labor is reduced to a minimum, while my own unpublished observations upon the respiratory exchanges indicate that the parturient women can go through labor with little or no increase in energy consumption, as indicated by the oxygen intake and carbon dioxide output. In other words, as I loosely express it to the students, she is conducting her body upon a "low gear" metabolism, so that the amount of energy necessary for the demands of the body plus the increased work incident to labor is scarcely increased.

If this supposition is correct, it may be permissible to assume that the temporary immunity to excessive loss of blood may in some way be connected with such a mechanism, and that the relative absence of shock may be due to the fact that for a few hours after labor the patient can get along upon a greatly diminished amount of blood, so that by the time the normal metabolism has been reestablished, the reparative processes will be sufficiently well under way to tide the woman over the immediate emergency. It must, however, be understood that such an explanation is entirely theoretical and is not supported by any known facts.

Finally, in order to avoid any possibility of misunderstanding, I wish to emphasize strongly that I do not claim that freshly delivered women are entirely immune to excessive hemorrhage, as to do so would be running contrary to ordinary clinical experience. But what I wish to point out is that many women may lose large quantities of blood with apparent impunity, and that routine measurement will show that an excessive loss occurs much more frequently than is generally believed. In my experience the average normal women can lose 1250-1500 c.c. of blood with little or no ill effect; and also that many can lose much larger quantities with relative impunity. At the same time a recent observation in private practice has taught me that a loss of 1800 c.c. may put the life of the patient in the greatest jeopardy, and Ahlfeld has reported several fatalities in which the loss barely exceeded 1500 c.c.

Abstracts of histories of patients losing 1250 c.c. or more blood (including one patient presenting symptoms following a loss of only 1000 c.c.).

In cases I to XXIX the loss varied from 1000 to less than 1250 c.c.

CASE XXX. 1000 C.c. (Symptoms).—History 8210, due to partial separation of placenta. Sixteen-year-old para-i. Pelvis normal, L. O. P. Prolonged second stage. Profuse bleeding immediately following birth of the child necessitating expression by Credé in ninety minutes. Patient evidently shocked; pulse 118 one and a quarter hours postpartum.

CASE XXXI. 1250 C.c.—History 8300, due to uterine atony. Twenty-three-year-old, para-i. Pelvis normal, L. O. A., labor easy. Bleeding after expulsion of placenta from vagina. No note as to symptoms. Pulse 104 two hours postpartum.

CASE XXXII. 1250 C.c.—History 9286, due to uterine atony. Twenty-three-year-old para-i. Pelvis normal, R. O. A. Preëclamptic toxemia treated for three weeks before labor. Labor prolonged, second stage four hours thirteen minutes, bleeding entirely after expression of placenta from vagina. No symptoms. Pulse 84 three hours postpartum.

CASE XXXIII. 1275 C.c.—History 8782, due to uterine atony. Seventeen-year-old para-i. Pelvis slightly generally contracted, L. O. A. labor easy. Bleeding after expulsion of placenta. Condition at all times good. Pulse 75 one and three quarters hours postpartum.

CASE XXXIV. 1300 C.c.—History 8491, due to uterine atony. Twenty-year-old para-i. Pelvis normal, L. O. A., labor prolonged, second stage three hours. Bleeding after expression of placenta lasting for twenty minutes. Although the patient was pale for two days the pulse only rose to 96 immediately after the bleeding and soon returned to normal.

CASE XXXV. 1350 C.c.—History 8310, due to partial separation of placenta. Twenty-year-old para-i. Pelvis normal, R. O. A. labor easy, repeated attempts to express placenta by Credé were not successful until one hour and twenty minutes after delivery. During the entire period bleeding at intervals which ceased completely after expression. Condition good, pulse 95 one and a half hours postpartum.

CASE XXXVI. 1350 C.c.—History 9492, due to uterine atony. Twenty-four-year-old para-i. Pelvis normal, L. O. A., labor easy. Bleeding entirely after expression of placenta, uterus boggy. Patient in excellent condition at end. Pulse 88 two hours postpartum. Hemoglobin: 2d day 55 per cent.; 4th day 40 per cent.; 8th day 55 per cent.

CASE XXXVII. 1375 C.c.—History 9494, due to uterine atony. Twenty-two-year-old para-i. Pelvis normal, L. O. A., labor easy. Bleeding after completion of third stage. Patient in excellent condition. Pulse 104 two hours postpartum. Hemoglobin: 2d day 70 per cent.; 4th day 55 per cent.; 10th day 65 per cent.

CASE XXXVIII. 1400 C.c.—History 8446, due to uterine atony. Twenty-five-year-old para-i. Pelvis slightly generally contracted,

R. O. A., labor normal. Bleeding after expression of placenta from vagina. No symptoms. Pulse 80. Hemoglobin on 4th day 55 per cent.

CASE XXXIX. 1400 C.c.—History 8494, due to uterine atony. Twenty-four-year-old para-i. Pelvis normal, L. O. A., labor easy, bleeding throughout the third stage, but particularly after expulsion of placenta. Vigorous massage necessary for one hour afterward. Pulse 90. Hemoglobin 55, 40 and 60 per cent., immediately postpartum, third and tenth days, respectively.

CASE XL. 1450 C.c.—History 9105, due to partial separation and atony. Seventeen-year-old para-i. Pelvis generally contracted rachitic, L. O. T., labor prolonged, thirty-one hours forty-five minutes. Bleeding began immediately after the birth of the child; expression by Credé eighteen minutes later. Patient's condition always good. Pulse 98 two and a half hours postpartum. One to one and one-half hours before birth of the child blood pressure was 124/94, while one hour after the birth of the child it had fallen to 98/74. Hemoglobin: One to one and one-half-hours antepartum 94.6; one hour postpartum 89 per cent.; 3d day 67.3 per cent.; 10th day 90 per cent.

CASE XLI. 1475 C.c.—History 9073, due to uterine atony. Eighteen-year para-ii. Pelvis normal, L. O. A., labor easy. Bleeding following expression of placenta from vagina. The condition was never alarming and the amount of bleeding would not have been noted had the blood not been measured. Blood pressure on admission 138/80; after conclusion of hemorrhage 98/54. Except for this no symptoms. Hemoglobin: end of second stage 82.6 per cent.; one hour postpartum 81.4 per cent.; 3d day 54.5 per cent.; 10th day 66.8 per cent.

CASE XLII. 1500 C.c. (Symptoms).—History 8804, due to partial separation of placenta and uterine atony. Eighteen-year-old para-i. Pelvis normal, L. O. A., labor easy. Bleeding commenced immediately after the birth of the child necessitating Credé's method. It continued afterward and gradually ceased after the hypodermic administration of pituitrin. Although the pulse rose immediately thereafter to 136, patient's condition was never alarming; pulse fell to 85 four hours later and did not exceed 104 afterward.

CASE XLIII. 1500 C.c.—History 8904, due to partial separation of placenta. Twenty-four-year-old para-i. Pelvis normal, R.O.A., labor easy. Oozing throughout entire third stage ceasing immediately afterward. No symptoms. Pulse 90. Hemoglobin immediately postpartum 65 per cent.; 3d day 55 per cent. and 12th day 60 per cent.

CASE XLIV. 1600 C.c. (Symptoms).—History 8835, due to uterine atony. Nineteen-year-old para-ii. Pelvis normal, L. O. A., labor easy. Bleeding after extrusion of placenta. Immediately thereafter pulse was rapid but never thready. Four hours later it fell to 75. Hemoglobin only determined on 9th day when it was 42 per cent.

CASE XLV. 1700 C.c.—History 9356, due to uterine atony. Thirty-nine-year-old para-v. Pelvis normal, R. O. P., prolonged labor. Hydramnios, 3 liters. Bleeding after completion of third stage. Retention of succenturiate lobe was suspected but was not found on introducing hand *in utero*. Bleeding stopped after a hot intrauterine douche. Pulse "good quality," 60 twelve hours postpartum.

CASE XLVI. 2000 C.c. (Symptoms).—History 8268, due to uterine atony. Twenty-three-year-old para-i. Generally contracted funnel pelvis. L. O. A., labor easy. Bleeding began immediately after the birth of the child and as it continued after the expulsion of the placenta the cervix was examined and found not to be torn, whereupon the hand was introduced into the uterus and found a few shreds of membranes but no placental tissue. Hemorrhage controlled by intrauterine pack. The patient was not sufficiently shocked to cause a special note to be made in the history. Two and one-half hours later pulse 104. Hemoglobin: 2d day 38 per cent.; fifth day 39 per cent.; 16th day 38 per cent.; the number of red cells varying from 3,120,000 to 2,632,000 to 2,832,000 on the respective days.

CASE XLVII. 2000 C.c.—History 8393 due to retained fragments of placenta. Twenty-eight-year-old para-v. Pelvis normal, R. O. P., labor rapid. Bleeding following expulsion of placenta was only checked after manual removal of the retained fragments followed by hot intrauterine douche. Condition at no time alarming. Pulse 78 three hours postpartum. Hemoglobin immediately after bleeding 60 per cent.; 1st day 42 per cent.; 11th day postpartum 42 per cent.

CASE XLVIII. 2100 C.c.—History 9265, due to partial separation of placenta. Twenty-nine-year-old para-iii. Pelvis normal, L. O. P. Slightly prolonged labor. Bleeding began ten minutes after the birth of the child and continued until the placenta was expressed from the vagina thirty minutes later. During this entire period the uterus remained firm and the loss of blood would not have been noticed had it not been collected and measured. No treatment required. Pulse of good quality 84, one hour later 104. Hemoglobin: 24 hours postpartum 40 per cent.; 4th day 42 per cent.

CASE XLIX. 2400 C.c. (Symptoms).—History 8941, due to retention of placental cotyledon. Thirty-two-year-old para-i. Pelvis normal, L. O. A., labor easy and rapid. Bleeding during and after the third stage necessitating introduction of the hand *in utero* and the removal of a retained cotyledon. Immediately thereafter the pulse was 100 and the blood pressure 70. One and a half hours later the pulse had risen to 115 where it remained for the next twenty-four hours. Hemoglobin immediately postpartum 50 per cent.; 2d day 38 per cent. and 10th day 60 per cent.

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