NORMAL LABOR

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FOREWORD

The author has, for 25 years, paid close daily attention to the detailed accuracy of labor records. Such critical analysis of each case history has been very time consuming, and would not have been possible in a large clinic unless conducted conjointly by several staff men with equal zeal. It is, however, something that can very readily be carried out in the average private practice. One does not, by this method, soon obtain a sufficiently large number of cases to be of statistical importance. Persistence will, after a time, allow one to reach certain conclusions in a critical analysis of his material. We now have some 16,000 records transferred to a private modification of the I.B.M. card (our cards are slightly smaller than the ordinary playing card) convenient for sorting. Our method, while much less expensive in money, is much too time consuming and is not to be recommended. Any one interested in this approach to clinical analyses should adopt the I.B.M. method. He will probably find it necessary, however, in the interests of accuracy, to punch his own cards. A superior clerk makes frequent errors. Even a superior obstetric resident does not have a sufficiently intense interest in what seems, to him, drab routine.

Through these years we have, as soon as sufficiently large numbers of cases became available, tried to analyze certain aspects of labor. This has met with varying success. Often, the number of cases has proven to be too small to be of statistical importance and reliability. That particular effort was then abandoned until a larger num-

ber of records were accumulated. Gradually we have been able to develop some clinical facts not previously known. Often these facts have been quite contrary to our own clinical impressions (and apparently the impressions of others). To find a truth, even though a minor one, under such circumstances is a very rewarding experience.

Such "clinical research," though obviously not as basic and perhaps not of as wide an application, is interesting and can, when new facts are demonstrated, be put to immediate practical use.

This little book, hardly more than an essay, is an attempt to put together in almost abstract form some of the conclusions reached in these studies. It is probably too personal. No attempt has been made to avoid whimsy. We have tried to make it readable. If you read it we are indebted to you.

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ETIOLOGY OF ONSET OF LABOR

None of the previous theories of the etiology of the onset of labor can any longer be considered applicable. The "optimum distention theory" of the uterus fails to account for the otherwise causeless early and late abortions and equally fails to explain the fact that many patients with marked hydramnios, or multiple pregnancy, sometimes go even beyond the expected date of confinement. On the basis of our present knowledge, it would seem that none of the other older theories even merits discussion.

The fact that rupture of the membranes usually results in labor, at whatever stage of pregnancy it may occur, would suggest that the change from an equalized pressure throughout the cavity of the uterus, including the lower uterine segment and cervix, to a more localized pressure in the lower part of the uterus, is in some sense provocative of uterine contractions. The very fact that labor does not always ensue under such circumstances would suggest that, perhaps, some factor other than localized pressure is also necessary.

The, as yet, rather scanty investigation of the estrin-progestin balance in the circulation suggests a fertile field of study. This is particularly true when one notes that death of the fetus in utero is almost always followed by labor within approximately one week. The rare occurrence of missed abortion and missed labor does not materially detract from the idea that the possible presence

of some endocrine function, inherent in the fetus and placenta, or both, is maintaining the status quo and thus preventing the onset of labor.

The further fact that careful clinical observation of patients in the last days, and even hours, before the beginning of labor often clearly demonstrates a softening of the cervix, even when no apparent increase in Braxton-Hicks contractions of the uterus can be demonstrated, suggests that there has been a change in the endocrine balance of the patient. (This point will be discussed more in detail later under the heading of cervical dystocia.)

The rather involved discussion, as to whether uterine contraction is purely a local reflex phenomenon, not in any way connected with the central nervous system, but, in part at least, controlled by adrenal secretion, or, there is present a more general neurogenic component, is very interesting. The graduated and progressive uterine contraction, beginning at the fundus and spreading to the lower uterine body and cervix, as demonstrated by S. M. R. Reynolds,[1] can quite certainly be accepted as the normal, as opposed to an irregular non-peristaltic contraction, or the very definite imbalance seen with contraction ring dystocia and the, less rare, hour glass contraction, observed in the third stage of labor.

We hear very glib talk about "pain threshold," and contention that the patient with the low pain threshold will feel uterine contractions (Braxton-Hicks?) earlier, and perhaps even sporadically, than will the patient with a higher pain threshold. The physiologists tell us that there is, at present, no satisfactory method of measuring pain threshold. Perhaps we are confusing ourselves by using this term.

One occasionally observes patients who seemingly have labor pains which produce some changes in the cervix, although perhaps only minimal, then spontaneously cease having these contractions for a variable period of time; have them resumed for perhaps a short period with some further change in the cervix, and finally after several such episodes, have continuing contractions which eventually result in dilation of the cervix and delivery of the baby.

All of this suggests that there is some sort of trigger mechanism bringing about the onset of labor. One phase of this must be neurogenic. Another phase must be endocrine (estrin-progestin balance?). It is not apparent whether the adrenal plays a part in the onset of labor, although quite probaby it is a factor in the progress of labor once contractions are initiated.

The recent work of Caldayro[2] shows clearly how labor begins, but does not add to our knowledge of etiology.

The actomyocin accumulation to the point of initiating contractions, while satisfactory as an initiating influence, must have considerable variation to explain all the clinical phenomena. What causes the formation of actomyocin?

ONSET OF LABOR

THERE is a considerable difference of opinion as to when labor begins. While this is quite obvious in theory, it is even more marked when applied to the individual patient. On the one extreme are those who say that a patient is not in labor until progressive effacement and dilation of the cervix can be demonstrated by careful examination. While we would not seriously disagree with this attitude, we cannot find ourselves in complete accord with this definition of the onset of labor. (1) We feel that our methods of examination are too crude to demonstrate minor changes in the cervix in some cases until many hours have elapsed. (2) We do not believe we can justifiably say that a patient whose cervix gradually dilates by entirely painless contractions can be said to be in labor.

On the other extreme are those who, by uterine stimulation of one sort or another, are able to produce somewhat painful, irregular contractions of the uterus so long as the stimulation is continued, and who, after several such attempts to induce labor over a period of perhaps several days, diagnose uterine inertia and proceed to Cesarean Section. With this definition and method of management, we would like to express serious conflict.

We have tried to adopt for our own guidance a middle ground, and have said that our patients were in labor when they had painful uterine contractions, whether or not changes in the cervix could be demonstrated by ordinary methods of examination. The only exceptions to this definition are those individuals whose pains cease *without*

medication and are resumed only after several hours or perhaps several days. In this event, we date the onset of labor at the resumption of uterine contractions. We recognize that in an occasional patient such a definition does not satisfactorily fulfill the academic situation, but we do feel that, for practical purposes, it is the best definition at present available. It is admitted that some of these patients, in their first period of painful uterine contractions (which later cease), will have achieved a small amount of cervical dilation. Quite as commonly, we also observe certain individuals who attain a similar, or even greater, amount of cervical dilation without benefit of painful contractions. As stated above, there are bound to be certain exceptions not completely fitting into any definitive concept.

In doubtful labor, without cervical dilation, and particularly without cervical effacement, we make frequent use of one-sixth grain doses of morphine, with or without atropine, as a clinical test of whether or not the patient is in labor; because we believe it is good therapeutics for false labor and is also a valuable diagnostic aid. With exceptions, such a dose of morphine will stop the painful contractions of false labor, and will not materially affect the progress of true labor in these early stages. It will, moreover, give the patient a considerable degree of comfort during this early part of labor, when little or no progress is being made. We have tried to carefully observe those patients given such medication, and, over a period of thirty years, have found no instance of harm resulting to the baby. We would recommend continued observation *by the physician*, because, if we understand correctly the antidotal value of Allylil Morphine, we are on safer ground now that it is available.

The correct dating of the onset of labor is, perhaps, not too important in the average normal case, but, as will be apparent later, it becomes very important in certain instances where an unusually firm cervix is present. This question, then, of the accurate dating of the onset of labor, is not just an academic discussion, but is occasionally one of very real practical importance.

FIRST STAGE OF LABOR

The first stage of labor, by definition, has to do with the effacement and dilation of the cervix. It is, in other words, the "cervical" stage of labor. It begins with the onset of labor and ends when the cervix is no longer a factor in the labor. This means that the cervix must be completely dilated and *completely retracted*. Complete retraction can be best determined by vaginal examination. As the cervix approaches full dilation, one cannot reach the anterior half of the rim by rectal approach, particularly if the presenting part is at its usual low station in the pelvis. The length of time elapsing after the cervix can no longer be felt by rectal touch until it is completely retracted is negligible in the average multipara and in the primipara whose labor pains are of good intensity. It may, however, in the primipara whose pains are of poor intensity be a matter of several hours before the cervix disappears.

That there is an essential difference between determining that the cervix is sufficiently dilated to allow the head to come through, and complete retraction of the cervix, is very apparent after careful close observation of only a few patients in labor. If one will examine such patients (thought to be fully dilated but the cervix still palpable) at the height of a uterine contraction, he will find the cervix clamped very tightly against the head, effectively preventing descent in the birth canal. As soon as the cervix is completely retracted (no longer in reach by vaginal examination), progress in descent is no longer impeded, and the patient has progressed into the second, or expul-

sive, stage of labor. Whereas this distinction may not be of too much importance so far as the first stage of labor is concerned, it is of great significance with respect to one's attitude toward the proper and usual duration of the second stage of labor, and, most particularly, with respect to one's attitude toward operative delivery.

The first stage of labor, then, is brought about by uterine contractions producing effacement, dilation, and retraction of the cervix. There are no other clinical components to be considered. The author[4] has shown that parity alone modifies the duration of labor. Age, stature of the patient, presentation, size of the baby, size of the pelvis, all have no bearing on the duration of the first stage, unless, perchance (and a very slight perchance at that) they have some bearing on cervical resistance or uterine force. In the individual case, one can without exception judge the progress of the labor, even predict its duration on the basis of (1) the cervix, and (2) the uterine contractions.

Obviously, if a patient enters labor with a completely uneffaced cervix, some work will be required to bring about this effacement. A thick walled cervix will be thinned out and dilated less readily than a cervix that is thin at the onset. Most important, however, is the consistency of the cervix. A simple measurement of cervical consistency has, over a long period of years, proved very helpful to us. We have labeled the cervix as of "1" consistency, when it seems to be very soft—almost mushy. The usual and normal consistency is that of the lip relaxed. This we have labeled "2." Definitely firmer, "3," is the cervix with a consistency of the ala of the nose. The very rare, and definitely pathological, cervix of cartilaginous firmness is called "4." All examinations, whether to de-

termine effacement, dilation, or consistency, must be made *at the height of a uterine contraction.* As a matter of fact, in very early labor, when the uterine contractions are often so weak as to not put the cervix on tension, one cannot always accurately determine cervical consistency, but must await the occurrence of better contractions later in the labor to clearly make out this point.

Of the three characteristics of uterine contractions—frequency, duration, and intensity—we find that frequency and intensity are important. Duration of the individual contraction does not determine its effectiveness in the *first stage* of labor, if considered apart from intensity. It is, of course, true that the longer the contraction, the more likely it is to be of good intensity. Weaker contractions are apt to be of quite short duration, but not necessarily so.

If one is interested in predicting the duration of the first stage of labor, he can readily do so by (A) seeing the patient at the onset of labor, in order to determine the character of the cervix. The amount of effacement, the amount of dilation, and the consistency of the cervix will give an estimate of the total amount of work to be done in the first stage. (B) It so happens, for what reason we do not know, that an estimation of the character of the labor pains, as to frequency and intensity, *at the beginning of dilation,* will determine the performance of the uterus for the whole of the first stage, excepting, of course, those rather rare cases of marked secondary inertia, developing late in labor—less than 1% of all patients. In making this estimation of the degree of goodness of the uterine contractions, one must observe the patient through a series of at least four or five uterine contractions; and select the longest interval and the weakest intensity of an individual contraction in

such a series, as the basis of his estimate. If the contractions are no more than three minutes apart, and the uterine wall, at a point not over the body of the baby, is only slightly depressed by moderate pressure of a single finger on the abdomen, they are said to be "good." (Such an intensity of uterine contractions might not necessarily be entirely satisfactory in the second stage of labor, but is definitely normal in the first stage of labor.) "Fair" pains are those with the intensity noted above, but with an interval of four minutes, or with an interval of three minutes or less and a lesser intensity (the uterine wall is readily depressed a definite amount with very moderate pressure from a single finger). "Poor" pains are those of satisfactory intensity, but an interval of five, six, or seven minutes, or pains of a weaker intensity at an interval of four minutes. If the interval between pains is eight minutes or more *at the beginning of dilation*, particularly if they are also of a very weak intensity, one cannot, at present, predict how long the labor will be. Such patients are not rare, but yet are of sufficiently infrequent occurrence and of such highly variable behavior, that they should be regarded as potentially pathological, and, therefore, not within the realm of this present volume ("Normal Labor").

On the basis of the two foregoing considerations, one might set up the following formula: good pains, effaced cervix, two centimeters dilation at onset of labor, "2" consistency=three hours for primiparas and two hours for multiparas. Fair pains, effaced cervix, two centimeters dilation, "2" consistency=add three hours for primiparas, two hours for multiparas. Poor pains, add *another* six hours for primiparas, two hours for multiparas. With uneffaced cervix, add three hours for primiparas, two

hours for multiparas. For firm ("3") cervix, add three hours for primiparas, two hours for multiparas. One cannot completely neglect station at the onset of labor in computing this formula, as, on the average, a high station will add approximately one hour for primiparas, and a little less for multiparas. Whether this is the result of minor differences in the cervix, not discernible by this rather crude method of examination, or similar minor differences in the uterine contractions, is not apparrent.

On the basis of this formula, the first stage in primiparas will be seen to vary from three to 19 hours, and for multiparas from two to 13 hours. Quite obviously, the formula does not apply, as above stated, to those primiparas whose first stage is less than two hours. In all such individuals, if seen at the onset of labor, there will be found a cervix of "1" consistency, a cervix of more than two centimeters dilation, or, very rarely, the labor pains will be of good intensity and less than a three minute interval.

Similarly, the formula does not cover examples of prolonged labor, all of which can be explained by a pathologically firm cervix, an interval of eight minutes or more *at the beginning of dilation,* labor pains of such weak intensity that one will question whether the patient is actually in labor (she probably is not), or, the relatively uncommon true secondary inertia.

Whereas, the majority of labors start rather slowly and tend to exhibit limited progress for a time, and then, by virtue of more frequent and more intense labor pains, exhibit a gradually increased rate of progress, there are a number of variants to disturb this pattern. Some labors, usually with very favorable conditions of both cervix and uterine contractions, progress rapidly from the beginning. Others, usually with unfavorable conditions of both cervix

and uterine contractions, continue to progress slowly for the whole of the first stage, and show rapid progress, perhaps, in the second stage. Herman Johnson[5] has pointed out that progress in the first stage of labor often takes place in waves. With this we can agree, at least in part, but believe that it is largely due to minor variations in the uterine contractions, and we feel quite certain that such apparent variations do not affect the over-all duration of the first stage. (If we have, for example, predicted at eight o'clock in the morning that a patient will be dilated at five P.M., and the process apparently has slowed around one or two P.M., we still find that dilation is complete at five P.M., as predicted.)

It should further be stated, at this point, that the amount of analgesic, and later, anesthetic, might materially modify these figures, which are based upon the administration of no analgesic for the very early mild pains of labor, except one-sixth grain of morphine, mentioned in connection with possible false labor. It has been our practice to administer an analgesic, or preferably an anesthetic, in the form of nitrous oxide and oxygen, with the labor pains, as soon as the pains become at all hard, regardless of the amount of dilation present at the time. (Our anesthetics are administered by the resident on the service and do not, therefore, constitute an economic problem, such as is involved in the average private hospital.) The problem of obstetric analgesia and anesthesia is still a large one, and the necessity for more or less of these agents is governed, in considerable part, by the rapport between patient and physician. As pointed out by Silas Starr,[6] the incidence of prolonged labor, and the necessity for larger amounts of analgesia, is three times greater in clinical patients than in private patients, where ample prenatal care has been

given, and the confidence of the patient in her physician has been established. The "protected" girl will require far more pain relief than the athlete. The birth of the unwanted baby is far more painful than that of the baby intensely desired. We are, therefore, not at all in accord with a routine manner of administering analgesics and anesthetics, but believe that the best results can only be obtained by continued close observation of the patient throughout her labor *by the physician.* To be present on the hospital floor when the patient walks in is worth much more in the way of pain relief than a considerable amount of drugs. When it is no longer possible to practice Obstetrics in this fashion, we will turn to something else.

We have heard a lot recently about psychosomatic medicine. A modified Grantly Dick Reid technic has been extensively tried at Yale University.[7] It remains to be seen whether such a technic will ever gain wide acceptance. It now seems doubtful that such will be the case. The fact remains that in obstetrics more than in any other branch of medicine, except perhaps psychiatry, there is an opportunity to do a great deal by suggestion and example. The author is not a crusader but is trying to consider the problem with cold logic and common sense. Pain relief *must* be given, but should not be administered when unnecessary, and never in overdoses. To send a patient to the hospital and have a large dose of analgesic administered by the nurse, without examination by the doctor, is not good obstetric practice. To routinely administer a dose of medication without consideration of the needs of the individual patient is not good practice. To administer moderate or large doses of medication without observing the effect on both mother and baby is bad practice. To fail to give necessary relief is also not good practice. To

fail to give necessary relief because of the expense involved cannot be condoned.

In recent years, we have been quite well impressed with the results of saddle block anesthesia, particularly for primiparas, and most particularly for primiparas with premature labor. We believe it possible to administer this type of anesthetic, with a small gauge needle, in the upright position for a minimum of four minutes after injection, with complete safety to mother and baby, with only a moderate decrease in the effectiveness of the uterine contractions, with little or no increase in the incidence of operative delivery, and with an incidence of less than 5% of post-spinal headache. In the situations where an anesthetist is not immediately available, this seems to us a very considerable improvement over other anesthetic procedures. Whereas saddle block is ordinarily considered an anesthetic for delivery—in other words, for the second stage—we normally administer it in our primiparas at 6 to 7 centimeters dilation, and in our multiparas at 4 to 5 centimeters dilation, unless progress in all its factors is too slow. It is, therefore, with us a very helpful first stage analgesic and anesthetic as well.

If lesser degrees of analgesia and anesthesia are used, the above formula will not apply in all cases, because we are convinced that the amounts used by us do lengthen the labors slightly. (In some instances, this increase is a very definite one.) If larger amounts are used (two of our visiting men do use larger amounts), a definite lengthening of the labors will ensue. Franklin Snyder,[8] in his very excellent book, has pointed out that all analgesics and all anesthetics are poison to the baby. The Yale group has amply demonstrated[9] that labors are shorter and easier under the "natural childbirth" method of management.

It seems, at present, inconceivable that we shall ever go to the extreme of no pain relief. It is equally inconceivable (?) to the author that we shall long continue with excessive medication. There would seem to be a middle ground of more or less safe pain relief, which is justifiable and, therefore, to be recommended.

If it is true that the first stage of labor is merely a matter of balancing the propulsive forces of uterine contractions against the total resistance offered by the cervix, and that the first stage of labor is entirely governed thereby, except as modified by analgesia and anesthesia (and we sincerely believe this to be true), why should we longer be influenced by superstitions and pseudo-scientific inheritances of past generations. Why not observe the problem as no problem at all, except as there is present a pathologically resistant cervix, such weak uterine contractions as to be almost pathological, or an added consideration in the form of premature rupture of the membranes, contraction of the pelvis, or a major complication of pregnancy. As a matter of fact, premature rupture of the membranes tends to produce a shorter labor. Contraction of the pelvis has been observed by us as a definite factor in prolonging the first stage of labor on only one occasion (it is a second stage problem primarily); and the rather frequent occurrence of prolonged labor in toxemia of pregnancy is, in our opinion, entirely due to the occurrence of poor labor pains (partly due to mild degrees of premature separation?) plus the effects of sedation, rather than to the toxemia itself. The more times we study this problem (and we have studied it repeatedly), the more we are convinced that the first stage of labor is simply a matter of balancing the uterine contractions (the frequency and intensity) against the resistance offered by the cervix.

THE SOFT CERVIX

A cervix, slightly to markedly softer than the usual normal, is observed frequently in multiparas and less commonly in primiparas. It is to be regarded as within the range of normal, and does not, in our experience, ever result in damage to either mother or baby, except that, if unrecognized, precipitate (unattended?) delivery may ensue. Such a cervix can almost always be recognized by rectal examination in the office in the last weeks of pregnancy.

It has been our feeling that such a cervix is more commonly associated with good (intensity and frequency) labor pains than is true of the normal or firm cervix. (Of this, we cannot be sure.) When labor actually begins, progress will be found to be more rapid, and the first stage will be shorter than that noted in the formula above.

PARTIALLY DILATED CERVIX

The strictly normal cervix probably has about 2 centimeters dilation at the onset of labor, if the patient be examined at the height of a uterine contraction. Slightly, or markedly greater, degrees of dilation, however, are not rare. Again, if the patient be carefully examined in the office in the last weeks of pregnancy, it is frequently possible to obviate delivery on the street, or en route to the hospital, by noting this situation and taking proper measures to safeguard against this accident. This is particularly important to the patient who lives at a distance from the hospital, and constitutes a good indication for the elective induction of labor by artificial rupture of the membranes, if the presenting part is at a sufficiently low station; that is, at or below the spines of the ischium. It should also be noted that the patient with four or five or

more centimeters dilation (she will also frequently have a softer than normal cervix) will not fit into the formula noted above, and frequently has a first stage of definitely less than one hour duration.

THE FIRM CERVIX

Whereas, lack of effacement or unusually thick walls of the cervix do offer somewhat more resistance to dilation, this is measurable in a few hours at the most. Firmness of the cervix, however, is a much more potent resistant. Alone and by itself, particularly in the presence of good pains, it is a quantity measurable in three hours for primiparas, and two hours for multiparas. If it is, however, associated with poor pains or very poor pains, it can become a definitely pathological situation of potential pathological importance to mother, baby, or both. True cervical dystocia is not within the province of this volume. It is important, however, to discuss the variants more or less within normal limits. The *usual* "3" cervix, described above, prolongs the first stage by three hours in primiparas and two hours in multiparas, when the pains are good. The prolongation may be of like amount or, perhaps, greater if the pains are fair. Not infrequently, in the presence of poor pains, the prolongation will be seen to be as much as six or eight hours. Poor pains, it will be recalled, are of fair intensity and six or seven minutes apart at the beginning of dilation, or of weak intensity and five minutes apart. Less frequent and/or weaker pains in combination with such a cervix may constitute a real abnormality.

When it is recalled that the above described method of determining cervical consistency is, at best, a very crude measurement, it is important to remember that it must

always be judged "at the height of a uterine contraction," indeed, at the height of a fairly good uterine contraction, which actually puts the cervix on definite tension. Moreover, experience clearly demonstrates that occasionally, in a small percentage of the patients, certain of these cervices are really not just "3" cervices but actually "3 plus." Such a cervix may, to all intents and purposes, behave like the truly pathological "4" cervix, and thus present a truly pathological situation. A very large proportion of the truly prolonged labors are to be explained on this basis. Such a cervix, in the presence of weak labor pains (eight or more minutes apart at the beginning of dilation), constitutes a truly pathological situation—to be discussed elsewhere.

ETIOLOGY OF THE FIRM CERVIX

We still, after 25 years of thought and study, do not know why some women enter labor with a firmer cervix than their sisters. A few facts are apparent. It is obviously not a structural, or anatomical, matter; since it is seldom observed in successive pregnancies. While more common in primigravid women, it is fairly common to see it in a multipara who has not had it in her previous labors. It is more common in premature labors than in those at full term, and least common in post-mature labors. The fact that it seems to be more common in those individuals entering labor with a high station does not necessarily establish a cause and effect relationship. It seems highly probable that the basic causes are of an endocrine nature, but whether ovarian, adrenal, or other glands are the more important, remains to be determined.

SECOND STAGE OF LABOR

The second stage of labor, by definition, has to do with the expulsion of the baby through the lower birth canal. If we accept the end of the first stage as the time when the cervix is completely retracted over the presenting part, the cervix can play no part in the second stage, except as it may impede the delivery of the aftercoming head in a breech presentation, or those relatively rare instances of anacephalus, where the shoulder girdle is larger than the head, or giant babies, where the same thing may be true. (Even in the usual cephalic presentations, there may be one or two pains necessary to retract the cervix over the baby's shoulders.)

It should be repeated that complete retraction of the cervix can only be accurately determined by vaginal examination, and that this examination should be made at the height of a uterine contraction. Partial retraction is not to be accepted, but only complete retraction is, in our experience, definite evidence that the patient is no longer in the cervical stage of labor. (We find that the necessary number of vaginal examinations to determine this point, if done with careful technic, is not sufficient to materially affect maternal morbidity.)

Since adopting this method of procedure, we have been very agreeably surprised at (1) the infrequency of prolonged second stage; (2) the very great ease with which almost all the patients deliver themselves. (3) Although we have assumed a much more liberal attitude toward the

use of forceps, we find the incidence of this type of delivery has decreased by more than 50% in our clinic.

THE PASSAGE

The *passage*, *passenger*, and *powers* are all involved in the second stage of labor. Abnormalities of the bony passage do not come within the scope of this discussion. The vagina is very readily distensible in the latter part of pregnancy, and even in the presence of what seems to be a congenitally small bore has not, in our experience, ever offered any material resistance to the passage of the baby. The pelvic floor sling and the vulva do not in our experience, offer any considerable obstruction. With the relatively frequent use of the episiotomy in modern obstetric practice and, in the absence of abnormal presentation, the obstetric passage offers little resistance.

THE PASSENGER

The larger the baby, the slower will be its delivery. Whereas, a multipara will ordinarily deliver a large baby (excepting, of course, the second baby after a previous episiotomy) with the greatest of ease, a definite difference will be noted between the small and the large baby in a primigravida. It is well that the very large baby in a primigravida should not be delivered too rapidly, as this can only result in unnecessary trauma to the mother, and a possible, although admittedly quite unusual, damage to the baby. It is unfortunate that we cannot tell more accurately the size of a given baby before it is born. If, however, we will suspect a large passenger when there is apparently slow progress under given conditions of uterine contractions, presentation, and internal rotation, we will have approached better practice under these circum-

stances. It is not to be assumed from the foregoing that large size of passenger alone will offer any considerable slowing of the labor in the second stage. Only when this large size is present in combination with absence of rotation, mal-presentation, and particularly with weakness of uterine contractions and lack of voluntary effort, does it constitute much of a deterrent.

FLEXION

Closely associated with the question of infant size in the minds of some is the degree of flexion of the head as it enters the pelvis. In our experience, the presenting point is usually about half way between the anterior and the posterior fontanelle, although there is considerable variation. One may observe the presenting point to be very close to the posterior fontanelle when the passenger is very large, and similarly in the case of a small baby it may be quite close to the anterior fontanelle. These are normal situations. Only when the presenting point is actually in the anterior fontanelle or anterior thereto are we dealing with an abnormal situation. This location of the presenting point is often preserved until the head reaches the pelvic floor, although flexion usually takes place as the cervix is being retracted over the head. Failure of flexion when the cervix is thought to be completely retracted is further reason for making sure that this retraction has taken place. Whether flexion precedes internal rotation, is coincident with it, or occurs after internal rotation is probably not of clinical importance. In general, it would seem that it precedes internal rotation, or is at least coincident with it.

INTERNAL ROTATION

Internal rotation[10] is a phenomenon the *importance or necessity* of which is not well established. "Rotation in

the cervix" (i.e., before the cervix is completely retracted) is occasionally observed and should be regarded as evidence of more than usually favorable circumstances. In not quite two-thirds of all patients (roughly 75% of multiparas and 60% of primiparas) internal rotation takes place during descent to the pelvic floor, or is at least completed by the time the head reaches the pelvic floor. How this is effected is not certain. That it may well be a matter of easier accommodation is probable. Similarly, its failure to occur may well be the result of the lack of necessity of its occurrence. In the vast majority of the remaining patients, rotation occurs during distension of the pelvic floor, and even as late as crowning of the head. This delayed internal rotation is more frequent in the presence of weak uterine contractions and lack of voluntary effort, and may well be explained on the basis of lack of sufficient propulsive force. The fact that the second stage is somewhat longer in this group of patients than in those where rotation has been completed by the time the head reaches the pelvic floor is not, in our mind, conclusive evidence that this late rotation is abnormal. If it be an abnormality, we prefer to think of it as an abnormality of the forces rather than one of the passage or the passenger.

Rotation to the posterior, incomplete rotation, and complete lack of rotation are, in our experience, very comparable to delayed rotation. The second stage in these patients, in our clinic, is actually shorter than in those who have delayed internal rotation. We cannot, at the moment, escape the conclusion that the head fails to rotate either partially or completely, or rotates in the "wrong" direction, due to the fact that this represents the easiest way for it to get out of the pelvis. Further reference to this point will be made in connection with the discussion

of forceps delivery. Suffice it to say for the moment, that we look upon any of these so-called abnormalities of internal rotation with perfect equanimity.

DESCENT

In approximately 60% of all patients (somewhat more in multiparas), the presenting point will be on the pelvic floor at the time the cervix is completely retracted. In the remaining 40%, descent to the pelvic floor occurs quite promptly in the majority of instances,—often without the incidence of any further uterine contractions.

It is interesting to speculate why the head should be on the pelvic floor at the time of complete retraction of the cervix in the majority of instances, and not in the remainder of the patients. This problem has been studied[14] without completely satisfactory conclusions. That it is the result of differences in vaginal wall resistance seems, at the moment, completely untenable. That the paravaginal fascia may be a factor sounds more reasonable. It does not seem that infant size, flexion, or lack thereof, or occiput posterior position are of any considerable importance.

The fact that descent to the pelvic floor is brought about by a maximum of ten uterine contractions in both primiparas and multiparas in almost all cases is significant. This would signify that in the absence of abnormal presentation or other pathology, such as hydrocephalus, failure of descent is almost unknown. It would further indicate that in the absence of prompt descent or progression thereof, definite abnormalities should be suspected and searched for. It is a definite rule in our clinic that failure of complete descent after a maximum of seven uterine contractions, following complete retraction of the cervix, calls for a careful vaginal examination. Almost always, it

is found that an error was made and that the cervix was not actually completely retracted.

One must, of course, recognize the relatively rare occurrence of such poor uterine contractions as to constitute almost a cessation of labor. Tensing of the abdominal musculature during a uterine contraction can easily lead one astray in estimating the intensity of the uterine contraction, which, during the second stage of labor, can only be accurately determined in the interval between voluntary efforts. (*One must credit the patient with having a uterine contraction by his own palpation, not by her statement that a contraction is in progress.*)

It is also quite obvious that those patients who complete their dilation with an intermediate or high station have a second stage potentially quite different from the majority where the presenting point is on the pelvic floor at the time the cervix is completely retracted. It is, therefore, convenient to think of the second stage as having a (possible) descent phase and a pelvic floor phase. Nevertheless, in experience, the pelvic floor phase of those who have had a descent phase is actually a little shorter than is the pelvic floor phase (the whole of the second stage) of those where the presenting point was on the pelvic floor at the time of complete retraction of the cervix.

PELVIC FLOOR PHASE

The passage of a baby (cephalic presentation) over the pelvic floor and through the vulva can be likened to the passage of a bolus of feces through the anus. The propulsive forces of the uterus, aided by voluntary effort, can be likened to the propulsive forces of the rectum aided, when necessary, by voluntary effort. The size of the baby (actual size, presentation, flexion, and internal rotation)

may serve as a deterrent or even actually impede the process if two or more adverse factors are present. The modern frequent use of episiotomy offers an advantage not readily available in the passage of feces.

The delivery of a baby is seen not infrequently in multiparas without benefit of a single uterine contraction and apparently without much voluntary effort. The average number of contractions for a multiparous delivery is, perhaps, not important, but will be found to be in the vicinity of three or four contractions. Very seldom will there be more than 10 contractions in the pelvic floor phase. Since no two observers will agree exactly as to when the head is actually "on" the pelvic floor, there will naturally be a variation of one or two contractions in this regard. It is the author's feeling that the head is not on the pelvic floor if it merely touches the floor at the height of a uterine contraction, but rather that it should be said to be on the floor when it remains there between contractions.

The majority of primiparas will complete their pelvic floor phase in 10 contractions or less, but only if the pains are relatively good, and/or some voluntary effort is exercised. If the pains are quite poor and little or no voluntary effort is exercised, the number of pains necessary to complete the delivery will rise to the range of 13 to 17, but will rarely exceed 20, unless there be considerable in the way of deterrent factors relative to the passenger. Late rotation or failure of rotation, plus a large baby, when combined with very weak labor pains and no voluntary effort may combine to produce a prolonged second stage.

We regard anything over one hour on the pelvic floor as being prolonged. We do not feel that such a prolongation is necessarily dangerous to either the mother or the baby, but we do feel that each such case should be thor-

oughly analyzed by careful examination, in order that proper management should be selected. Failure to recognize weak contractions in the second stage may well lead to an excessive blood loss in the third stage—a point to be discussed more fully when considering the third stage of labor. Failure to recognize an oversized baby or lack of internal rotation may produce serious injury, particularly if operative delivery is decided upon.

Effectiveness of uterine contractions in the second stage of labor is based upon their frequency, duration, and intensity. The duration becomes important as the longer contractions afford opportunity for the exercise of more than one voluntary effort per contraction. While pains at two-minute intervals are usually more effective than those at four-minute intervals, such a correlation cannot be accepted without careful examination of the patient. One will frequently observe frequent contractions to be of very poor intensity. This is especially true of contractions occurring at intervals of one minute to one and one-half minutes. On the other hand, contractions of five- to seven-minute intervals will often be of good intensity. For these reasons, we have, for the past several years, felt that the duration of the second stage of labor should be measured not in minutes but rather that it should be measured by number of uterine contractions.[12] Given two patients with contractions of equal intensity, the second stage of one, in whom the interval is five minutes, might be considered to be prolonged when one hour had gone by; and the other, with an interval of two minutes, would be considered to have had a very satisfactory (short?) second stage, if she completed it in 24 minutes. Actually, each of these patients has had 12 contractions, and to all intents and purposes, from a physiologic point of view, is like the other.

We would not leave the impression that number of pains alone is a good measure of the second stage, but would, on the contrary, emphasize that intensity of the individual contraction is of considerable importance. Palpation of uterine tension must be done with care, since tensing of the abdominal wall musculature can easily confuse one and leave the impression that the uterus is in contraction when it actually is not. It is even more difficult to detect the difference between a weak and a strong contraction if the patient is exerting continued voluntary effort. Interruption of the voluntary effort is, therefore, necessary when one is judging the intensity of a uterine contraction. As stated elsewhere, 10 contractions of good intensity will suffice in all cases to complete the descent to the pelvic floor where dilation is complete at a high or median station. Ten contractions of good intensity will suffice to complete the pelvic floor phase in almost all primiparas and in all multiparas. As a matter of fact, 10 contractions of fair intensity will accomplish the delivery unless there is a complete lack of voluntary effort. If the contractions are quite weak, the necessary number may rise to 20 or even more in the primipara. It is, therefore, important to determine intensity of contractions carefully, not entirely with respect to completion of the second stage, but rather to be prepared for the proper management of the third stage, which is to follow, as there is a very high degree of correlation between second stage contractions and blood loss in the third stage.[13]

It has long been known that voluntary effort on the part of the patient is a big factor in determining the rate of progress in the second stage and the successful delivery of the child, particularly when that child happens to be large or internal rotation delayed or absent. Quite obviously,

good uterine contractions need not, and probably should not, be supplemented with very much in the way of voluntary effort. In certain abnormal conditions in the mother, notably mitral stenosis and, perhaps less importantly, severe toxemia of pregnancy, it is unwise to allow the patient to exert much if any voluntary effort. Under perfectly normal circumstances, however, a certain amount of voluntary effort is highly desirable, providing it is not overdone. We would strongly advise moderation in this respect, and we would also advise careful timing, as it does not seem to us that the exertion of voluntary effort, even though it comes spontaneously, before complete retraction of the cervix is either helpful or desirable. Since there is no method of measuring either the degree or the effectiveness of voluntary effort, one cannot make too definite statements with respect to this adjuvant to the uterine contraction. The rather widespread employment of caudal anesthesia in some clinics, with its complete abolishment of voluntary effort, and the almost 100% operative deliveries resulting, has perhaps taught us as much about voluntary effort as any experience, measurement, or study heretofore. Having observed the strong tendency to employ voluntary effort by certain groups of patients, we regard it as physiological and probably desirable if not overdone.

There is a natural tendency on the part of all of us to look toward the culmination of the delivery of the baby as the end of the story. This is particularly true if there has been any change in the fetal heart rate or rhythm which might indicate fetal distress. So much is this so that a number of the leading men have concluded that more or less routine forceps delivery is justified. They distinguish between "indicated" and elective, prophylactic, outlet, or even "convenience" forceps. Aldridge believes that

once one has developed sufficient skill, he can deliver the mother with less trauma with forceps than would occur with spontaneous delivery. With this we cannot agree. If there were nothing more than the interposition of the forceps blades between the advancing head and the birth canal, a larger object is presented to that birth canal. Furthermore, very few, if any, of us can emulate nature with 100% success. We are strongly in favor of "indicated" forceps, but cannot agree with routine or nearly routine forceps. Let me hasten to add that I am, personally, a very poor waiter, and use forceps with lesser "indications" than almost anyone in my group. The main point I would like to make here is that something over 90% of all forceps deliveries are associated with, perhaps a direct result of, poor uterine contractions, a situation which may well lead to large blood loss in the third stage. To assist moderate uterine contractions with a large baby and a resistant perineum with gentle traction on forceps is, we think, good obstetrics. On the other hand, to employ forceps with no disproportion and only because the uterine contractions are very poor, may well result in a very large third stage blood loss. In our management of the second stage of labor, no matter by what method, we must consistently keep in mind that there is a third stage to follow, and that unless we prepare for it during the second stage, we may well be unable to successfully manage the third stage when confronted with that necessity.

FORCEPS DELIVERY

"Indicated forceps" does not come within the scope of a discussion of perfectly normal labor, as all true indications, with one exception, come within the scope of pathological labor. The one exception is very poor labor pains

and complete, or almost complete, lack of voluntary effort by the patient. This situation is uncommon, except where the patient has been very heavily sedated or almost completely anesthetized. Complete anesthesia and amnesia are not consonant with spontaneous delivery. We are told by Arthur Bill, Albert Aldridge[14] and others, that we can achieve complete anesthesia and amnesia and do a routine forceps delivery with less trauma to the mother and baby than would result from spontaneous delivery. We are further told that Arthur Bill handles the obstetric forceps with the same delicate technic that Fritz Kreisler handles the violin bow. Beyond question, such a technic will be less traumatizing than will that of most of us who will never attain this delicacy of maneuver. After 30 years of experience, the author finds some of his babies show a minor nerve injury and some of his mothers have rather extensive vaginal wall trauma. In my hands, routine forceps delivery would be very bad judgment. I still shudder when watching a young house officer or general practitioner attempt forceps delivery. These house officers must be trained to use forceps in order to know how to most skillfully employ them when they are definitely indicated. In a teaching clinic, therefore, both indications and contraindications must be carefully taught, and "indications" must be rather liberal.

The admonition of Williams, DeLee, Litzenberg, and others, that the cervix must always be checked and found completely dilated should be changed to read "completely dilated" and "completely retracted." If one will do this in the patient who has not been over-sedated, he will rarely have time to put on the forceps, as the normal primipara in our clinic delivers in approximately 20 minutes, or less, and the *average* for multiparas is approximately 10 minutes.

The very fact that the authors of the various obstetric textbooks have recently recommended that we should classify as low forceps only those cases where the head is on the perineum and *completely rotated;* that even though the head is on the perineum, the forceps should be called low-mid forceps before rotation has taken place, is rather significant. High forceps were long ago abandoned because of the great danger to mother and baby. Edward Dennen,[15] Louis Douglass,[16] and others have recently cautioned against the use of high-mid forceps. Douglass has further suggested the use of "trial" forceps and advocated when such trial proves difficult the procedure should be abandoned. The author has long taught that easy forceps deliveries are probably unnecessary forceps deliveries and that difficult forceps deliveries are contraindicated. One cannot help but wonder whether high-mid forceps should not be relegated to the same ash can as high forceps.

In addition to the very great care in applying forceps exactly to the sides of the baby's head, should we not also make certain that not too much traction will be made by insisting that such traction be made with one finger only?

I should like also to strongly urge that when called upon to deliver an occiput posterior with forceps, one deliver it as an occiput posterior without any attempt at internal rotation. Some few of these heads will rotate as traction is made. To this, there is no objection. If, however, such a tendency is not noted, I am convinced that less trauma to both mother and baby will result if the head is delivered as is.

One very great disadvantage with forceps delivery is generally overlooked. Everyone recognizes that the employment of forceps increases the amount of anesthesia and therefore adds to the blood loss in the third stage of

labor. What is not recognized is that the forceps delivery is done before the uterus is ready to function well in the third stage. Immediately after the retraction of the cervix, there is often a considerable lull in uterine activity. As the second stage progresses, the uterine contractions increase in intensity and by the time the baby is born are often quite forceful. The author has shown[13] that the blood loss in the third stage of labor is proportional to uterine activity in the second stage of labor. If, however, the second stage is terminated before this increased uterine activity has developed, one can expect a considerably greater blood loss in the third stage.

EPISIOTOMY

Whether the episiotomy should be routine in all primiparas and should be done with considerable frequency in second deliveries, as is believed proper by so many today, needs to be discussed here. Dr. Harold Gainey[17] has satisfied himself that the patient between pregnancies is well served by this procedure. With this we would agree, if the episiotomy is not too long delayed and the perineum not over-stretched before it is performed. That absolutely all primiparas have occult, if not obvious, damage without an episiotomy is hard to accept. That the vast majority will receive damage from laceration (or perhaps overstretching) is well accepted. That the episiotomy is easier to repair than a ragged laceration goes without saying. One point frequently overlooked is that blood loss is greater from episiotomy than from laceration by about two to one on the average.[18]

That there are certain definite indications for the episiotomy is well accepted. It should be performed with all operative deliveries on primiparas and some multiparas.

Breech delivery is much facilitated by an episiotomy, and particularly in the case of the premature baby it should be done so that if the after-coming head is at all impeded by a resistant cervix, that cervix can more readily be incised. That we should always do an episiotomy with premature (cephalic) babies is perhaps open to question. Certainly, it should be done if the perineum seems at all tight. To do an episiotomy to shorten the second stage for either fetal or maternal reasons is an unnecessary procedure, unless the patient is so heavily sedated that the presenting part will remain a long time on the perineum.

Elective episiotomy, as mentioned above, has certain advantages and certain disadvantages. It seems to be gaining in popularity. One disadvantage frequently overlooked by the doctor is post-delivery pain. True infection with purulent drainage is relatively uncommon. The author has never had one of these perineums break down to the extent that secondary repair became necessary. Post-delivery pain, however, is a definite problem. Most often, it is apparently due to edema, but occasionally to definite infection. The recent recommendations of the Margaret Hague Hospital and others that the wound be infiltrated with Efocaine no doubt has merit. The author has been, for many years, using hot sitz baths effectively. Only recently, however, have we learned to start these sitz baths on the first day after delivery with definitely better results. Whether or not the head cradle is of definite value in relieving this discomfort seems to me, after many years of use, questionable. A special wet dressing applied to the perineum has been very helpful. This is made up of equal parts of 70% alcohol, glycerin, saturated solution of magnesium sulfate, and witch hazel. The latter ingredient is probably the most important because of its anesthetic

properties. Nurses trained in our hospital, and having their babies elsewhere, send back to our pharmacy for this prescription. One might well ask the question whether the episiotomy in a patient who would not be deeply lacerated otherwise, is justified in the face of what seems to the patient a considerable amount of pain resulting from that episiotomy.

THIRD STAGE OF LABOR

The third stage of labor *is still* the most dangerous stage. Whereas, maternal mortality due to infection and the toxemias has been very markedly reduced, that due to hemorrhage still remains too high. A part of the blood loss is definitely due to errors in the management of the second and latter part of the first stage of labor, but more accurate ideas of the physiology and, therefore, the management of the third stage is a definite necessity. Whereas, alternate contraction and relaxation of the uterus is vitally important in the first stage of labor and definitely necessary in the second stage of labor, any relaxation of the uterus in the third stage of labor is definitely fraught with possible ill result. Constant attention to continued uterine contraction means controlled blood loss. This is not to say that the uterus must remain continuously in a firm state of contraction, but rather that definite relaxation is to be strictly avoided. It is well known that good uterine activity toward the end of the first stage of labor does not assure the same kind of activity in the second stage. Frequent strong contractions may be very abruptly followed by weak and infrequent ones as soon as the cervix is completely retracted. A long drawn out first stage with consistently weak contractions may be followed by a precipitous second stage. Whereas, the author was able to point out[13] that there was some correlation between the type of uterine activity in the second stage and its activity in the third stage and, therefore, in the blood loss observed in the third stage, this correlation must not be relied on too implicitly.

Another obvious fact frequently overlooked is that whereas the first stage covers a matter of hours, and the second stage a matter of minutes up to as much as an hour, the third stage seldom exceeds a few minutes. Huge blood loss may occur in less than two minutes. The greatest degree of alertness is, therefore, necessary until the behavior of the uterus in the third stage is definitely known.

This uterine behavior can only be learned safely by continued palpation of the uterus.[19] This palpation should begin as the baby is being delivered. The placenta occasionally separates from the uterine wall during the delivery of the baby, and very frequently within a matter of ten to fifteen seconds thereafter. Just as one can visually see this prompt separation in Cesarean Section, one can palpate it in vaginal delivery. Immediately after the delivery of the baby, the uterus has a discoid shape,[19] is very much flattened from before backward, and has a rather sharp superior margin. Within seconds (up to two or three minutes) in the majority of patients, there is a change in shape to a more globular one. This change in shape, in our experience, reliably indicates, particularly if the uterus in contracted, that the placenta has, at least partially, separated from its attachment to the uterine wall. Whereas, a separated placenta lying within the uterus and lower uterine segment, particularly if it is partially extruded through the cervix, is very conducive to bleeding within the uterus and should, therefore, be expressed as soon as feasible, the greatest single error in the management of the third stage is to try to express this placenta before the uterus is brought into a sufficiently strong state of contraction. One must, therefore, at this point either have the benefit of the activity of a strong

Figure I. The uterus immediately after delivery is discoid in shape—thin from before backward—with a rather sharp superior margin.

oxy-toxic drug or obtain this strong uterine contraction by uterine massage. Moderate massage of the uterus may be entirely inadequate. Very vigorous massage may be necessary. Adequate massage at this point is worth a great deal more than a considerably greater degree of effort later.

A vigorous effort at expressing the placenta from the uterus (Crede Expression) should probably no longer be employed. In no instance should the uterus be pushed down into the true pelvis. To get the uterus low in the pelvis is to get it out of control, to produce rather than to control blood loss, and to bring about a generally unsatisfactory result. Rather, we should definitely try to keep the uterus high in the abdomen. Whether one uses a two-

Figure II. Immediately upon separation of the placenta from the uterine wall, the organ assumes a globoid shape—round on all sides. This is a reliable sign of placental separation and takes place ordinarily within a few seconds.

hand or a one-hand technic is unimportant, so long as the desired result is achieved.

"Simple expression," or squeezing of the uterus without downward pressure, is the better way to express the placenta from the uterus. If the placenta is not promptly produced by this procedure, the author strongly believes that one hand should be inserted into the vagina, where it will nearly always be found that a part of the placenta protrudes through the cervix, can be readily grasped and very gently withdrawn as an aid to the attempt to express it from above. This very simple procedure has not been found by us to add to maternal morbidity, and has resulted in a very much reduced blood loss in the third stage. This

placental withdrawal, which does not involve invading the uterine cavity, is, in our mind, a very different and less dangerous procedure than true manual removal of the placenta, advocated in some clinics whenever the third stage becomes prolonged (one hour?). We still feel that true manual removal of the placenta is indicated only when bleeding becomes alarming, and/or when the third stage exceeds two hours (we have not had such a case in the last several years).

Having delivered the placenta, one must reasonably assure oneself that it is complete. If there be any doubt, the uterine cavity should be thoroughly explored, under as aseptic conditions as possible. The danger of exploring the uterine cavity is much less than that of leaving a cotyledon attached to the uterine wall.

One is even now not through with the management of the third stage (some call it the fourth stage), as a high degree of uterine contraction is still necessary until such time as thrombosis of the uterine vessels is complete. In the average patient, one can thus assure himself in an hour or less. In the remainder of the patients, whose uteri show a tendency to relax, longer periods of observation and continued attention are necessary. This is particularly true in cases of placenta previa and premature separation of the placenta. The modern practice of moving the patient out of the delivery room to her own room within a matter of minutes after delivery is to be looked on askance. We dislike early moving of the patient for three reasons: (1) almost inevitably it means less close contact of the patient with her physician. This contact should be maintained until the physician is completely satisfied that the uterus need no longer be watched. (2) The very act of moving the patient has at least some tendency to initiate further

bleeding. We have lost at least one placenta previa case by too early removal from the delivery room, and have had many examples of increased bleeding in otherwise normal patients. If the patient could be transferred to her bed in the delivery room (much as is done with surgical patients in the operating room) this early moving might be less hazardous. To transfer a patient from the delivery bed to a cart and then from the cart to her own bed, seems to us clumsy and totally unnecessary in the modern maternity. (3) Should bleeding resume in the patient's room and active treatment become necessary, a further moving of the patient is almost always obligatory, with further loss of time and, perhaps, another patient already in the delivery room. Too often one finds in studying maternal mortalities that the recurrent bleeding is not noticed in the patient's own room until a very considerable blood loss has ensued. The author has now had a very considerable experience in the use of the recovery room following surgery, and has toyed with the idea of establishing a recovery room for obstetrics. We recognize that this is not feasible in hospitals presently in use, but feel that it should be a desideratum in future hospital construction.

What oxy-toxic drugs should be administered in the third stage, and at what time they should be given, and by what route of administration, will probably remain highly variable for some time to come. The author is convinced that in private practice some form of these drugs should be given at the delivery of the baby or, perhaps, sooner by people who have already learned how to massage a uterus and to know when it is in a sufficient state of contraction. In a teaching hospital, where students and interns must be taught these things, we have consistently not used oxy-

toxic drugs until after the placenta has been delivered, except on special indication. We are quite certain that if we were to change this procedure, the obstetricians of the future would never learn how to massage a uterus and would be in the same position that the internists are today; namely, that they cannot any longer diagnosis pneumonia without an x-ray plate (or heart disease without an E.K.G.). We are further convinced that if one really needs help from these drugs, he had better administer them intravenously rather than intramuscularly. Intramuscular administration of Ergotrate seems to us almost useless. More and more we are also giving pituitrin (or pitocin) intravenously. We are further convinced that whereas intravenous drip pitocin is very valuable in the first or second stages of labor when indicated, it is quite inadequate in the third stage. It would seem, however, that if it has been given in the first and second stages, it must not be discontinued in the third stage, but rather added to—perhaps larger dosage.

There has been some discussion as to whether the repair of episiotomy or lacerations should precede or follow the delivery of the placenta. If one has done a rather deep episiotomy and there is considerable bleeding therefrom, it is obvious that such bleeding must be controlled, particularly if there be little or no bleeding from the uterus. On the other hand, we would, in general, strongly advise that the uterus be emptied and bleeding therefrom controlled before any attempt is made to repaid the episiotomy or laceration. We would, further, recommend that in those patients who have had either: (1) a firm cervix; (2) a rapid terminal portion of the first stage of labor; (3) an operative delivery; or (4) bleeding during the second stage of labor; that the cervix be inspected immediately,

before either the delivery of the placenta or the repair of the perineum. Several people have advised routine inspection of the cervix. With this we are not in any particular conflict. We believe, however, that if the above indications for inspection of the cervix are carefully followed severe injury to that structure will be seldom overlooked. (We have had only one deep laceration of the cervix go unnoticed when the above routine has been followed in the last 5,000 deliveries.)

The author was taught as a student that if a sixth grain of morphine (a quarter grain in the larger woman) were to be given immediately after delivery, it would result in a certain degree (very safely) of amnesia. We have continued to follow such a practice for the last many years. We do not know whether it does produce amnesia or not, because we have no experience without its use. We do know that very few of our patients look back unfavorably upon their labors, or look forward to their subsequent labors with any considerable degree of dread. Without knowing its actual value, we rather feel like recommending it.

We would like to go along with the Grantly Dick Read concept to the extent that we feel that most of our "normal" mothers get a tremendous bang out of hearing the baby's first cry, and get a considerable personal satisfaction out of not only being shown their new baby, but also in being permitted to touch the new arrival. For this reason, we tend to favor saddle block and pudendal block anesthesia (more later), but do not feel that these desirable events should be the overpowering factors in the choice of anesthesia.

We are quite convinced that 1% silver nitrate, properly instilled into the conjunctival sacs without severe trau-

ma, is not contraindicated. (We have no choice in our state.) We also feel that every umbilical cord stump will, if carefully cultured, show organisms no matter what the treatment or dressing has been. We have, therefore, discarded the use of antiseptics and merely try to protect the cord by an aseptic dressing held in place by a not too tight abdominal binder for the first 24 hours. Dr. Herbert Miller, our chief pediatrician, has been making an extended study of abdominal versus thoracic breathing in the newborn period, and it may well be that his studies will result in a modification of our present attitude toward the use of an abdominal binder to hold the cord dressing in place. We shall probably abandon the binder.

Resuscitation of the newborn is seldom necessary if the patient with a normal pregnancy has been properly managed during her labor. In less than 3% of our infants is any effort at resuscitation necessary as the other 97% all cry, cough, and sneeze within a matter of five to 10 seconds. The necessity of resuscitation is a matter of challenge of the manner of management of the patient previous to that time. We still believe that standing the baby on its head and milking the upper respiratory tract and nose of its fluid content is the very best procedure in anything like a normal situation. We have so seldom found it necessary to insert a tracheal catheter that we have no clear idea of its real value. Maintenance of body temperature and early administration of oxygen, we feel are most important. Awareness that in certain abnormal patients the baby may be in difficulty; Preparedness for situations where trouble is expected; Taking care that the baby be not chilled or otherwise insulted during the critical first three or four minutes of its life is *APT* to result in a vigorous infant.

How much or how little care should be devoted to the postpartum breast and perineum is still a matter of difference of opinion. We still believe that the breasts should be washed before nursing for the protection of the infant, and afterward to prevent caking of dry milk. We say this with our tongue in our cheek, because not too long ago an epidemic of breast infections was studied and in all instances the infection was found to have been brought to the mother by her baby (staphylococcus hemolyticus). Dr. Ed Plass has taught that the perineum need not be irrigated, washed, covered by a perineal pad, or treated with a heat lamp. Our own patients seem to be very grateful when we give them hot sitz baths. We have already mentioned that they like our specific kind of wet perineal dressings. We believe it well to follow some procedure long enough to decide in one's own mind how that procedure works for him, and, therefore, not to change methods of treatment so frequently that he fails to know much about any one of the plans of treatment.

It has been our objective that each of our patients shall ask for a cup of coffee or a coke and a cigarette within 30 minutes after delivery. That we always attain this objective is obviously untrue. It still gives us a considerable gratification when our patients do express this desire to "get back to normal." (My wife ate five pieces of bacon the first morning after delivery.)

We have not yet reached the stage of having our patients walk from the delivery room to their own rooms, but quite freely admit that we may be backward in this respect. We still walk from the bathroom after a bowel movement.

Our principal objective in the immediate puerperium is the personal comfort, rest, nutrition, and careful observa-

tion of the regressive changes following delivery of the baby. The usual discomforts of after-pains, breast engorgement, and perineal pain have attracted considerable attention, and, it is hoped, can be better controlled in the future than they have been in the past. How big a part drugs are to play is still a matter of difference of opinion. The author does not hesitate to employ morphine if the after-pains are at all severe, but believes that careful attention to the expulsion of any blood clots within the uterus an hour after delivery will go far toward the prevention of after-pains. We have not employed stilbestrol to control breast engorgement, although many have recommended its use. In our experience, the ice bag, plus, perhaps, some codeine, has been very satisfactory. Perineal pain has responded quite well to the use of heat. We do not yet know whether dry heat, hot sitz baths, or a combination of the two brings the best results. The injection of long lasting local anesthesia at the time of perineal repair has, in our hands, given immediate relief, but has not materially reduced discomfort in the subsequent days over and above the results obtained by the use of heat.

Much less than the ideal amount of rest is now obtainable in the modern maternity than would be desired. Perhaps the biggest item in this respect is the apparently unavoidable passing of bed pans and wash basins at 5:30 in the morning. How this pernicious routine can be broken is more than mere man can apparently figure out.

Dr. Hubert M. Floersch, of our department, devised a trapeze suspended to the head of the bed, hanging at about arm's length and at about breast level. This has added materially to the patient's comfort and ease of moving about; has materially reduced nursing care, and is the de-

light of every patient who has access to it. The new obstetric beds, with self-operating elevation of the head of the bed, are a distinct improvement.

A high protein diet is probably quite as essential in the puerperium (whether the mother is nursing her baby or not) as in pregnancy. Ample fluid intake should help to prevent the all too frequent urinary tract infections. Probably of greater importance is, however, the avoidance of distention of the bladder. Competent nursing, or careful observation by house officers, should completely prevent this unfortunate distention. One can also very quickly teach the intelligent patient to palpate her own bladder and be warned that it is filling before the sensation thereof will evidence itself, particularly in the first 24 hours. We have not found the routine use of antibiotics or sulfa drugs completely effective in preventing puerperal cystitis and pyelitis. It is our impression that penicillin is completely useless and that if one chooses to exhibit any medication it should be one of the sulfa drugs. The author has found sulfadiazine particularly satisfactory.

The only medication that we routinely employ is mineral oil. This, of course, should not be continued over a long period of time. It has been particularly useful, in our opinion, in easing the discomfort of the first few bowel movements, particularly in those patients who have engorgement of the hemorrhoidal vessels, either internal or external. An oil enema, 36 to 48 hours after delivery, followed several hours later by a two, three, four enema (two ounces of glycerin, three ounces of a saturated solution of magnesium sulfate, and four ounces of water) has proven much more efficacious than an ordinary soapsuds enema. This is thought by a very few patients to be a little rigorous, but is welcomed by more than 90% because of its

greater effectiveness and the usual lack of further enemas later. In the presence of visible hemorrhoids, we have found a suppository, containing three grains of opium, very effective. Common suppositories, containing much smaller amounts of opium, have in our hands proven valueless.

Breast care has, on the whole, not given us any trouble. Soap and water cleansing of the nipples before and after nursing, has been all that is necessary. A short time ago, a veritable epidemic of breast infections, due to hemolytic staphylococcus, was promptly controlled by the administration of aureomycin to all babies in the nursery. It is, of course, necessary to warn patients that the baby should not be allowed to nurse more than 10 minutes at any one nursing period. We also believe that breast feeding will almost certainly prove to be futile unless the nipples are well formed. We further believe that when in doubt with reference to breast feeding, one should not insist upon it, as artificial feeding is much safer and much more reliable than it was 30 years ago. (Having spent the greater part of a lifetime urging patients to nurse their babies, I am now content to leave this item to the Pediatrician.) (The same applies to circumcision of the male infant.)

Early ambulation has filled the obstetric journals in the last several years. As a topic, it leaves us very cold. We never subscribed to the necessity of 10 days bed rest. No more do we now subscribe to the necessity of having the patient out of bed the first day after delivery. We have always felt, and we still feel, that each patient should be allowed out of bed as soon as she is ready and able to do so. This will vary from patient to patient. Very certainly, some multiparas are ready and anxious to be out of bed for short periods within a few hours after delivery. Cer-

tain primiparas and others having a difficult and traumatizing delivery will not feel ready to be ambulated until two or more days have gone by. Blind adherence to a routine will, in our opinion, not bring the best results.

The same general principle applies to dismissal of the patient from the hospital. We do not believe that very many patients should leave the hospital and undertake the necessitous duties of home living at the end of three or even five days. That all patients should be kept in the hospital 10 days seems to us silly and to unnecessarily increase the expense of obstetric care. We have always felt that if a nurse, either graduate or practical, is to be hired, she should be later in the home rather than in the hospital. Those patients who are so fortunate as to have a sister or mother to look after them after going home can be dismissed from the hospital a day or two earlier than those who must assume a major portion of the care of their new baby more or less unaided. (Most fathers are not very helpful in this respect, even during the night hours.)

We have routinely instructed our patients to obtain as much rest as possible during the first two weeks at home. Dr. Whitridge Williams clearly demonstrated in his last paper[20] (published after his death) that healing at the placental site was not complete until seven weeks after delivery. Theoretically, therefore, the puerperium cannot be considered as complete until seven weeks have gone by. We have all frequently noted sanguinous discharge from the vagina to be noticeably present for four to five weeks of this period. That our patients should necessarily remain in partial quiesence for this whole period of seven weeks seems hardly necessary. That they should avoid over-exertion for at least half of this period seems very reasonable.

REMOTE PUERPERIUM

In all patients having large babies, moderate to marked hydramnios, and twin pregnancy, it seems to us that a maternity corset should be insisted upon. In the primipara who has had a small baby, with less than average amount of amnionic fluid, such a supportive garment is probably not necessary. One should, however, distinguish between the individual with congenitally relaxed tissues and the individual who has excellent tissue tonus in this respect. We do not believe that post-partum exercises will be best employed until some four to six weeks have gone by. Any of the usually recommended exercises for either abdominal wall or perineum (or bladder) should certainly be suggested at the time of the (four to) six weeks post-partum examination if they seem indicated.

In our opinion, the two principal considerations at this six weeks examination is the patient's hemoglobin and evidence of pelvic congestion. (If there has been any toxemia, other tests are, of course, indicated.) Persistent anemia is evidence of poor obstetric care, and will not occur if the hemoglobin determination is a part of the routine at the six weeks examination. Cervical erosion is the one finding most often noted. In the author's opinion, it is but one evidence of pelvic congestion. In almost all instances, cervical erosion is definite evidence of the failure on the part of the patient to observe two weeks of inactivity on returning home from the hospital. Even at this time, a two weeks period of rest will cause the erosion to disappear. The employment of cervical cauterization to

clear up these erosions leaves us very cold, as this cauterization does not correct the cause of the erosion, and does not prevent the later occurrence of much more serious pelvic conditions incident to pelvic congestion. Other symptoms and findings of this important condition should not be overlooked. In the average gynecological clinic, the history of "I haven't been well since Mary was born" is much too common and is an evidence of lack of thoroughness at the six weeks' examination. This may even include overlooking a persistent urinary tract infection. In the grande multipara particularly, it may also include a persistence of hypothyroidism.

If, at this six weeks examination, one finds his patient entirely normal, further periodic examinations of the patient seem entirely redundant and far more important to the doctor than to the patient. If, on the other hand, the patient's condition is not entirely satisfactory, it is our distinct duty to continue observation and recommend whatever treatment seems necessary. Retro-displacement of the uterus, if not attended with pelvic congestion, is in our opinion not an indication for further observation and treatment. Low hemoglobin, urinary tract infection, evidence of pelvic congestion, or pubic or sacro-iliac pain do call for further treatment. Careful adjustment of the maternity corset may completely relieve pubic or sacro-iliac pain if instituted at this time. Postponement of treatment of these painful joints may well result in more or less permanent disability. If the maternity corset does not prove entirely satisfactory, orthopedic consultation should be sought.

ANALGESIA AND ANESTHESIA

With the ready availability of such excellent works as that of Dr. Franklin F. Snyder on the experimental aspects of "*Obstetric Analgesia and Anesthesia*"[8] and the more recent practical treatise by Dr. J. P. Greenhill,[21] it is totally unnecessary, at this time, to present any extensive discussion of analgesia and anesthesia. We cannot refrain, however, from expressing an attitude (or, if you will, a philosophy) toward this very important subject.

Too much thought has been given to the relief of pain and too little thought to the possible harm to the mother and the probable harm to the baby by many of the procedures employed. Dr. Nicholson J. Eastman has recently called attention to this point in rather dramatic fashion in his *Mount Everest in Utero.*[22]

The author has been guided through the years by five thoughts. (1) Every analgesic and every anesthetic is a poison to the baby. Like all other poisons, if given in small enough amount, the danger may be almost negligible. If given in large amount, it may well be lethal. (2) Do not use a drug with which you are not thoroughly familiar. The dictum of the detail man is not sufficient information. Pharmacologists can very frequently valuably supplement the information of the clinician—even the *experienced* clinician. (3) More important than knowing your drug is knowing the dose of that drug. Dosages also vary in their potency and in their dangers under different circumstances. What may be a very safe dose of a drug before labor or even at the very onset of labor in a primip-

ara can be very dangerous later in that same labor. In general, drugs for which there is a definite antidote are safer than those where no such anti-drug is available. Litzenberg, Schreiber, and many others have pointed out that combinations of drugs (and anesthetics) are many times more dangerous than either of these drugs alone. This applies not only to fetal mortality but also, and perhaps more importantly, to mental damage among those babies who live. (4) No matter what drug or anesthesia is employed, it is obligatory on the attendant to maintain a constant watch of the effects of such administration on both mother and baby. May we repeat that sending a patient into a hospital and ordering a certain "routine" analgesic without first examining that patient is very bad obstetric practice. Even with usually innocuous procedures, bad effects can be observed, and if prompt remedial measures are adopted, calamities can be averted. (5) Always be prepared for emergencies. Nowhere in the practice of medicine is there such a potential for unexpected and unpredictable calamities, or near calamities, as in the practice of obstetrics.

The work of Masters, *et al.*[23] clearly pointed out the superiority of regional over general anesthesia. Dr. Gordon Douglas and associates have pointed out some of the values of paravertebral anesthesia. Our own experience with this procedure would indicate that (a) it is a difficult technic, (b) it has a limited use, but (c) it is very valuable in limited circumstances. Dr. Klink[24] at Temple University has perfected an improved technic of pudendal block which would, it seems to us, also have a somewhat limited applicability. It has worked very well in our hands in many instances, but has also—perhaps because we have not yet learned the technic sufficiently well—exhibited

many failures. The saddle block technic, suggested by Adriani and studied by Dr. Herbert Schmitz and others, has served us very well. The recent adverse reports indicating more or less permanent bad effects (paralysis etc.) for the mother has given us pause.

In general, we still like the regional over the general anesthetic, whether it be the simple perineal infiltration or something more extensive. At the moment, we feel that the possibilities of pudendal block anesthesia have not been sufficiently probed. There are no apparent objections to its use from the baby's point of view. That it has not been uniformly successful, so far as the mother is concerned, is obvious. Is that our fault? Should we not try harder to develop a proper technic? Dr. Klink's technic deserves careful study. It is particularly applicable by one who does not have the ready availability of a proper anesthetist. The only type of regional anesthetic we cannot condone is caudal anesthesia. While caudal anesthesia has certain virtues in gynecologic surgery, we have never felt that it was advantageous in obstetrics. The very fact that almost 100% operative deliveries are required makes it somewhat less than desirable. (Perhaps we should not speak so strongly, as we have had no experience with it. It just sounded bad to us from the beginning and nothing in the literature up to date has served to change our minds about it.)

If one wishes to use inhalation anesthesia, we still believe that nitrous oxide and oxygen is the best choice. One can do quite well in the way of pain relief throughout the first stage of labor with 25% nitrous and 75% oxygen, varying the proportions on two bases: (1) the necessity of pain relief; and (2) the effect on the uterine contractions. At the terminal period, the proportion of nitrous is neces-

sitously increased. One should, however, even for the performance of an episiotomy, not increase the percentage of nitrous oxide above 75%. As previously stated, our experience with trilene has not been satisfactory, even with the recent new gadget for its administration. We have had no experience with ethylene, and have not been convinced from the reports in the literature that we should even try it.

We cannot subscribe to the attitude that a superior analgesic or anesthetic should not be used because it is expensive or because it requires an experienced anesthetist. We cannot subscribe to the idea that a good surgical anesthetist is necessarily a good obstetric anesthetist. We still feel that one of the most important elements in training an obstetrician is in training him in proper obstetric anesthesia. All such people, so trained to date, share the author's feeling that an obstetrician can better give obstetric anesthesia than can a surgical anesthetist. Most importantly, obstetric analgesias and anesthesias administered in the presence of an obstetrician will be much safer than those administered in the past or administered in most situations in the present.

SUMMARY

The author has "never had a baby" (frequently so-reminded by his patients), and almost certainly will never have one (constitutionally inadequate), but has, for many years lived quite closely associated with those having babies. He is, therefore, quite willing to subscribe to the very bare and quite inadequate statement in the textbooks that it is a physiologic process. Such a simple statement falls far short of covering the clinical implications. Such a statement is even more inadequate when psychological considerations are involved. The still present "Prayer for the newly delivered mother" in the Episcopal Book of Common Prayer, which starts with "Dearly Beloved, whereas you have just come through the valley of the shadow of death" is no longer physiologic, humane, or desirable. We might even suggest that the words of the *Holy Bible* that "into the world ye shall be born in travail and in pain" be modified. (We do not mean to be presumptuous.) We do mean that we, as Doctors of Medicine, have been far too lax in counteracting these influences (to say nothing of back yard fence gossip or the far more pernicious teatime elaboration of "what a horrible time I had"). That one has a large practice and therefore cannot spend the time necessary to properly counteract these influences is not a good excuse. Properly organized Mothers' Classes can do it for him. Funds are readily available for the organization of such classes. (One of our dietitians, Miss Toevs, has recently organized classes in Diet in Pregnancy, has developed a competitive

spirit in our patients, and has produced a distinct improvement in our prenatal care.)

It is well recognized that the individual with a well developed "fissure in ano" can come to dread a bowel movement. So far as the author knows no woman has a "fissure in vaginum." Can we not do a better job?

The idea that labor is a physiologic process and, therefore, does not require the presence of the doctor until the baby is to be delivered is also, in our opinion, quite obsolete. Why should he be there at the delivery of the baby (except to collect his fee)? We would rather take the attitude that labor is a physiologic process but that it is capable of developing pathology faster than any other phase of the practice of medicine, and that it, therefore, requires (not just watchful expectancy but) constant surveillance of acute intensity, *considerate* sympathy, and "watchful expectation of possible (sudden?) pathology."

Appendix A

ON PREDICTING THE LENGTH OF LABOR*†

UNBIASED consideration of the physiologic process known as the first stage of labor would lead one to the conviction that two principal factors should be considered. The motive force is known to be, almost exclusively, uterine contraction. Resistance is provided by the cervix. Very little consideration has been given in obstetric literature to these two major factors in the various discussions of prolonged and difficult labor. Instead, the publications have dealt with age and stature of the mother, size of the pelvis, and size and presentation of the baby. There has been a great tendency to confuse difficult first stage and difficult second stage. We tried to show in our previous publication[1] that there was no correlation between the first stage and second stage and that, therefore, quite different factors must be presumed to govern the second stage from those having to do with the length and relative ease or difficulty of the first stage. We have previously demonstrated with respect to the first stage that such factors as maternal age and stature and pelvic size (within certain limits) do not have a demonstrable bearing on the length of, or difficulty involved in, that process. Infant

*Read at the Sixty-sixth Annual Meeting of the American Gynecological Society, Colorado Springs, Colo., May 26 to 28, 1941.

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size has no effect on the duration of the first stage in multiparas and little or no effect on primiparas. Occiput posterior has been said by all observers to result in a somewhat longer first stage than occiput anterior. At the time of our previous publication (1931), it was also our opinion that this was true. More recent information (to be presented in another communication) will prove this view fallacious. Abnormal presentation has been consistently looked upon as one cause of prolonged and difficult labor. Whatever the effect of abnormal presentation on the second stage, there is no particular reason to assume that it would necessarily prolong or otherwise make difficult the first stage of labor. We showed quite conclusively that this was true regarding breech presentation,[1] but the same is not yet settled with reference to bregma, brow, and shoulder presentations. There has been considerable literature with reference to the role of the membranes. Conclusive proof as to the effect of "premature rupture" of the membranes upon the first of labor is not yet available.

In a previous publication, we pointed out that variations in consistency of the cervix and variations in frequency and intensity of the labor pains did have an important bearing on the duration of the first stage. It was quite obvious, however, that other factors must also be involved. These two variants alone (as analyzed at that time) could not explain eiither the very short or the very long labors. It gradually became obvious to us that we could not learn what these other factors were without careful examination of a considerable series of patients at the onset of labor and close observation of changing conditions throughout the labor. To see for the first time a patient who has already been in labor several hours does

not give us the necessary information as to the conditions present at the time of the onset of the pains and, therefore, leaves us unable to judge what total of work is presented to the uterine forces. In the past few years, we have been making an effort, therefore, to see more patients as their labors begin and to note the relative degree of effacement of the cervix, as well as the dilatation of the external os, the consistency of the cervix, and the station of the presenting point. Balancing this information with the character of the labor pains subsequently observed, we are now able to account for most, if not all, of the variations involved in the first stage. We find ourselves able to predict the duration of the first stage quite accurately. The occasional exceptions can usually be traced to definite pathology.

It should be pointed out that the patient must be seen at the onset of labor. We have found that an examination made the day previous to the onset of labor is not reliable, as in a considerable number of patients quite marked changes take place in the last 24 hours before labor begins. We have at present available for study 676 primiparas and 374 multiparas who were seen at the onset of their labors or very shortly thereafter. In a few instances, the primiparas were seen as much as one and one-half (or two) hours after the onset when the uterine contractions had been very weak and infrequent, and it was obvious that no material change had yet taken place. No multipara was included in this group when more than one hour had elapsed since the first discomfort was experienced. These are consecutive cases with no selection or elimination. (A much larger series of patients would have been desirable to prove the thesis to follow, but the conclusions are so clear-cut and the information so readily usable by phy-

sicians and students alike that it seemed wise to present the material now.)

DEFINITIONS

Effacement was said to be present (for purposes of this study) when the cervix was either completely effaced or was three or more centimeters dilated (even though there might still be a considerable thickness to the cervical wall). All lesser degrees of effacement were said to be "not effaced."

If the presenting point was at or below the level of the ischial spines, the head was said to be "engaged"; if the presenting point was at any higher level, it was said to be "not engaged."

If the cervix was of the consistency of one's lip, or softer, we called it a "2" cervix; if of the consistency of the ala of the nose, or firmer, we called it a "3" cervix.

In judging the effectiveness of labor pains, we considered intensity and frequency. We did not consider duration as we had previously shown[2] that duration of the individual labor pain was not important in affecting the duration of the first stage of labor. There is sufficient variation in labor pains, both with respect to frequency and intensity, as labor progresses that one must select a certain time in the labor on which to base his estimate of effectiveness and then try to apply that judgment to the whole of the labor, or the labor must be considered in several segments according to the type of pain present during each of those segments. The latter method is probably too complicated for practical use. The relative infrequency and lack of intensity of the uterine contractions during the effacement phase of the first stage caused us to think that possibly the labor pains should be judged

not during effacement but rather at the beginning of the dilation phase. We therefore, took as our standard the frequency and intensity of the pains at the time the cervix was either 2 or 3 cm. dilated. We classified the pains as "good," "fair," or "poor," according to the following plan: Good pains were those which occurred at intervals of three minutes or less and with something more than a very weak intensity. Fair pains were those occurring four or five minutes apart with a fair intensity *or* at intervals of three minutes or less but with a very weak intensity. Poor pains were those occurring at intervals of five or more minutes *and* with a very weak intensity.

ANALYSIS OF RECORDS

What might be called completely favorable conditions at the onset of labor would be complete effacement, engagement, soft cervix, and good pains. One hundred thirteen primiparas were in this classification (Table I).

TABLE I

LENGTH OF FIRST STAGE (PRIMIPARAS)

No unfavorable factor
Effaced, engaged, soft cervix, good pains
113 patients—Ave. 3 hr. 17 min.
Range—20 min. to 6 hr. 15 min.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
110	3	0	0	0

The average length of the first stage in this group was three hours and seventeen minutes. The shortest was 20 minutes and the longest six hours and 15 minutes. There were included in this group a small number of patients who had considerable dilatation (four or more centimeters) at the onset of labor. These patients accounted for the very short labors. The majority of patients in this group were in the first stage between two and four hours.

It should be noted that no instance of anything like a prolongation of the first stage was noted in this group. A period of about three hours then may be taken as the "basic" duration of the first stage in primiparas.* †

TABLE II

LENGTH OF FIRST STAGE (MULTIPARAS)

No unfavorable factor
Effaced, engaged, "2" cervix, good pains
53 patients—Ave. 1 hr. 43 min.
Range—5 min. to 5 hr. 35 min.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
53	0	0	0	0

Table II shows the similar data for the 53 multiparas in this classification. The usual duration of the first stage in this group is very close to two hours. The average of one hour and 43 minutes is slightly less, due to the fact that several of these patients also had considerable dilatation at the onset of labor and the average of the whole group was thereby reduced. The "basic" duration of the first stage in multiparas is then about two hours, and the "basic difference" between a primipara and multipara is about one hour.

In the remaining 563 primiparas (83%) and 321 multiparas (86%), one or more of the above four factors (effacement, engagement, consistency of cervix, character of pains) was found to be unfavorable; and the labor, thereby, prolonged beyond the basic three hours for primiparas and basic two hours for multiparas. If two factors were unfavorable, further lengthening of the first stage was ob-

*The scientifically accurate time is perhaps three hours and 20 minutes. This figure is a little more difficult to remember and, as will be developed presently, might be a little more difficult to handle in everyday work. The three-hour period is sufficiently close to be satisfactory for practical purposes.

†Eight patients had a "mushy soft" ("1" on our scale) cervix but their first stage of labor averaged two hours and 31 minutes, not much less than the average for a "2" cervix.

served; three or more unfavorable factors caused a further increase, etc. Carrying this analysis to the limit of the possibilities involved, we were able to develop a table whereby the length of any labor can be predicted with a considerable degree of accuracy.

Lack of effacement adds three hours in primiparas and two hours in multiparas, the same length of time as the basic figures for these two groups (Table IV).

A slightly firmer ("3") cervix also adds three hours (Table V) for primiparas and two hours for multiparas.

TABLE III

PREDICTING THE LENGTH OF FIRST STAGE

		Primiparas	*Multiparas*
Effaced, Engaged, "2" Cervix	Good pains	3 hr.	2 hr.
	Fair pains	6 hr.	4 hr.
	poor pains	12 hr.	8 hr.
Effaced, Engaged, "3" Cervix	Good pains	6 hr.	4 hr.
	Fair pains	9 hr.	6 hr.
	Poor pains	15 hr.	10 hr.
If not effaced add		3 hr.	2 hr.
If not engaged add		1 hr.	1 hr.

TABLE IV

LENGTH OF FIRST STAGE. EFFECT OF NONEFFACEMENT

Primiparas	
Effaced, engaged, "2" cervix, fair pains	6:56
Not effaced, engaged, "2" cervix, fair pains	9:33
Multiparas	
Effaced, engaged, "2" cervix, good pains	1:43
Not effaced, engaged, "2" cervix, good pains	3:19

TABLE V

LENGTH OF FIRST STAGE. EFFECT OF "3" CERVIX

Primiparas	
Not effaced, not engaged, "2" cervix, good pains	6:27
Not effaced, not engaged, "3" cervix, good pains	9:19
Multiparas	
Not effaced, not engaged, "2" cervix, fair pains	6:31
Not effaced, not engaged, "3" cervix, fair pains	8:47

Fair pains (Table VI) likewise require three hours more to dilate the cervix in primiparas and two hours more in multiparas.

Poor pains, on the other hand (Table VII), constitute a more potent factor and, instead of adding three hours to the length of labor when the pains are good, we must add three times three for primiparas and three times two for multiparas.*

TABLE VI

LENGTH OF FIRST STAGE. EFFECT OF "FAIR" PAINS

Primiparas	
Not effaced, engaged, "2" cervix, good pains	6:04
Not effaced, engaged, "2" cervix, fair pains	9:33
Multiparas	
Not effaced, engaged, "2" cervix, good pains	3:19
Not effaced, engaged, "2" cervix, fair pains	5:19

TABLE VII

LENGTH OF FIRST STAGE. EFFECT OF "POOR" PAINS

Primiparas	
Not effaced, engaged, "2" cervix, good pains	6:04
Not effaced, engaged, "2" cervix, good pains	15:08
Multiparas	
Not effaced, engaged, "2" cervix, good pains	3:19
Not effaced, engaged, "2" cervix, poor pains	9:56

TABLE VIII

LENGTH OF FIRST STAGE. EFFECT OF HIGH STATION

Primiparas	
Effaced, engaged, "2" cervix, good pains	3:32
Effaced, not engaged, "2" cervix, good pains	4:45
Multiparas	
Effaced, engaged, "2" cervix, good pains	1:43
Effaced, not engaged, "2" cervix, good pains	2:34

*Further classes of "very poor" and "very, very poor" pains will be possible in a sufficiently large series. A few such patients in this present series materially increased the averages in the "poor pains" groups in Tables XV, XVII, XIX, and XX.

Lack of engagement is a matter of less importance and apparently affects primiparas and multiparas to the same degree, as we need add only one hour in each group (Table VIII).

Those primiparas having one unfavorable factor are summarized in Table IX. There were 59 patients whose cervices were not effaced but in whom engagement was present, cervix soft, and pains good. The average for this group was predicted to be six hours and was computed

TABLE IX

LENGTH OF FIRST STAGE (PRIMIPARAS)

One unfavorable factor

			(Predicted)
Not effaced	59 patients	5:59	6 hr.
Not engaged	41 patients	4:23	4 hr.
No soft cervix	17 patients	5:52	6 hr.
Fair pains	30 patients	6:44	6 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
94	53	0	0	0

at five hours and 59 minutes. There were 30 patients whose cervix was effaced and soft and where the head was engaged but who had only fair pains. The predicted duration of the first stage in this group was six hours and the average found to be six hours and 44 minutes. Seventeen patients had a firmer cervix but all other conditions were favorable. These "six-hour" patients averaged five hours and 52 minutes. Forty-one patients entered labor with the fetal head high but all other conditions favorable, including good pains. The predicted duration for this group was four hours and the average was found to be four hours and 23 minutes. It should be noted that there was no instance of a first stage of more than 12 hours in any of these four subgroups. About two-thirds of all these patients had labors of less than six hours and one-third between six and 12 hours.

TABLE X

LENGTH OF FIRST STAGE (PRIMIPARAS)

One unfavorable factor

			(Predicted)
Not effaced	16 patients	3:19	4 hr.
Not engaged	49 patients	2:34	3 hr.
"3" cervix	1 patient	2:40	3 hr.
"Fair" pains	11 patients	3:41	4 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
75	2	0	0	0

Table X shows the similar figures for multiparas.* Only two of 77 patients in these four subgroups had a first stage in excess of six hours. The predicted and computed figures are quite close, considering the small number of patients involved.

TABLE XI

LENGTH OF FIRST STAGE (PRIMIPARAS)

Two unfavorable factors

			(Predicted)
Not effaced, not engaged	67 patients	6:27	7 hr.
Not effaced, "3" cervix	12 patients	8:51	9 hr.
Not effaced, fair pains	28 patients	8:49	9 hr.
Not engaged, "3" cervix	17 patients	6:39	7 hr.
Not engaged, fair pains	26 patients	7:41	7 hr.
"3" cervix, fair pains	7 patients	11:56†	9 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
64	79	13	1	0

† Two of these patients had an unusually firm cervix, 16 and 17 hours respectively.

Table XI shows primiparas with two unfavorable factors. The computed and predicted figures are again found to check very closely in each subgroup of patients. In this whole group there were 13 patients with labors of between 12 and 18 hours and one patient in excess of 18 hours. Multiplication of unfavorable factors may at times

*In multiparas where the cervix is effaced, relative firmness ("3") of the cervix apparently causes only about one hour increase. Where the cervix is not effaced, the difference is the usual "basic" two hours.

prolong the labor beyond the predicted level. Nevertheless, when it is considered that 143 of these 157 patients had short, or relatively short, labors, the reliability of the index is apparent.

The same data for multiparas (Table XII) show 137 of 139 patients under 12 hours and again a very close reliability of prediction for each subgroup.

TABLE XII

LENGTH OF FIRST STAGE (MULTIPARAS)

Two unfavorable factors

			(Predicted)
Not effaced, not engaged	81 patients	4:16	5 hr.
Not effaced, "3" cervix	5 patients	5:28	6 hr.
Not effaced, fair pains	17 patients	5:27	6 hr.
Not effaced, "3" cervix	9 patients	3:15	4 hr.
Not engaged, fair pains	26 patients	5:20	5 hr.
"3" cervix, fair pains	1 patient	4:00	5 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
107	30	2	0	0

When three unfavorable factors are present (Table XIII for primiparas and Table XIV for multiparas), the prediction for each individual patient becomes somewhat less exact although for any considerable group of patients the prediction is still very accurate. Sixty-nine patients whose cervices were not effaced and presenting part not engaged and with only fair pains had a predicted duration of 10 hours and a computed duration of 10 hours and one min-

TABLE XIII

LENGTH OF FIRST STAGE (PRIMIPARAS)

Three unfavorable factors

			(Predicted)
Not effaced, not engaged, "3" cervix	33 patients	9:19	10 hr.
Not effaced, not engaged, fair pains	69 patients	10:01	10 hr.
Not effaced, "3" cervix, fair pains	10 patients	10:52	12 hr.
Not engaged, "3" cervix, fair pains	15 patients	8:30	10 hr.
Poor pains	16 patients	12:29	12 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
28	81	24	8	2

ute. Two primiparas in this whole group (represented by Table XIII) had a first stage in excess of 24 hours, the first instances of what might be called "prolonged labor." Thus, a labor in excess of 24 hours may be considered distinctly abnormal unless at least three unfavorable factors are present in the patient.

TABLE XIV

LENGTH OF FIRST STAGE (MULTIPARAS)

Three unfavorable factors

			(Predicted)
Not effaced, not engaged, "3" cervix	6 patients	6:12	6 hr.
Not effaced, not engaged, fair pains	32 patients	6:31	7 hr.
Not effaced, "3" cervix, fair pains	1 patient	6:10	8 hr.
Not engaged, "3" cervix, fair pains	0 patient		6 hr.
Poor pains	9 patients	7:24	8 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
24	21	3	0	0

TABLE XV

LENGTH OF FIRST STAGE (PRIMIPARAS)

Four unfavorable factors

			(Predicted)
Not effaced, not engaged "3" cervix, fair pains	26 patients	15:00	13 hr.
Not effaced, poor pains	12 patients	17:25	15 hr.
Not engaged, poor pains	16 patients	11:31	13 hr.
"3" cervix, poor pains	7 patients	13:49	15 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
3	19	27	7	5

TABLE XVI

LENGTH OF FIRST STAGE (MULTIPARAS)

Four unfavorable factors

			(Predicted)
Not effaced, not engaged, "3" cervix, fair pains	14 patients	8:47	9 hr.
Not effaced, poor pains	9 patients	9:56	10 hr.
Not engaged, poor pains	12 patients	9:00	9 hr.
"3" cervix, poor pains	0 patients		9 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
9	18	7	1	0

Four unfavorable factors bring the primiparas' labor up to 13 to 15 hours (Table XV) and multiparas' labor to nine to 10 hours (Table XVI). Short labors have now become quite uncommon, and there were five primiparas whose labors exceeded 24 hours.

Five unfavorable factors (Tables XVII and XVIII) show a disappearance of the short labors (six hours) for both primiparas and multiparas, and an appearance of an appreciable proportion of primiparas in excess of 24 hours.

Six unfavorable factors (Tables XIX and XX) show for primiparas a labor in excess of 24 hours to be the rule and

TABLE XVII

LENGTH OF FIRST STAGE (MULTIPARAS)

Five unfavorable factors

			(Predicted)
Not effaced, not engaged, poor pains	25 patients	23:00	16 hr.
Not effaced, "3" cervix, poor pains	7 patients	24:53	18 hr.
Not engaged, "3" cervix, poor pains	7 patients	17:46	16 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
0	6	12	12	9

TABLE XVIII

LENGTH OF FIRST STAGE (MULTIPARAS)

Five unfavorable factors

			(Predicted)
Not effaced, not engaged, poor pains	12 patients	11:48	11 hr.
Not effaced, "3" cervix, poor pains	0 patients		12 hr.
Not engaged, "3" cervix, poor pains	0 patients		10 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
0	4	6	2	0

TABLE XIX

LENGTH OF FIRST STAGE (PRIMIPARAS)

Six unfavorable factors

			(Predicted)
Not effaced, not engaged, "3" cervix, poor pains	16 patients	29:37	19 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
0	0	5	2	9

therefore normal. There were no labors less than 12 hours. The one multipara whose labor was less than six hours probably represents an error in the initial recordings on this patient.

TABLE XX

LENGTH OF FIRST STAGE (MULTIPARAS)

Six unfavorable factors

Not effaced, not engaged, "3" cervix, poor pains — 9 patients — 13:57 — (Predicted) 13 hr.

0-6 Hr.	*6-12 Hr.*	*12-18 Hr.*	*18-24 Hr.*	*Over 24 Hr.*
1	2	5	1	0

DISCUSSION

It should be noted that the management of this series of patients did not include heavy sedation for any first stage. Nitrous oxide oxygen with small doses of morphine (on indication only) were the only means of sedation employed. Other patients delivered in the hospital during the same period and to whom heavy sedation was given had much longer labors. One patient only was excluded from this series because of a pathologically hard cervix. In one patient only a small pelvis might have had a deterrent effect on the course of the labor. This patient was a multipara for whom a 13-hour labor was predicted, and she was not completely dilated until the end of 17 hours. Her conjugata vera was estimated at 8.5 cm. Whenever a patient developed a secondary inertia with no pains for a period of several hours, that painless period was not counted in the total duration of her labor. The number of induced labors was too small for us to tell whether the induced labors were either shorter or longer than those occurring spontaneously. The same can be said with respect to premature rupture of the membranes.

SUMMARY

Table XXI shows in simple form a method for predicting the duration of the first stage of labor with the percentage likelihood of the occurrence of "good," "fair," and "poor" pains so that, with any given patient, the likely duration can be quite readily determined even in advance of any labor pains. As soon as the first dilating pains appear, the patient can be completely catalogued and the time of complete dilatation readily determined.

This knowledge is of importance in several ways. If a long labor can be predicted, the need of maintenance of free food and fluid intake is obvious. If a short, easy labor

TABLE XXI

PREDICTING THE LENGTH OF FIRST STAGE

		Primiparas	*Multiparas*
Effaced Engaged "2" cervix	Good pains 63%	3 hr.	2 hr.
	Fair pains 25%	6 hr.	4 hr.
	Poor pains 12%	12 hr.	8 hr.
Effaced Engaged "3" Cervix	Good pains 45%	6 hr.	4 hr.
	Fair pains 33+	9 hr.	6 hr.
	Poor pains 22%	15 hr.	10 hr.
If not effaced add		3 hr.	2 hr.
If not engaged add		1 hr.	1 hr.

can be predicted, the need for operative intervention in certain types of pathology is obviated. It is high time that labors should be judged on the anatomic and physiologic factors in the genital tract rather than on "manufactured dicta" such as age and stature of the whole body. It is also important, if the labor goes definitely beyond the predicted limits, that careful search for unrecognized abnormalities should be instituted without delay.

Finally, it is interesting to speculate on the etiology of the variations in the cervix and in the uterine contractions. The cause is not anatomic; it is almost certainly physiologic. There is some evidence that variation in the cervix may produce variation in the uterine contractions and vice versa. The etiology of the onset of labor is inextricably involved in both. Further research is obviously necessary. Only when we find this physiologic factor can we hope to so "prepare" the least favorable patients in advance that they may enter labor with unresisting cervices and good uterine contractions.

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Appendix B

THE SECOND STAGE OF LABOR —INTERNAL ROTATION*†

INTERNAL rotation has long been the most interesting feature of the mechanism of labor. This interest has been partly due to the fact that the etiology is unknown. A great difference of opinion has also existed with reference to the significance of failure of rotation.

This present study has two objectives. It was thought that if we could learn more exactly the time at which internal rotation occurred and study carefully the results of failure of rotation, we might possibly arrive at a more definite knowledge of why internal rotation takes place. Or, failing that, we might learn how better to manage the unrotated head.

For the past several years, we have tried to improve our labor records by noting carefully the direction of the sagittal suture and the exact presenting point with reference to the two fontanelles at each successive examination during the labor. Vaginal examinations have deliberately been made as frequently as necessary when exact information on these points was not available by rectal examination. During the second stage particularly, the direction of the sagittal suture was noted frequently. It was our impres-

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sion that internal rotation usually takes place while the head is descending to the pelvic floor. We, therefore, made it a particularly urgent necessity to know whether this was true. As a result of having made these careful records on some 2,900 primiparas and some 2,500 multiparas, we can now say that internal rotation is complete at the time the head reaches the pelvic floor in approximately two-thirds of all patients (hereafter referred to as "early rotation"). In something less than 30%, internal rotation is completed very shortly after the head reaches the pelvic floor. The length of time varies from as little as one uterine contraction in a multipara to as many as 10 or 12 contractions in some primiparas.° In something over 4% of all patients, rotation to the anterior does not take place. In a portion of these, rotation posteriorly to the hollow of the sacrum occurs. In another portion, partial rotation anteriorly is observed (as from an obliquely posterior position to an obliquely anterior position). The largest fraction of this 4% , however, is made up of those patients in whom no internal rotation occurs. A total of 2.6% of all primiparas and 1.4% of all multiparas fall into this latter group. It should be pointed out that not all of these patients are truly "persistent" occiput anterior or "persistent" occiput posterior. Of 100 such primiparas, 25 delivered spontaneously without any considerable delay and without harm to mother or baby. Thirty-two out of 42 similar multiparas delivered spontaneously with labor prolonged no more than a few minutes as a result of the unrotated position of the head. The remaining 75 primiparas and 10 multiparas were delivered by opera-

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	Primiparas	*Multiparas*
Early	1,827	1,734
Late-soon	347—Av. 6.6 min.	353—Av. 3.3 min.
Late—delayed (?)	564—Av. 42.0 min.	311—Av. 17.5 min.
Late—3 groups	143	100

tive means. It could well be that a considerable portion of these latter groups would have rotated and delivered spontaneously had the application of forceps or manual rotation been delayed a few more minutes. (These latter four groups of patients—those rotating anteriorly [either soon or a little later] after reaching the pelvic floor, those rotating posteriorly, those undergoing partial rotation, and those undergoing no rotation—will hereafter be referred to collectively as "late rotation.")

TABLE I

INTERNAL ROTATION

Type of Pains	*Size of Baby*	*No. of Cases and Rotation*	*Incidence of Late Rotation*
		Primiparas	
Good	Small	772 Early 374 Late	33%
	Large	229 Early 121 Late	35%
Poor	Small	592 Early 432 Late	42%
	Large	234 Early 163 Late	41%
		Multiparas	
Good	Small	716 Early 272 Late	28%
	Large	434 Early 174 Late	29%
Poor	Small	349 Early 186 Late	35%
	Large	235 Early 125 Late	35%

WHEN (AND WHY?)

As stated above, internal rotation occurs in approximately two-thirds of all patients by the time the head has reached the pelvic floor. In the remaining one-third, it occurs later or, perhaps, not at all. Whereas internal rotation has taken place during the first stage of labor in a

very small percentage of all patients, it is, for the most part, very definitely a second stage phenomenon. In this connection, several statements in a previous publication[1] will not be repeated here. The long-standing belief that only small round heads sometimes failed to undergo internal rotation is not borne out by this study. Not only does the same proportion of large heads (baby weight 3,500 grams and over) rotate, but the rotation occurs at approximately the same time, so that size of infant's head or size of infant is not a factor in this process. Similarly, failure of rotation occurs with occiput anterior as well as with occiput posterior. It is only slightly more frequent with the posterior position. Somewhat to our surprise (Table I), we found that early rotation was definitely more frequent in multiparas than in primiparas. What was even more interesting was the fact that, in this series, early rotation was considerably more common with good labor pains then it was with poor labor pains.* We thus find that multiparas with good labor pains will have early rotation in 72% of all cases. Primiparas with poor labor pains, on the other hand, will have early rotation in only 58% of all cases. Failure of internal rotation similarly occurs in only 1.2% of multiparas with good pains, and in this series was judged to have failed in 5.6% of primiparas with poor pains.

Whereas, the above findings do not definitely establish the etiology of internal rotation, it seems that we can very definitely state that parity and the character of the labor pains are definite factors in this process.

*Labor pains were said to be good, for the purposes of this study, if they occurred at intervals no longer than two minutes and of an intensity that would barely allow a slight indentation of the fundus of the uterus by the examiner's finger at the height of a contraction and at a point not directly over the body of the baby. They were said to be poor if of a longer interval or a lesser intensity, or both.

SIGNIFICANCE OF LATE ROTATION

As previously stated, the vast majority of all heads unrotated at the time the pelvic floor is reached will rotate quite promptly thereafter. In multiparas particularly, this rotation takes place during the next one or two uterine contractions. In primiparas, three to five such uterine contractions are usually necessary. In these groups of patients, this amount of delay in rotation is not evidenced in the complete pelvic floor phase of the second stage. There seems to be sufficient distention while rotation is taking place that the whole pelvic floor phase is accomplished just as quickly as though the head had been completely rotated at the time the pelvic floor was reached.

Similarly, rotation of an occiput posterior into the hollow of the sacrum and spontaneous delivery thereof, be the patient primipara or multipara, does not materially delay the completion of the delivery.

In the remaining groups, that is, those in whom internal rotation is only partly accomplished, or in whom no rotation takes place (2.6% of primiparas and 1.4% of multiparas), failure of rotation is a much more significant item

TABLE II

SECOND STAGE—PELVIC FLOOR PHASE IN MULTIPARAS

Type of Pains	*Size of Baby*	*Rotation*	*Time in Minutes*	*No. of Cases*
Poor	Small	Early	8.7	716
		Late	add 3.0	272
	Large	Early	9.5	434
		Late	add 3.5	174
Good	Small	Early	12.1	349
		Late	add 8.1	186
	Large	Early	14.7	235
		Late	add 6.6	125

in primiparas but not of serious import in multiparas. Even in primiparas, it is not of great importance if the

labor pains are good, but if the labor pains are poor, forceps delivery was thought necessary in 75% of our primiparas.

Table II shows these differences for multiparas in simple tabular form. The group of large baby, late rotation, and poor pains, should probably be looked upon as adding something like 10 or 12 minutes to the duration of the early rotation group, rather than the 6.6 minutes recorded in the table.

Table III presents the same material for primiparas. It will be observed that significant prolongation of the pelvic floor phase of the second stage is present where the labor pains are poor. It should be noted that this difference of 17 minutes observed in late rotation for small babies is, perhaps, not far from being entirely correct. Although approximately 25 per cent of the late rotations were delivered with forceps, only a very few could be said to have prolonged second stage in this operative group. Large babies with late rotation and poor pains present a considerably different picture. In this group, the labor may be considerably prolonged. The fact that we used forceps on 40% of these patients explains the apparent contradiction noted in Table III, where late rotation seemingly

TABLE III

SECOND STAGE—PELVIC FLOOR PHASE IN PRIMIPARAS

Type of Pains	*Size of Baby*	Rotation	*Time in Minutes*	*No. of Cases*
Good	Small	Early	28.7	772
		Late	add 3.7	374
	Large	Early	33.6	229
		Late	add 10.8	121
Poor	Small	Early	44.9	592
		Late	add 17.0	432
	Large	Early	61.6	234
		Late	add 9.9	163

prolongs the second stage by only 10 minutes. This figure would undoubtedly be at least 30 to 40 minutes if it were not decreased by frequent operative intervention.

Careful appraisal of Tables II and III would suggest that poor pains constitute a much more significant item than failure of rotation, which is apparently of equal importance to "large" baby as a deterrent to prompt completion of the second stage. Although no data are here included, we also know from recent careful observation that voluntary effort is at least equally important to the labor pains.

TABLE IV
FORCEPS DELIVERIES IN PER CENT

Type of Pains	*Size of Baby*	*Rotation*	*Primiparas*	*Multiparas*
Good	Small	Early	4.0%	
		Late	5.1%	
	Large	Early	4.4%	0.7%
		Late	9.1%	
Poor	Small	Early	15.5%	
		Late	24.3%	2.2%
	Large	Early	26.1%	2.5%
		Late	39.9%	6.4%

Table IV presents the data for these same groups of patients with incidence of operative delivery, all but very few of which were low forceps. From this tabulation, it would seem that operative delivery is rarely if ever necessary in multiparas, except perhaps in the group of large baby, late rotation, and poor pains, where approximately one out of 16 such patients was so delivered in this series. In primiparas, we are more and more learning that forceps are not necessary where the labor pains are good, but we are, perhaps, increasing our incidence of forceps deliveries in the presence of poor pains, particularly when the baby

is large or rotation is late. In the complete absence of rotation, our forceps incidence was 75% of that very small group of primiparas (2.6%) where the pains were poor and the baby large (1.95% of all primiparas). Even in this very small group one should not proceed to the immediate application of forceps as soon as the head reaches the pelvic floor, or even in three to five pains thereafter, as a delay of 30 to 60 minutes will produce sufficient distention of the perineal tissues that the forceps delivery will be found to be much easier than if attempted immediately. Moreover, one is frequently surprised to find that rotation does occur at the end of 30 to 40 minutes, when in the first 15 or 20 minutes it had seemed most unlikely. The old rule of "not over one hour on the pelvic floor," as stated by Litzenberg, Baer, Polak, and others, is still a pretty good rule.

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Appendix C

THE SECOND STAGE OF LABOR—THE DESCENT PHASE*†

Some years ago we endeavored to demonstrate that the first stage of labor was a very simple process, controlled by the frequency and intensity of labor pains balanced against the resistance offered by the cervix.[1] The passenger, either with respect to its size or its presentation, had no effect on the progress of the first stage. With the possible exception of ruptured membranes, nothing other than labor pains and cervix was of any major importance.

A similar study of the second stage of labor reveals quite a different situation. Here, we find a very complicated process, affected by many different considerations. Voluntary effort of the patient is of as much, if not greater, importance than the involuntary contractions of the uterus. Ruptured membranes facilitate descent, but may act as a deterrent factor in negotiating the pelvic floor. Size of the passenger is of considerable importance, particularly in primiparas. Presentation is of little importance in some respects, but a definite factor as regards internal rotation. The station at which internal rotation takes place has a definite bearing on the rapidity and ease of delivery. The frequency and intensity of labor pains are of relatively lit-

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tle moment in multiparas, but a factor of considerable importance in primiparas.

Since there are so many factors involved and since these factors are more or less interdependent, clarity of understanding will be served by discussing only one of them at this time. The remainder of this discussion will concern itself with that phase of the mechanism of labor known as descent.

The textbooks give one the impression that descent, while partial in the first stage, is a more or less continuous process during the second stage of labor. In the present series of some 2,400 primiparas and 1,700 multiparas, our findings are not quite in accord with this impression. In something over half (54%) of all patients, the head was definitely on the pelvic floor at the time the cervix receded over the head. It has been our custom to say the cervix was completely dilated only when it was also completely retracted. Very frequently, there is no descent when the cervix is seemingly dilated but still palpably present around the head. Palpation at the height of the uterine contraction will show this remaining rim of cervix to be tightly clamped against the head and to be preventing descent thereof. As soon as the cervix is retracted, the head will frequently almost fall down through the pelvis to the perineum. Conversely, the head may be on the pelvic floor for a matter of minutes or even hours before dilatation is complete. The assumption that the patient is in the second stage of labor merely because the head is on the perineum may well lead to the impression that forceps delivery will be required because of "lack of progress." In these patients in particular, it is unsafe to depend upon the finding by rectal examination, and it has been our custom for the past few years to do vaginal ex-

aminations routinely under these circumstances (i.e., head on perineum with no progress).

In this group of patients, with the head on the perineum at the time dilatation is complete, the second stage is wholly concerned with the negotiation of the pelvic floor.

In the remaining patients (something less than half of all cases in the present series), the presenting point is at a somewhat higher station at the time dilatation is completed. This station may vary all the way from approximately 1 centimeter above the pelvic floor to a point well up in the pelvis. *In this latter group of patients, descent to the pelvic floor must precede the pelvic floor phase.* This descent may require all the way from a very few minutes to as much as an hour or more. After it is completed, there then remains the pelvic floor phase, which is exactly like the whole of the second stage in the first group of patients. It has seemed advisable to us when referring to the second stage in this second group of patients to speak of "Descent Phase" and "Pelvic Floor Phase." The duration of the second stage in this group cannot be directly compared with the second stage in the first group. Failure to make this differentiation inevitably leads to inaccurate judgments as to the proper amount of progress in individual patients and, therefore, to ill-advised abstinence from operative delivery in the first group and ill-advised early interference with the second group.

ETIOLOGY OF HIGH STATION

Since more than half of all patients in this series had the head on the perineum at the time dilatation was complete, it becomes of interest to try to determine the etiology of the high station in the smaller group.

TABLE I. ETIOLOGY OF HIGH STATION

(At Onset of Second Stage)

Cervix and L.U.S.	33% factor
Unruptured membranes	15% factor
Large baby (over 3,500 Gm.)	5% factor
Occiput posterior Deflexion	Negligible
Abnormal presentation, Hydrocephalus, etc., not studied.	

One major factor (the cervix and lower uterine segment), one somewhat less important factor (the time of rupture of the membranes), and several almost negligible factors seem worthy of consideration. It is quite apparent that the cervix and lower uterine segment are much stretched and markedly thinned out before the onset of labor in a small proportion of patients. Some of these individuals are observed to "carry their babies on their heels" for the last several weeks of their pregnancies. Considerably more frequently, one observes the head descending through the pelvis during the first stage so that it may reach the pelvic floor by the time the cervix is only 5 or 6 centimeters dilated. Stretching of the lower uterine segment (and parametrial tissues?) would, therefore, seem to precede effacement and dilatation of the cervix in a small number of individuals, and to proceed apace in a considerable fraction of the remainder. Failure of stretching of the lower uterine segment and cervix would naturally prevent descent of the head until the cervix is completely dilated and, therefore, completely removed as an obstructive factor to descent. As nearly as could be judged from this present series of patients, 33% of all individuals fall into this category. In this 33% of patients, the station of the head is high at the time dilatation is complete regardless of all other factors in the individual.

The next most important consideration is the time at which the membranes rupture. Of 2,397 patients whose membranes had been ruptured previous to the completion of dilatation, 59% (1,404 patients) had the head on the perineum at the time dilatation was complete. Of 1,185 patients in whom the membranes did not rupture until after the completion of dilatation, only 44% (521) had the head on the perineum at the time dilatation was complete. That unruptured membranes can act as a deterrent to descent is particularly evident in multiparas whose pains are very poor, and who exert little or no voluntary effort. One patient in this series had complete dilatation for four hours with the head just above the pelvic floor and no progress. Rupture of the membranes was followed by birth of the baby within one minute and without a uterine contraction. The difference between 59% and 44% would suggest that late rupture of the membranes relative to the time of completion of dilatation is approximately a 15% factor in preventing early descent.

Three other clinical findings were carefully studied and found to be unimportant or of negligible weight in determining station as of the time of complete dilatation. The presenting point in 52% of primiparas was on the perineum, while in multiparas, 59% was at a low station; 53% of occiput anterior as against 51% of occiput posterior; 55 per cent of the small and medium-sized babies and 50% of the large babies (3,500 grams and over). Baby size alone, therefore, of these three factors might be considered as of minimum importance, and to be, at most, a 5% factor. If we combine the factors favorable for a low station, namely, small and medium-sized multiparas' babies, with early rupture of membranes, we find that 66% are on the perineum at the time the cervix is completely

dilated; whereas, primiparas with large babies and unruptured membranes, have only 34% on the perineum at the time the cervix is at complete dilatation. It is thus apparent that the resistance offered by the cervix is a very major factor in preventing early (first stage) descent; unruptured membranes are a considerable factor; and baby size, parity, and posterior occiput position are negligible—certainly so for the individual patient.

TABLE II

THE DESCENT PHASE

Voluntary effort	Most important
Character of pains	20-minute factor
Large baby	6-minute factor
Unruptured membranes	3-minute factor
Occiput posterior Late internal rotation Incomplete flexion	Negligible unless combined with other adverse factors

THE DESCENT PHASE OF THE SECOND STAGE

The length of time necessary for, and the factors concerned in, descent occurring in the second stage are of considerable interest (Table II). Several factors are concerned with this process, but only two are of anything like major importance. It is not yet apparent whether the relative amount of voluntary effort exerted, or the relative intensity and frequency of the uterine contractions is the more important. It is quite apparent that patients with good pains coming at frequent intervals will bring about complete descent to the pelvic floor in an average of some 12 minutes in primiparas (multiparas—six minutes). Voluntary effort is unnecessary and relatively unimportant in this situation. On the other hand, if the contractions are quite weak and infrequent, good voluntary effort is almost a necessity and will frequently produce descent in 10 to

15 minutes. With average cooperation by the patient, descent requires an average of 40 minutes, and with no voluntary effort may well require more than an hour. Since we do not have a precise method of measurement, we can only say that it is our present impression that voluntary effort is more important than uterine contractions, both with respect to the descent phase and the pelvic floor phase of the second stage of labor. This is more striking in multiparas than in primiparas.

Effectiveness of the uterine contractions can be somewhat more readily judged. Descent in primiparas with no obstructing factor and with good pains occurs in some 12 minutes. Where the pains are weak and infrequent, the pelvic floor may be reached in a few minutes, but may require 40 minutes or more. The average in most such groups is 30 to 35 minutes. For purposes of comparison with the other factors involved, the labor pains could, therefore, be said to be a factor of 20 minutes or more.

Perhaps next most important is the size of the baby (occiput presentations only are being considered in this paper, and abnormal presentations are, therefore, automatically excluded). In primiparas, babies of 3,500 grams and over, require on the average some six minutes more for completion of descent (multiparas three minutes) than the average of small and medium-sized babies. Marked variations are observed, and it is not infrequent that large babies apparently descend more rapidly than small ones. These figures quoted are, therefore, to be looked upon only as averages or general tendencies. On this basis, largeness of baby could be said to be a six-minute factor.

In this group of patients, it was noted that if internal rotation took place during descent, that descent was completed on the average more rapidly than if internal rota-

tion did not occur until after the presenting part was definitely on the perineum. Here again, the differential was about six minutes for primiparas, and three minutes for multiparas. This series is not sufficiently large for us to be certain whether this differential does not represent inadvertent selection. It may well be that some factor which inhibits internal rotation during descent also inhibits descent itself; as for example, the large size of baby above noted. In this connection, it was supposed by us that moderate degrees of deflexion would be found to be of considerable importance. Again, the size of the present series does not enable us to be certain that such is the case. At present, it would seem that deflexion of the head does not materially inhibit descent except when associated with large babies, and that it then does not particularly magnify the inhibition characteristic of the large-sized infant.

Occiput posterior descends as rapidly as occiput anterior, if the baby be of small and medium size. In the present series, occiput posterior averages for some rather large groups are actually less than occiput anterior averages. The large baby, however, with occiput posterior will show an average in excess of that of exactly comparable occiput anterior groups. The differential is four to eight minutes for primiparas, and zero to six minutes for multiparas. It would seem to us that occiput posterior as a deterrent of descent, can be entirely neglected in the individual patient, as the effect is too inconstant for individual patient consideration.

If the membranes are ruptured previous to the completion of dilatation and the head still remains high until dilatation is complete, it was found by us that descent was more rapid in the second stage than if the membranes were still intact while descent was taking place in the sec-

ond stage. The differential here is approximately four minutes with good pains and as much as eight minutes for exactly comparable groups whose pains are poor. Previous rupture of the membranes, therefore, facilitates descent. It is interesting, however, that all this advantage is lost after the head reaches the perineum, and the total time consumed by the descent phase and the pelvic boor phase (combined) becomes exactly the same for those with early and those with late rupture of the membranes.

Failure of descent was observed only twice in this series. There was no instance of contracted pelvic inlet interfering with descent. One patient cared for during this period had a pelvis sufficiently small that elective cesarean section was done. Some five or six patients had sufficiently small pelvic outlets that there was delay in the pelvic floor phase. In no instance was this of serious degree. The obvious delay produced by abnormal presentations, such as bregma or brow, is not discussed here, as these abnormal presentations were not included in this study. Hydrocephalus occurring during this period happened to be associated with brow presentation in every case. There were observed one case of markedly delayed descent and one case of failure of descent. The marked delay was brought about by a huge amount of scar tissue in the pelvis following a previous ischiorectal abscess. The failure of descent was the result of the baby being suspended in a loop of its own umbilical cord. After many hours of failure of descent, a high median forceps delivery resulted in rupture of the cord followed by an extremely easy forceps extraction. Complete failure of descent is so rare in our experience that we have come to the rather firm conclusion that apparent failure of descent or apparent delay in descent is almost exclusively due to the fact that the

cervix is not yet quite completely dilated. It is, therefore, a rule in our clinic that if the head is not on the pelvic floor within 30 minutes of the time dilatation was thought to be complete, a vaginal examination is to be done. This will nearly always reveal a rim of cervix still holding the head at a high station. The patient is, therefore, still in the first stage of labor, and the second stage has not begun.

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Appendix D

THE SECOND STAGE OF LABOR*

NUMBER OF PAINS

Some years ago, we suggested to our house staff that whenever there was doubt as to completeness of dilation of the cervix, a vaginal examination, under aseptic technique, should be done. This resulted in a lessened frequency of prolonged second stage in our clinic. There was still remaining, however, a higher incidence in the clinic patients than was being observed in our private patients. We, therefore, made it a rule that a vaginal examination should be done when the head did not reach the pelvic floor within 30 minutes after the cervix had been thought to be completely dilated. (We had always operated in the belief that the cervix should not be considered to be completely dilated until it had completely retracted over the head.) It was very apparent, after the initiation of the above rule, that the final stages of cervical retraction were often very slow in the presence of poor labor pains in primiparas. It was also very apparent that a partially retracted cervix could not be palpated, in the anterior half of its circumference, by rectal touch.

Another survey of our records, a little more than a year ago, showed an almost complete absence of prolonged

*Read at the seventy-first annual meeting of the American Gynecological Society, Williamsburg, Virginia, May 24 to 26, 1948. Reprinted from *Am. J. Obst. & Gynec.*, 57:1, pp. 106-112, January, 1949. Also *Tr. Am. Gynec. Soc.*, *LXXI*:1183-189, 1948.

second stage. There was still, however, a marked variation in the duration of this part of the labor. While most of the patients, both primiparas and multiparas, had a quite short second stage, there was still a considerable number of primiparas in whom the second stage exceeded one hour. A survey of the latter group, separated from the larger fraction of the patients, showed a remarkably high incidence of long interval between pains (four to as much as eight minutes). We immediately wondered whether the prolonged second stage could not be partially explained on the basis of this long interval. We had previously found[1] that intensity of uterine contractions was a highly important item in the duration of the second stage. It is quite apparent to everyone that pains of good intensity are usually close together. It is also evident that pains at infrequent intervals are usually of poor intensity. Since there is no simple method of measuring intensity of uterine contractions accurately,* it was difficult to tell whether intensity or frequency was the more important consideration. The very fact that the results were measured in minutes introduced a third variable—time. It occurred to us, therefore, that we should, perhaps, try to eliminate both the frequency factor and the time factor from our consideration. This could very readily be done, if we noted the intensity of the pains, and then counted the number of pains, and used as our measure of the duration of the second stage the number of pains, instead of the number of minutes. This is very logical, since 15 pains at four-minute intervals, thereby consuming one hour, should not logically be expected to accomplish more than 15 pains at two-minute intervals, which would consume only

*We have called contractions during which the uterus cannot readily be indented at the height of a contraction as "good," in comparison with contractions during which the uterus is readily indented, which we have called "poor."

half as much time. It should be noted here—somewhat parenthetically—that 15 pains at one-minute intervals do not actually accomplish as much as 15 pains at two-minute intervals. This is probably due to an insufficiently long period of relaxation, and might be considered as subclinical tetany.

In the last year and a half, since the above plan was adopted, the vast majority or our records contain the number of pains, in addition to the previous data theretofore included. Not always has the vaginal examination been made, although there has developed somewhat of a tendency to examine most patients by vagina if the head does not reach the perineum immediately after the cervix is thought to be dilated. We have not discouraged this tendency, because, in a teaching clinic, we feel it highly important to impress upon everyone that such is the normal course of events.

TABLE I
STATION AT COMPLETION OF DILATION

		On Pelvic Floor		*Above*	
No. of Patients		*No.*	*Per Cent*	*No.*	*Per Cent*
Primiparas	790	558	71	232	29
Multiparas	1178	909	77	269	23

Among 790 primiparas with occiput presentations (Table I) the head was found to be on the pelvic floor at the time the cervix was completely dilated in 558 patients (71%). In 59 others, the head reached the pelvic floor either before or during the course of the next uterine contraction. In other words, the head was on the perineum at the time the cervix was dilated, or with the next pain, in a total of 617 out of 790 primiparas (78%). Similar figures for multiparas showed 909 of a total of 1178 on the perineum at the time the cervix was dilated (77%). One

hundred and sixty-four others reached the perineum on or before the completion of the next contraction. A total, then, of 1073 of the 1178 multiparas had the head on the perineum at the completion of dilation, or within one pain thereafter (91%). One cannot help but wonder whether the strictly normal course of events does not call for the head being on the perineum at the time the cervix is completely dilated. One cannot, however, reason conversely that the head on the perineum means complete dilation, as we see a definite percentage of our patients with the head on the perineum for a considerable time before the cervix is completely retracted. Two to 3% of all patients show this. In one group (primiparas with poor first-stage pains), 8% will have the head well down on the perineum by the time there is 7 to 9 cm. dilation.

We have previously urged[2] that the second stage be considered as being composed of two phases: one, a descent phase, and two, a pelvic floor phase. From the above, it is quite apparent that at least 70 odd per cent of both primiparas and multiparas have the head on the perineum at the time the cervix is completely dilated. These patients have only a pelvic floor phase in the second stage. The remaining 20 odd per cent, of both primiparas and multiparas in this present series, did not bring the head to the pelvic floor for a variable time after the cervix was completely retracted. As will be shown, the number of pains required to complete this descent phase varied from none to 10. Following completion of descent, these patients then had the same pelvic floor phase characteristic of the larger group. The total duration of the second stage for this smaller group, who had both a descent phase and a pelvic floor phase, cannot logically be compared directly with the total duration of the larger group, which had only a pelvic floor phase.

TABLE II
PRIMIPARAS, DESCENT PHASE

Number of pains	*0-1*	*2-4*	*5-10*	*Over 10*
Good pains	32%	37%	31%	
Poor pains	23%	42%	33%	2%

Study of the descent phase in the 232 primiparas (Table II), showed that the descent was a bit more rapid with good pains than with poor ones but that, even with poor pains, all had reached the pelvic floor in 10 pains or less. Two per cent—a total of three patients only—according to the records, showed 13, 15, and 20 descent-phase pains, respectively. In none of these three patients were the pains actually counted, but only "estimated," and in none of the three was a vaginal examination done. Critical review of these three records would seem to indicate that only the last one of the three probably had more than 10 pains to reach the pelvic floor. In the 269 multiparas (Table III), the vast majority had reached the pelvic floor within six pains, and all save two patients had reached the pelvic floor within 10 pains or less. One of these two patients was "estimated" to have had 14 contractions in her descent phase, and the other one 16. No vaginal examination was made in the first, and the record is uncertain as to whether a vaginal was made in the second. Assuming that the second patient did actually have more than 10 pains in her descent phase, we then have one primipara out of 790 and one multipara out of 1,178 who required

TABLE III
MULTIPARAS, DESCENT PHASE

Number of pains	*0-1*	*2-4*	*5-10*	*Over 10*
Good pains	67%	29%	4%	
Poor pains	57%		13%	1%

more than 10 pains to reach the pelvic floor after complete dilation of the cervix.

As stated above, the pelvic floor phase of those patients having a descent phase was in no way different from the larger group, who had no descent phase. The 1,174 multiparas (Table IV) were found to have completed the pelvic floor phase in the vast majority of cases in about three pains, and in virtually all instances in 10 pains. Again, good pains accomplished the end result more quickly than poor pains, but the difference between good pains and poor pains was not nearly so marked as we had previously thought, further emphasizing the value of pain measurement over minute measurement. Eight patients only (less than 1% of the total), according to the records, required more than 10 pains. (One patient, previously delivered by cesarean section and, therefore, a primipara for purposes of this discussion, was also inadvertently included in Table IV.) Six of these eight patients were said to have had 12, 13, 13, 14, 14, and 15 pains, respectively. The duration in minutes of the second stage in these same patients was 20, 20, 24, 28, 28 and 30 minutes. In most instances the pains were not actually counted, but the number only estimated.* In at least three of the six patients, no vaginal examination was done. In three cases, the

TABLE IV

MULTIPARAS, PELVIC FLOOR PHASE

		0-3		4-6		7-10		Over 10	
Number of pains		*No.*	*Per Cent*	*No.*	*Per Cent*	*No.*	*Per Cent*	*No.*	*Per Cent*
Good pains	602	470	78	100	17	31	5	1	1
Poor pains	572	386	67	135	24	43	8	8	1

*While the house staff has been very diligent in counting the pains, it is only natural that they should forget occasionally. As a matter of fact, interne and resident usually keep separate count, and when they disagree, an estimate is the result.

pains were said to be one to one and one-half minutes apart, which, as noted above, is not a desirable situation. It seems doubtful whether any of these six patients had materially more than 10 pains in her pelvic floor phase. The remaining two patients certainly had more than 10 pains.

One, a 25-year-old gravida ii, para i, had the head on the perineum three minutes after completion of dilation (one pain), and delivered spontaneously 36 minutes later, after 18 pains. She was normal in all respects; the baby weighed 3,640 Gm.; and the head was completely rotated at the time the head reached the pelvic floor. She was said to have had "very poor" pains. She had been given 2.5 mg. of pontocaine in 0.5 cc. of 10% glucose intraspinally. We do not feel that this minimal dose saddle block materially reduces the effectiveness of second stage pains, but, like any other anesthetic, it does have some effect. The other patient, a 30-year-old gravida ii, para i, required 35 minutes (10 pains) to reach the pelvic floor, at which time the head rotated posteriorly and was delivered after 29 very poor contractions with the aid of low forceps. (It should, perhaps, be stated here that forceps were used only five times in the delivery of the 1,174 multiparas.) According to this patient's history, this pregnancy terminated at the end of 33 weeks, and the attendant was quite surprised to find the baby weighed 3,100 Gm. This was quite readily explained, however, when it was noted that the placenta weighed 780 Gm. The infant did, throughout the neonatal period and for a considerable time thereafter, react like a premature infant—required incubator care, etc. While it is, therefore, possible for a multipara to require more than 10 pains to deliver the baby over the perineum, it is of rare occurrence in this present series.

TABLE V
PRIMIPARAS, PELVIC FLOOR PHASE

Number of Pains		0-10		11-20		21-30		Over 30	
		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Good pains	302	242	80	60	20				
Poor pains	488	269	55	175	36	39	8	5	1

The survey of the pelvic floor phase in primiparas also produced very interesting data. Three hundred and two of these primiparas (Table V) were said to have good second stage pains. Two hundred and forty-two (80%) of these were delivered within 10 pains or less. The remaining 60 (20%) were delivered in most instances in 15 pains or less, and in all cases within 20 pains or less. Only five of the 302 patients had forceps deliveries, thus reflecting our previously gained confidence that primiparas with good pains will promptly deliver themselves spontaneously. Two of these five forceps cases might have had a few more than 20 pains had the forceps not been used. One can, however, say very confidently that all primiparas, with good pains, will deliver themselves over the perineum in 20 pains or less.

Four hundred and eighty-eight primiparas were said to have poor second-stage pains. A little more than half of these patients were delivered in 10 pains or less. Another 36% were delivered in the second 10 pain period. Eight per cent required 21 to 30 pains, and 1%—five patients—required more than 30 pains. Three of these five patients were eventually delivered with forceps, and all of them required more than an hour, except one, who was delivered at the end of 46 minutes. The incidence of forceps in this poor-pain group is as follows: of the 269 patients delivered in the first 10 pains, 39 were delivered with forceps; and 17 of the 175 in the 11 to 20 pain group

were similarly managed. This relatively higher rate of forceps exhibition is the result of our previously gained impression that primiparas, with very poor pains, are quite unlikely to deliver themselves spontaneously in a reasonable period of time. This present study has gone a long way toward establishing the contradiction of that idea, since 444 (less a few of the forceps cases) are shown to have delivered themselves within 20 pains or less. Of the remaining 44 patients, 39 were delivered between 21 and 30 pains, six of these by forceps. Five had more than 30 pains, and three of the five were delivered by forceps. It seems, on the basis of this study, that it is rather futile to expect a patient to deliver herself spontaneously if she has not done so within 30 pains. It should be noted, however, that the five patients having more than 30 pains in this present series constitute only 1% of those having poor pains, and slightly more than half of 1% of the total number of primiparas. Similarly, it might be noted that the 44 patients having more than 20 pains constitute about 5% of the total number of primiparas.

DISCUSSION

In other words, the primipara, with pains at two-minute intervals, will nearly always have delivered herself within 40 minutes. The primipara, with pains at three-minute intervals, can be expected to deliver herself within one hour. The primipara, with pains at four-minute intervals, will naturally require up to 80 minutes, even if the individual pains are of good intensity.

CONCLUSIONS

1. Complete retraction of the cervix as a measure of the end of the first stage, or of the beginning of the second,

leads to a better understanding of the physiology of the second stage and a better clinical judgment of its progress.

2. Measurement of the duration of the second stage by number of pains, rather than by number of minutes, is more logical and, in our hands, a much more satisfactory method of measurement.

3. Most primiparas can be expected to deliver themselves spontaneously, after the head reaches the perineum, in 20 pains or less.

4. A simple second-stage formula might be stated as follows:

All patients, primiparas and multiparas, will complete their descent phase in 10 pains or less.

All multiparas will complete their pelvic floor phase in 10 pains or less.

Primiparas, with good pains, will complete their pelvic floor phase in 20 pains or less. Primiparas, with poor pains, will complete their pelvic floor phase, in nearly all cases, in 30 pains or less.

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Appendix E

FACTORS GOVERNING BLOOD LOSS IN THE THIRD STAGE OF LABOR*

(A PRELIMINARY REPORT)†

One of the many unexplained facts in obstetrics is the marked variability in the loss of blood in the third stage of labor. Obviously more definite knowledge of the factors underlying this variation is highly desirable. The present study, of which this paper is merely a preliminary report, contemplates the determination of some of these factors and the laws governing their operation. There were available for this study 868 consecutive deliveries past the 30th week. Fifteen of these patients were delivered by cesarean section, leaving 853 cases delivered vaginally and hence suitable for this investigation. The average blood loss in this group of 853 cases was 222 cc. This average compares very favorably with others published in the literature. DeLee and Hirst each estimate an average of 250 cc. Williams computed the average of 1,000 cases and found it to be 344 cc. Ahlfeld's average on 2,058 cases was 505 cc. Other averages include those of Champneys (300 cc.), Tucker (300 cc.), Commandeur (500 cc. to 600 cc.), and Tarnier and Chantreuil (600 cc. to 700 cc.).

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

†Reprinted from *Am. J. Obst. & Gynec., XVII*:14, p. 578, April, 1929. Also *Tr. Am. A. Obst., & Gynec., Abd. Surgs., XLI*:136-141, 1928.

Not only do the several averages show a considerable variation, but the range of the individual series is also quite variable. Our cases ranged from zero to 1500 cc. Williams' 1000 cases ranged from zero to 2400 cc. Ahlfeld reported one case with a loss of 3250 cc. followed by recovery. This element of variability is so great that we have not had, in the past, a satisfactory definition of what should be regarded as normal loss and what should be looked upon as pathologic. An arbitrary limit of normal has been set by three different writers. DeLee and Hirst place this limit at 500 cc.; Williams at 600 cc. Eighty-seven per cent of Williams' cases were under 600 cc. As far as our series is concerned 600 cc. would seem to be about the proper limit of normal. Ninety-six per cent of our cases lost less than 600 cc.

Our technic of measurement of the blood loss is as follows: At the first show of blood, after delivery of the child, a sterile hand basin is placed against the perineum between the vulva and anus. The placenta and associated blood are caught in the basin. The basin is held in place until the active bleeding has been controlled. The blood in the pan is then measured in a graduate and is labeled the measured loss. In the majority of cases there is other bleeding previous to the placental stage, either from laceration or episiotomy, or subsequent to it from imperfect contraction of the uterus, injuries to the birth canal, etc. This amount is estimated, care being taken not to underestimate it. This second portion is called the estimated loss. While theoretically the method employed in arriving at this latter amount is subject to error it is believed to be accurate to 25 cc. on the average. It was selected in

preference to the more accurate method of Williams because of the desire to separate the placental stage blood from other bleeding, as different factors might be involved in the two types. The sum of the measured loss and the estimated loss equals the total loss. Analysis of each of the three values has been made. Williams' method is as follows: "Immediately after the birth of the child a sterile douche pan is placed under the buttocks of the patient where it remains until all bleeding following the birth of the placenta has ceased. The entire amount is then poured into the graduate, accurately measured in cubic centimeters and noted in the history."

Certain types of cases in the series of 853 were found unsuitable for inclusion in an analysis of normal labors (Table I).

TABLE I

	Cases	*Average cc.*
Placenta previa	22	351
Hydramnios, myoma uteri, retained placenta, etc.	5	410
Median (and high) forceps	12	428
Third degree lacerations	3	358

Excluding this group of abnormalities there were 809 cases remaining for analysis (average blood loss 213 cc.). Of these 533 were white women with an average blood loss of 223 cc., and 276 were colored women with an average loss of 198 cc.

Certain other types of abnormalities and complications were included in the analysis because the average blood losses were not materially different from the general average (Table II).

TABLE II

	Cases	*Average cc.*
Slightly More Than Average Blood Loss		
Toxemia of pregnancy	61	261
Deformed pelvis	23	245
Low forceps	53	292
Version, combined podalic	17	232
Breech presentation	31	233
Slightly Less Than Average Blood Loss		
Twin pregnancy	9	203
Syphilis	41	193
Anemia, severe	10	170
Bag, Voorhees'	17	185

Analysis of the 809 cases, including those in Table II, was first made. It was further noted, however, that the type of laceration received has some effect upon blood loss.

First degree laceration	273 cases	199 cc. average
Second degree laceration	116 cases	240 cc. average
Episiotomy	72 cases	272 cc. average

Wishing to eliminate all possibility of the effect of abnormality on the coefficients, a second set of analyses was made on the 516 strictly normal cases. (By strictly normal we mean not more than first degree laceration, no complication, and no operative procedure.) The average blood loss in this group of 516 normal cases was 207 cc.

Further refinement by classes or groups was not possible because of the small size of the present series, although it was noted that:

Private	cases had an average blood loss of 235 cc.
White ward	cases had an average blood loss of 225 cc.
Colored ward	cases had an average blood loss of 200 cc.

Moreover the work of the interne is not negligible. Fourteen consecutive internes, each serving three months, showed:

In the first	month an average loss of 238 cc.
In the second	month an average loss of 223 cc.
In the third	month an average loss of 211 cc.

This was in spite of the fact that the resident or a visiting man was present at each delivery.

Pearson's coefficient of correlation has, so far, been used exclusively in these analyses.*

The results of the first series of correlations (on the whole group of 809 cases) are listed in Table III.

TABLE III

CORRELATIONS (ALL CASES)

Age of mother	−0.007 ±0.024
Parity	−0.056 ±0.024
Length of gestation	+0.140 ±0.029
Conjugata vera	+0.062 ±0.026
First stage of labor	+0.067 ±0.025
Second stage of labor	+0.127 ±0.024
Third stage of labor	+0.118 ±0.024
Height of mother	+0.119 ±0.029
Weight of mother	+0.162 ±0.030
Length of baby	+0.180 ±0.025

From Table III one might draw the following deductions:

1. The age of the mother has no effect on the blood loss.

2. Parity probably has no effect, as the coefficient, besides being small, is hardly more than twice its probable error.

3. Length of gestation beyond the 30th week has a definite though small effect, as the coefficient is more than four times its probable error. This coefficient is, however,

*Coefficient of correlation $(r) = \frac{\Sigma xy}{N\sigma x\sigma y}$ where x, y are deviates from the mean of X, Y; N is the number of cases, and $\sigma x \sigma y$ are the standard deviations of the means of X, Y. This coefficient is very satisfactory because of its applicability to partially correlated biologic phenomena. When the two variables are perfectly proportional to each other, the coefficient is plus 1.0; when they bear no reation, one to another, the coefficient is 0.0; and when they are in perfect inverse proportion to one another, the coefficient is minus 1.0. Any value between zero and plus 1.0 indicates a direct proportion correlation, and any value between zero and minus 1.0 indicates an inverse proportion correlation. It is very rare in biologic phenomena to find correlations greater than plus 0.5 or minus 0.5.

smaller than that for the length of the baby, and so the effect of the length of gestation is to be explained on the basis of a co-existent increase in height of the child.

4. The size of the pelvis has but little if any effect on the blood loss. The coefficient is only slightly more than twice its probable error. The same seems to be true of the length of the first stage of labor.

5. The length of the second and third stages of labor would seem to have some effect on the blood loss, as their coefficients are more than four times the probable errors. The same might be said of the height of the mother.

6. The weight of the mother shows a larger coefficient, more than five times its probable error, and shows a definite effect in direct proportion on the blood loss.

7. The size of the child seems to be the most important factor of this group, affecting the blood loss in direct proportion.

When we come to the consideration of the coefficients for the series of 516 normal cases we find in Table IV:

TABLE IV

CORRELATIONS (NORMAL CASES ONLY)

First stage of labor	$+0.101 \pm 0.032$
Second stage of labor	$+0.060 \pm 0.032$
Third stage of labor	$+0.070 \pm 0.032$
Height of mother	$+0.109 \pm 0.037$
Weight of mother	$+0.130 \pm 0.040$
Length of baby	$+0.139 \pm 0.032$

1. The length of the first stage of labor appears of more importance than that of the second or third stage but none of them are particularly significant.

2. The height and the weight of the mother still show coefficients of about the same magnitude, but because of the small size of this series their probable errors are larg-

er, and their significance must remain somewhat in doubt until a larger series can be analyzed.

3. The length of the baby has a coefficient which is more than four times its probable error. This coefficient must, therefore, be regarded as significant.

Determination of the coefficients for the component parts of the total blood loss shows a rather significant result in Table V.

Very evidently the measured loss is the part affected both by the size of the baby and weight of the mother.

None of the above factors show a marked effect on the blood loss. Several of them seem to have a small effect. Analysis of a series of at least 4000 cases will reduce the probable errors to such a point that more definite conclusions can be drawn. Further search for other factors such as the size and weight of the placenta, blood volume of the mother, coagulation elements of the mother's blood, and blood pressure, must be made.

TABLE V

CORRELATIONS (NORMAL CASES ONLY)

Total blood:	Length of baby	$+0.139 \pm 0.032$
Measured blood:	Length of baby	$+0.175 \pm 0.133$
Estimated blood:	Length of baby	$+0.075 \pm 0.134$
Total blood:	Weight of mother	$+0.130 \pm 0.040$
Measured blood:	Weight of mother	$+0.144 \pm 0.040$
Estimated blood:	Weight of mother	$+0.001 \pm 0.042$

If definite knowledge of the physiology of blood loss can be acquired, it may be possible to determine the etiology and nature of the excessive bleeding in the various types of cases where hemorrhage so frequently occurs.

At this point in the study the following conclusions seem justified:

1. Pearson's coefficient of correlation affords an excellent medium for this type of investigation.

2. Age of the mother has no effect on the blood loss at delivery. Parity has little or no effect.

3. There is a direct proportion between the length of the baby and the blood loss (most marked in the measured loss). This effect is definite but not large.

4. The height and weight of the mother probably affect the blood loss in direct proportion.

5. No one of the factors studied exerts a major effect on the blood loss. Further decrease in this amount must, therefore, come through improved management of the third stage.

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Appendix F

THE THIRD STAGE OF LABOR*

RELATIONSHIP OF BLOOD LOSS TO PRECEDING LABOR PAINS

In three previous communications[1, 2, 3] the author has attempted to present an accurate knowledge of the physiologic factors governing the amount of blood loss in the third stage of labor and, thereby, to arrive at a more logical management of the parturient woman. This fourth contribution in the series is prompted by the well-established belief throughout the profession that prolonged labor due to poor labor pains, and secondary inertia due to exhaustion, are both likely to be followed by a large blood loss in the third stage because of the continued inability of the uterus to contract sufficiently to stop oozing from the maternal blood sinuses. The latest edition of Kerr and Ferguson's *Textbook*[4] italicizes the sentence, "We are absolutely satisfied that the three important causes of postpartum hemorrhage are faulty management of the third stage, unduly prolonged labor, and large doses of anesthetic and sedative drugs." DeLee's *Obstetrics*[5] states, "An exhausted uterus . . . may be attended by bleeding." Inasmuch as our experience has not been in agreement with these and many other similar statements in the obstetric literature, we are submitting the following sum-

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mary of the relation between the character of the labor pains in the second stage and the amount of blood loss in the third stage. Inasmuch as the tonicity of the uterus sometimes changes as labor progresses, it was felt that a study of the correlation between second stage labor pains and blood loss would be more significant than the correlation between first stage pains and blood loss. There were available for this study some 700 consecutive labors in which full data as to the character of the pains and the amount of blood lost are available. The blood loss has been *measured and recorded* in the same manner as previously described.[1] The labor pains were analyzed and classified with respect to their frequency, duration and intensity. The intensity was determined by noting the degree of hardness of the uterine wall at a point on the fundus not directly over the body of the baby as described in a previous communication.[6]

The information thus obtained was collected and classified as in Tables I and II. The results are quite apparent. In Table I it is quite evident that neither duration nor intensity of the individual pain has any effect whatever on the amount of blood lost in the third stage.

TABLE I

THIRD STAGE BLOOD LOSS IN RELATION TO SECOND STAGE LABOR PAINS
MULTIPARAS

Frequency of Pains		
Less than two minutes apart	47 cases	185 cc. average
Two minutes or more apart	196 cases	152 cc. average
Duration of Pains		
Thirty seconds or less	89 cases	153 cc. average
Thirty-five seconds or more	129 cases	165 cc. average
Intensity of pains		
Weak contractions	67 cases	165 cc. average
Moderate or strong	190 cases	161 cc. average

TABLE II

THIRD STAGE BLOOD LOSS IN RELATION TO SECOND STAGE LABOR PAINS
PRIMIPARAS

Frequency of Pains		
Less than two minutes apart	61 cases	136 cc. average
Two minutes or more apart	317 cases	198 cc. average
Duration of Pains		
Thirty seconds or less	160 cases	216 cc. average
Thirty-five seconds or more	180 cases	155 cc. average
Intensity of pains		
Weak contractions	123 cases	255 cc. average
Moderate or strong	270 cases	155 cc. average

At first glance it would seem that the frequent labor pain was conducive to a slightly greater blood loss (30 cc.) than results when the pains are farther apart. This apparent small difference is probably not significant. The chance occurrence of one or two rather large losses in the small group of 47 patients could well account for the slight difference noted.

Similar data on primiparas, Table II, shows a somewhat different picture. Here we find that poor labor pains are attended with greater blood loss than that noted with good labor pains. This is true whether we consider the frequency, the duration, or the intensity of those pains. Infrequent labor pains are followed by a 50% greater blood loss than is present when the pains are close together. Short labor pains show a similar increase in blood loss when compared with long labor pains. It would seem that the intensity of the contraction is even more important, as here we find a difference of 100 cc., on the average, between moderate or strong pains on the one hand and weak contractions on the other.

Why primiparas should show this characteristic when it is not present in multiparas we are, as yet, unable to ex-

plain. It was thought that perhaps the greater incidence of episiotomy and deep second degree laceration might be a factor. Reassembly of the case records and analysis thereof, making full correction for both episiotomy and deep laceration, failed to substantiate this supposition, as it was found that no part of the difference could be ascribed to this cause. Operative delivery is somewhat more frequent in this "poor pain" group than when second stage pains are good, but, as previously reported,[1] operative delivery is not attended with as much difference in blood loss as that indicated in Table II due to the difference in the character of the labor pains. We use less anesthesia in spontaneous deliveries when the pains are poor than when they are good. Corrections for anemia and for such abnormalities as placenta previa, both of which occur more frequently in primiparas than in multiparas, were also made and found to have no effect on these averages shown in Table II. We are, therefore, unable to explain why primiparas do show this difference in blood loss definitely correlated with the character of second stage labor pains while multiparas fail to show a similar correlation. Perhaps it is something inherent in the primipara. Our previous studies[2] have shown that primiparas do not lose appreciably more blood than multiparas. We have been able to indicate[1] that there is no appreciable correlation between the duration of the labor (either first, second, or third stage) and the amount of blood loss. The only distinct difference between primiparas and multiparas which we are able to offer as an explanation at the present time, is that noted in our second communication with reference to the difference in blood loss produced by differences in the size of the baby and the size of the placenta in primiparas as contrasted with multiparas. It was noted in the Litzenberg series of cases that

the large baby and the large placenta both produced a much greater increase in the blood loss in primiparas than did these same factors in multiparas. Whether large babies or large placentas are more conducive to poor labor pains in primiparas than in multiparas we do not yet know. Our "clinical recollection" would indicate this to be true, but clinical recollection with respect to labor has been so often proved in error that we hesitate to offer this as an explanation until further analysis of actual, carefully collected, records can be made.

It might be well to point out that this communication does not consider "exhaustion states" of the whole organism whether due to the labor or to general body disease. Assuming that any "uterine exhaustion" would be reflected in the uterine contractions, we have studied these contractions in their relationship to blood loss. Whereas, this is not a study of anesthetics, we recognize the importance of proper anesthesia and have routinely employed nitrous oxide-oxygen analgesia with as short anesthesia as possible. Proper management of the third stage of labor[3] dictates that one should discontinue the anesthetic immediately following delivery of the child and re-employ it for repair of lacerations after delivery of the placenta and after establishment of good uterine tone.

SUMMARY

In our previous communications we have shown that parity of the mother has no effect on the blood loss in the third stage. Length of labor has also been shown to have no influence. The episiotomy adds about 60 cc. of blood on the average blood loss. The relative loss with a large baby or a large placenta is about 100 cc. more than with a small baby or small placenta. We have noted here in

primiparas a difference between good pains and poor pains of about 60 to 100 cc.; so that, while each of these factors is a definite one, it is relatively unimportant when compared with the difference between poor management and good management of the third stage (200 to 400 cc. on the average). It might, therefore, be well to change Kerr and Ferguson's statement so that it would read, "We are absolutely satisfied that the two important causes of postpartum hemmorrhage are faulty management of the third stage and large doses of anesthetic and sedative drugs."

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Appendix G

MANAGEMENT OF THE THIRD STAGE* OF LABOR†

THE PROPER management of the third stage of labor has received comparatively little real investigation either by research workers or by clinicians. Numerous studies of postpartum hemorrhage have been made, and considerable progress toward prevention and improved treatment has resulted. Almost without exception, however, various writers have failed to recognize that a large proportion of all obstetric patients offer the opportunity to prevent moderate hemorrhage. One textbook on obstetrics lists some 25 possible causes for postpartum hemorrhage and then goes on to say that a fairly large proportion of cases of hemorrhage do not fall into any one of these 25 categories. In other words, hemorrhages can and do occur in the absence of any one of the known causes. Moreover, a comparatively large loss of blood (not enough to be classified as "hemorrhage") is frequently passed by without much thought as to its etiology. There can be but one conclusion: The technic of management of the third stage of labor, as generally practiced, is deficient with respect to its control of blood loss. Litzenberg has

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taught that 90% of postpartum hemorrhages are preventable, the inference being that the occurrence of postpartum hemorrhage is presumptive evidence of faulty management. My purpose in this paper is to show not only that 90% of postpartum hemorrhages can be prevented but to show that 90% of moderate losses of blood can be reduced to a minimum and that not over 10% of all patients should lose in excess of 300 cc. of blood in the third stage of labor. The importance of reducing blood loss and the consequent saving in mortality and morbidity is so evident that it requires no further emphasis.

Various estimates and (or) averages have been quoted in the literature covering the general experience of blood loss in various clinics. These figures are not entirely convincing because of the lack of description of the method of arriving at the amount of blood, and it remained for Williams[1] to point out the necessity of actually measuring the blood loss if one is to have any real idea as to the results. Williams' technic is as follows: "Immediately after the birth of the child, a sterile douche pan is placed under the buttocks of the patient, where it remains until all bleeding following the birth of the placenta has ceased. The entire amount is then poured into a graduate and actually measured in cubic centimeters and noted in the history." Litzenberg has further improved on this technic to the extent that he recognizes that not all the blood can be caught in a pan and that the linen, sponges and the like will naturally remove a considerable additional amount that cannot be measured in a graduate. This additional amount is estimated and added to the collected blood, and the whole amount, thus arrived at, recorded on the chart. One cannot emphasize too strongly the importance of both measuring and recording the amount of blood lost,

as without this practice one regards the loss at only one-third to one-half the actual figures.

Williams[1] reported 1,000 consecutive spontaneous deliveries at full term with an average loss of 343 cc. of blood. He purposely eliminated the operative deliveries and premature deliveries and, by so doing, presented figures that do not represent a true cross section of all deliveries. Three thousand and two cases from Litzenberg's clinic, previously reviewed,[2] demonstrated an average blood loss of 462 cc. This series included operative deliveries and premature deliveries as well as normal full term deliveries and, therefore, more nearly represents a true cross section of obstetric experience. This average figure also included the "estimated" in addition to the "measured" loss of Williams. It is quite in line with De Lee's estimate of 500 cc., Ahlfeld's 500 cc. and Tarnier's 600 cc.

It is probably fair to assume that in most clinics some part of the 500 cc. is due to the fact that most of the patients in such clinics are delivered by interns or younger residents. Physicians have quite generally assumed that their own figures would be more favorable because of their skill and experience. In 1,157 privately conducted labors and employing the Williams technic of blood measurement, Plass[2] had an average loss of 317 cc. This figure, however, is not directly comparable with Williams' average of 343 cc. because Plass did not exclude from his series operative deliveries or premature deliveries. Whereas the difference between his average and that of Williams is only 26 cc., the actual saving is probably in the vicinity of 50 cc. due directly to the skill of the attendant. Fifty cubic centimeters subtracted from the average blood loss of 450 or 500 cc. is an appreciable but not a phenomenal

ly all authors recommend that the placenta be expressed as soon as it is definitely separated. At about the time the uterus changes in shape there is also a slight trickle of blood from the vagina. I believe that this indicates separation and, while I do not regard it as certainly indicative of more than partial separation, that it is confirmatory to the sign of change in shape.

Making use of this modification of Williams' technic, I[4] was able to report an average blood loss of 222 cc. for 853 cases. This material reduction in the average blood loss quite substantiates Williams' contention that the placenta should be expressed as soon as it is separated. It seems hardly necessary to reiterate that no attempt at expression of the organ should be made until it is completely separated from the uterine wall. This difference in technic from that recommended by Willliams is merely an earlier recognition of separation.

Encouraged by this material saving, I have attempted some other modifications of technic, one of which seems to have been quite productive of improvement. Having determined that placental separation has taken place one should not proceed at once to express the placenta but should first massage the uterus, quite vigorously if necessary, to insure firm, hard contraction and then, by squeezing and downward pressure, expel the organ. This modification materially minimizes the bleeding which otherwise frequently follows immediately on, or really with, the delivery of the placenta. Adding this slight modification to the technic, I am now able to report an average loss of 179 cc. for the last 800 consecutive cases. Nearly all of these patients were delivered by the interne or the resident and yet the average blood loss was within a few cubic centimeters of that of the patients delivered by the staff men who use this technic.

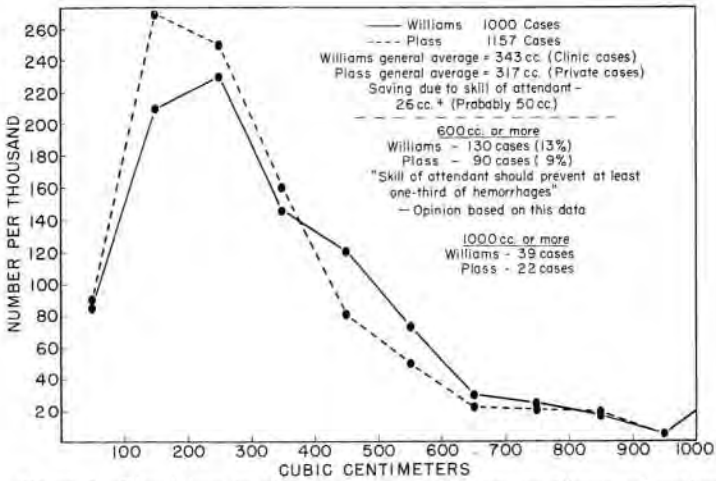

Chart 1.—Blood loss in the third stage of labor: incidence of various serial amounts.

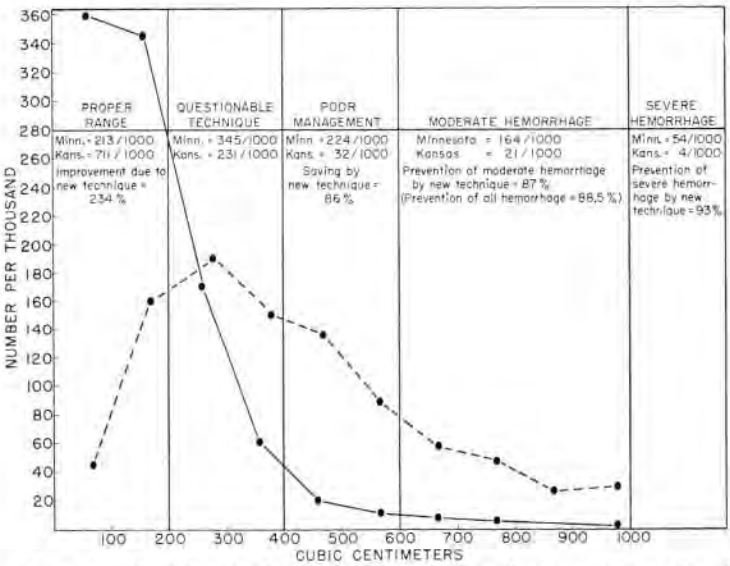

Chart 2.—Blood loss in the third stage of labor showing (1) results of new technic of management; and (2) necessity of individualizing management.

It is important to emphasize the constant contraction of the uterus both before and after separation as well as during and after delivery of the placenta. Periodic relaxation does not seem necessary in the mechanism of separation, either to the promptness or to the completeness of separation.

Inspection of charts 1 and 2 indicates that this saving of blood loss is not merely an elimination of hemorrhages but it is, even more, a reduction of moderate losses (from 200 to 600 cc.), as 71% of my patients lost 200 cc. or less and 89% lost 300 cc. or less. Williams states that a loss of blood exceeding 600 cc. should be considered abnormal. I believe that a loss of blood exceeding 400 cc. should be considered abnormal. Only 5% of the patients lost more than 400 cc. of blood and 2.5% lost more than 600 cc. In Litzenberg's cases, 216 patients in a thousand lost 600 cc. or more; thus, by these changes in technic, 88% of moderate and large hemorrhages are prevented. Of Litzenberg's patients, 224 in a thousand lost between 400 and 600 cc. of blood as compared to 33 in the group reported here, a saving of 85% of moderately large losses not ordinarily classified as hemorrhages. Furthermore, analysis and review of the events associated with the third stage of labor in each individual patient will usually reveal, even to an interne, why the patient lost in exess of 300 cc. of blood. My associates and I practice such review for every loss in excess of 300 cc. Finally, I believe that, unless an obstetrician has as a goal in each individual case a blood loss of less than 100 cc., he cannot hope to render his patient the greatest service in this respect.

TECHNIC OF MANAGEMENT

The technic of the management of the third stage of labor might be stated 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 a 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. Whereas I believe that constant, moderate (physiologic) contraction is necessary during the separation phase of the third stage, I am in accord with Williams that excessive (pathologic) contraction, as occasionally induced by solution of pituitary, is potentially productive of real pathologic changes. There is an obvious reason why solution of pituitary, given immediately after the delivery of the baby, does not often cause trouble. It requires from seven to 20 minutes to produce a severely hard contraction of the uterus and in the majority of instances the placenta will have been delivered before the expiration of that time.

Employment of this technic of management has resulted in an average duration of the third stage of labor

of approximately four minutes, the majority of cases showing completion of delivery of the placenta in one, two or three minutes. Although I do not believe that delayed separation of the placenta causes any increase in bleeding, I do believe that delay in expulsion of the organ after its separation does cause increased bleeding. I find that not more than one case in eight will be delayed for as long as 10 minutes after the delivery of the baby and that in at least one case in five separation of the placenta is completed within thirty seconds after the delivery. Constant contraction of the uterus both before and after the delivery of the placenta seems to be of major importance in reducing blood loss to minimum figures.

CONCLUSION

Constant attention to constant uterine contractions means controlled blood loss.

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