

THE LENGTH OF LABOR

PART III. THE FIRST STAGE: LABOR PAINS AND CONSISTENCY OF CERVIX

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IN TWO previous communications (Parts I and II) it was pointed out that such clinical factors as age, height and weight, length of conjugata vera, size of the baby, and duration of the pregnancy have little or nothing to do with the length of labor, particularly the length of the first stage of labor. It was suggested in those communications that the consistency of the cervix was probably a very important factor in determining the length of the first stage. It was further suggested that the character of the labor pains might be a much more important factor than we have previously thought. No doubt Rudolph's recent publication³ was prompted by much the same line of thought. It is probably unfortunate, however, that he should attempt to divide obstetricians into two schools of thought, placing such well recognized authorities as Schauta, De Lee, Williams, Cragin, Holmes and Burdick, Bumm, Kerr, Eden and Holland, Solomons, Commandeur, Brouha, Goodall, Beck, Danforth and Grier, Maxwell, and Longaker in the "anatomicophysiologic school" and inferring that their management of labors was based solely on a study of the anatomy and physiology of the individual patient without employing any particular clinical judgment; and then placing such other well known men as Bailey, Lull, Hirst, Newell, Stein and Leventhal, Quigley, Lafferty, Tweedy, Baer, Courtiss and Fisher, and Kreis in the category of "clinical school" and inferring that these men manage their labors on the basis of clinical interpretation and judgment without reference to the anatomicophysiologic relation in the individual patient. Permit us to suggest that a better obstetric ideal would be the study of the anatomy and physiology of the individual patient utilized to develop one's clinical judgment over a period of years, which clinical judgment could then be applied to the anatomy and physiology of the individual patient to real advantage. Has that process not been true of the masters past and present?

In our previous communications we have attempted to analyze the importance of the anatomic factors as to their effect on the length of labor. This present communication aims at the study of the physiology of the first stage of labor with the hope that some little improvement may be made in our clinical judgment in the future. No reference to the second stage of labor will be made at this time. It has been previously shown that the factors governing the progress of the second stage and the length

of the second stage are quite different than those operative in the first stage and that, therefore, they demand separate discussion.

THE CERVIX

By definition, the first stage of labor has to do entirely with the effacement and dilatation of the cervix. The main obstructive factor, therefore, is this structure known as the cervix. No doubt the length of the canal, the thickness of the wall, and the amount of dilatation previous to the initiation of labor pains are important factors in determining the amount of resistance which the cervix will offer to the progress of the first stage. To obtain an accurate concept of the amount of resistance that will probably be offered in any given patient one must necessarily study each of these factors in addition to the fourth resistant factor, determined by noting the consistency of the cervix. This present study, however, is limited to this fourth factor alone. This is not done with the idea of minimizing the importance of any of the other three factors, but only with the idea of learning more about the importance of the consistency of the cervix.

To this end each individual patient has been carefully examined and the relative degree of softness of her cervix recorded when she was first seen in labor. If she presented a "normally" soft cervix this fact was recorded on the chart with the figure 3; if her cervix were definitely softer it was labelled with the figure 2. The occasional cervix of "mushy" softness was labelled with the figure 1. On the other extreme a cervix which might be described as "firm" or "tough" or unyielding was labelled with a figure 4. A "hard" cervix has not yet been felt, but would be labelled with a figure 5. It might be interesting to note the distribution of cases since this plan was adopted: (1) seventeen cases; (2) 115 cases; (3) 122 cases; (4) twenty cases.

It is surprising that we should have labelled so many as 115 cases with the figure 2, indicating that they were softer than normal. This proportion would seem unduly high on the basis of expectancy in biologic variation but, as will be seen later, it is accounted for by the preponderance of soft cervixes in multiparæ where the number of 2's exceeds the number of 3's. The proportion of 2's in primiparæ is relatively small. This study presents the consistency as carefully noted in the first examination in labor but, more recently, it has been noted in every subsequent examination until full dilatation is reached. This repeated observation of the consistency of the cervix shows conclusively that in a large proportion of cases the cervix becomes softer as dilatation proceeds. Whether this progressive softening is a normal phenomenon of usual occurrence or even necessary to normal progress of labor we cannot say, as a sufficiently large number of determinations are not yet available. This present communication will deal only with the consistency of the cervix as deter-

mined early in labor. On the basis of this single finding it is interesting to note that the average length of the first stage for the various consistencies of the cervix was as shown in Table I.

TABLE I

Primiparæ			Multiparæ		
Cervix	Patients	Hours	Cervix	Patients	Hours
1	5	6.0	1	12	6.9
2	56	8.9	2	59	8.0
3	73	13.6	3	49	10.6
4	15	20.5			

In order to indicate a little more definitely the spread of the duration of labor with the various types of cervixes, Chart I indicates the frequency distribution in certain arbitrarily selected lengths of labor (to show only the difference between the 2-cervix and the 3-cervix). There was not a sufficient number of cases to similarly analyze the 1-cervix and the 4-cervix to advantage. It will be noted that for primiparæ the

CHART I

DURATION OF FIRST STAGE CONSISTENCY OF CERVIX

(Number of Patients Completing Dilatation in Certain Arbitrarily Selected Periods for Each Category of Cervix Consistency)

		2 Hours	4 Hours	8 Hours	13 Hours	Over 17 Hours
Primiparæ	2 Cervix	2	16	20	17	
	3 Cervix		7	18	23	24
Multiparæ	2 Cervix	16	13	27		
	3 Cervix	3	3	21	19	

2-cervix means a labor of from four to thirteen hours, with the greatest number in the eight-hour group. The 3-cervix, on the other hand, means a labor of from eight to an unlimited number of hours, with the largest number of cases coming in the thirteen-hour and in the unlimited-hour group. For multiparæ a 2-cervix means a labor of from two to eight hours and a 3-cervix a labor of from eight to thirteen hours.

These results are sufficiently suggestive that we feel more than repaid for our study, and feel that we can earnestly recommend the adoption of this or a similar plan to others.

LABOR PAINS

In studying the labor pains we have attempted to note carefully frequency in minutes, duration in seconds, and intensity by an arbitrarily selected method. This method was as follows: A contraction sufficiently hard that the uterus cannot be indented by moderate pressure with a single finger at a point on the fundus not directly over the body of the baby was labelled as a pain of 3-intensity. If the uterus could be slightly, but not definitely, indented the intensity was labelled with a 2. Definite indentation of the uterus meant to us a still weaker contraction and was labelled with a 1. Numerous instances of pains weaker even than this were labelled with a 1—. On the other extreme, there were a very few instances of pains which were apparently harder than normal. These pains were labelled with a 4, recognizing that it is almost impossible to determine the difference between our grade 3 and grade 4 pains. For the most part these grade 4 pains occurred in the second stage of labor and do not properly come into consideration in this communication. (This very simple method of determining pain intensity was selected for its practicability as all previous methods have been too cumbersome for general use.)

Inasmuch as we have, at the present time, accurate data on only some 300 patients, we cannot present a more intricate analysis than to utilize the separate criteria of labor pains individually. It is quite obvious that all three factors must be considered together to arrive at the most accurate conclusion as to the results of the labor pains in any given case. Such accurate analysis cannot be made with so small a series as we have, at present, available.

It is also recognized that each of these characteristic changes in many instances as labor progresses. It has been very interesting to us, however, to note that the character of the first few pains in the labor determines to a very great extent the character of the pains throughout that particular labor. We have noted only one instance where pains occurring at intervals of three minutes at the beginning of the labor became as far apart as ten or fifteen minutes later in the labor. The converse occurs with considerable frequency. Nevertheless, it would seem from this study of a small group of cases that the character of the initial pains is carried through the whole of the first stage in a remarkably large proportion of cases. We, therefore, noted particularly the character of the first few pains, and this analysis is based entirely on the first few pains of the labor with no analysis of subsequent pains.

Frequency.—We divided our patients into groups on the following

basis: group 1—pains not over three minutes apart at the onset of labor; group 2—pains three and one-half to five minutes apart; group 3—pains six to ten minutes apart; group 4—pains over ten minutes apart. The average duration of labor in these various groups is shown in Table II, and the frequency distribution in Chart II.

TABLE II

	Labor Pains	No. Patients	Average hours of labor
Primiparae	Less than 3 minutes	33	7.5
	3½ to 5 minutes	51	11.9
	6 to 10 minutes	41	14.1
	Over 10 minutes	28	16.7
Multiparae	Less than 3 minutes	19	2.4
	3½ to 5 minutes	34	6.8
	6 to 10 minutes	29	9.6
	Over 10 minutes	36	10.9

CHART II

DURATION OF FIRST STAGE FREQUENCY OF LABOR PAINS

(Number of Patients Completing Dilatation in certain Arbitrarily Selected Periods for Each Category of Pain Frequency)

<u>Primiparae</u>	2 hours	4 hours	8 hours	13 hours	Over 17 hrs
Not Over 3 Minutes Apart	5	11	9	7	1
3½ to 5 Minutes Apart	2	11	13	12	8
6 to 10 Minutes Apart	3	4	11	8	15
Over 10 Minutes Apart		1	8	10	9

<u>Multiparae</u>	2 hours	4 hours	8 hours	13 hours	Over 17 hrs
Not Over 3 Minutes Apart	16	2	1		
3½ to 5 Minutes Apart	8	11	10	4	1
6 to 10 Minutes Apart	1	9	12	5	2
Over 10 Minutes Apart	1	10	11	10	4

It is obvious that frequency of labor pains is a very important consideration. This is not new information but, perhaps, the degree of differences has not been fully appreciated.

Duration.—We divided our patients into four groups on the basis of duration of the initial labor pains as follows: group 1—less than ten seconds; group 2—eleven to twenty seconds; group 3—twenty-one to thirty seconds; and, group 4—over thirty seconds. The results expressed in terms of average duration of labor and the frequency distribution of cases are shown in Table III and Chart III.

Whereas a longer labor pain seems to make for more rapid progress in multiparæ, the differences are not very great, and in primiparæ the duration of the pain seems to have no effect on the length of the first stage. From a practical point of view it would hardly seem worthwhile

TABLE III

	Labor Pains	No. Patients	Average hours of labor
Primiparæ	Less than 10 seconds	18	12.9
	11 to 20 seconds	53	13.1
	21 to 30 seconds	50	12.6
	Over 30 seconds	15	14
Multiparæ	Less than 10 seconds	19	11.2
	11 to 20 seconds	52	9.1
	21 to 30 seconds	28	5.8
	Over 30 seconds	10	6.3

CHART III

**DURATION OF FIRST STAGE
DURATION OF LABOR PAINS**
(Number of Patients Completing Dilatation in Certain
Arbitrarily Selected Periods for Each Category of
Pain Duration)

Primiparæ

Up to 10 Seconds
11 to 20 Seconds
21 to 30 Seconds
Over 30 Seconds

	2 hours	4 hours	8 hours	13 hours	Over 17 hrs
		3	7	4	4
	2	8	16	14	13
	3	13	15	10	9
	2	3	2	4	4

Multiparæ

Up to 10 Seconds
11 to 20 Seconds
21 to 30 Seconds
Over 30 Seconds

	2 hours	4 hours	8 hours	13 hours	Over 17 hrs
		2	9	4	4
	10	16	15	8	4
	7	10	8	3	
	4	1	3	2	

to continue to determine accurately the duration of the individual labor pain as a routine.

Intensity.—Whereas we determined intensity by the figures 1, 2, 3 and 4, it was evident, when it came time to analyze the results, that there were many more patients in the 1 group than had been anticipated at the beginning of this study. A different rating or classification would probably have been worthwhile. To avoid misunderstandings in our clinic we have continued our original classification and, in this analysis, there-

fore, the division into groups is made on the basis given in Table IV and Chart IV.

It is quite obvious from Table IV and Chart IV that primiparæ with very weak pains will have long labors regardless of the frequency or

TABLE IV

	Intensity Classification	No. Patients	Average hours of labor
Primiparæ	1— (very weak pains)	31	19.4
	1 (weak pains)	78	11.7
	1+, 2, 3 (moderate and strong pains)	47	8.5
Multiparæ	1— (very weak pains)	45	11.5
	1 (weak pains)	54	6.8
	1+, 2, 3 (moderate and strong pains)	24	3.7

CHART IV

DURATION OF FIRST STAGE INTENSITY OF LABOR PAINS

(Number of Patients Completing Dilatation in Certain Arbitrarily Selected Periods for Each Category of Pain Intensity)

Primiparæ	2 hours	4 hours	8 hours	13 hours	Over 17 hrs
1— (Very weak Pains)			6	7	18
1 (Weak Pains)	1	11	29	25	15
1, 2, and 3 (Moderate and Good Pains)	7	16	12	9	2
Multiparæ	2 hours	4 hours	8 hours	13 hours	Over 17 hrs
1— (Very weak Pains)	3	8	16	12	6
1 (Weak Pains)	8	21	15	9	1
1, 2, and 3 (Moderate and Good Pains)	16	4	3		1

duration of those pains and regardless of the consistency of the cervix, as more than half of our cases in this group had a labor in excess of twenty hours. With slightly stronger pains the labor was most apt to run from eight to thirteen hours, and with moderate or good intensity the labor was from four to eight hours. The results were even more marked in multiparæ, as, with moderate or good pains the labor was

about two hours in two-thirds of the cases and from eight to thirteen hours in over half the patients with very weak pains. This is particularly striking when it is remembered that this is without regard to duration or frequency of the pains or consistency of the cervix. It would seem that this simple method of determining pain intensity is eminently practical and that it offers a definite aid in prognosis as to duration of labor and, therefore, should be helpful in management.

DISCUSSION

It is unfortunate that there is not in our series, at the present time, a sufficient number of cases to make it possible to analyze these characteristics of the labor pain, one with the other, and the three in conjunction. We can only say that intensity and frequency each has an important bearing on the duration of the first stage and that duration of the individual pain is of little or no importance. It is likewise unfortunate that we cannot, at the present time, balance the motivating power of the labor pain against the resistance of the cervix as determined by its consistency. We hope to continue this work until a sufficient number of carefully recorded cases is available to warrant more definite conclusions.

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3. RUDOLPH, LOUIS: The test of labor. *Am. Jour. Obst. and Gynec.* (June), 1933, 25:840.

DR. B. G. HAMILTON, KANSAS CITY, MO.—The papers of both Dr. Adair and Dr. Calkins have been interesting. It has been most refreshing to note that neither of the essayists has so much as suggested that pain in labor is no longer a problem. On the contrary, they have a new thought that should be the beginning of a new chapter in obstetrics, namely—the significance of uterine contraction and pain in labor. It is very evident that if later reports are as conclusive as Dr. Adair's preliminary report, we will be compelled to revise our teachings. In this report he shows the significance of uterine contractions graphically. To us this has a practical application of much importance.

We have discussed the clinical significance of pain in labor with Dr. Calkins on several occasions. With these discussions we have also seen the practical application of his suggestions in the wards.

When I have had a private case in the University Hospital, the resident not only reported the usual findings, but would report the type, force and duration of pains and the type of the cervix. Later he reported that he thought my patient would deliver at a certain time. This caused me to observe closely, and this is what I found. The resident would stay in the room and observe pains for some time and would palpate the uterus away from the baby with each pain and would record his findings. He would examine the cervix rectally for several pains and report his results. These examinations were made at regular intervals in which his findings were always tabulated. It is needless to say, I checked his findings each time and must admit they were accurate at all times. I am now convinced that it is a simple procedure that can be delegated to students and interns and that the appreciation of the clinical significance of pain in labor is a valuable asset in the management of labor.

DR. J. L. REYCRAFT, CLEVELAND, OHIO.—At the clinical meeting of this Association in Cleveland in 1931 an ingenious device known as a hysterograph was demonstrated. This consists of a tambour covered with gum rubber which is attached to the patient's abdomen by adhesive tape, recording contractions as they occur by means of a kymographic tracing. Dodek published this work in 1931 and proved the contentions made by Dr. Adair almost identically. The same apparatus is now in use and it has the added advantage over the hydrostatic bag in that it can be used any time in the puerperium with no danger of infection, merely being attached to the fundus at whatever height it may be. Some of this work is soon to be published in conjunction with the Department of Pharmacology of Western Reserve University and may give us some additional information on this subject.

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—Dr. Adair has referred to the well known variations in the activity of ergot. As you doubtless know, there

is recent evidence from Duryee and others that we have here in the United States ergot poisoning as well as in Europe. Apparently a considerable proportion of the rye consumed is spurred. The difference is that in Europe the rye flour is used without preliminary storage and while the ergot is still potent, whereas in this country the flour is kept in storage for a considerable period of time and the ergot deteriorates.

This is of particular interest in relation to the large number of vascular disturbances, such as gangrene of the extremities, that occur in persons of the foreign population and who live to a large degree upon rye bread. In individual instances it has been found that the rye consumed was heavily contaminated and had recently been imported from Europe on account of the flavor. It is quite possible that the ergot thus consumed may influence certain patients during pregnancy.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—Both of these papers are well intended to advance the systematic knowledge of the physiology of pregnancy. I wish to ask Dr. Adair whether these records are average records; I mean has each individual record been repeated? Sometimes there are errors in recording just the primary reaction.

With regard to both Dr. Calkins' and Dr. Adair's papers, it would be interesting to have included in the series of observations the constitutional types of each individual, because constitutional differences refer us to the differentiation of the entire form of body, or perhaps the local differentiation of the uterus, of the cervical portion, of the blood vessels, et cetera. The reaction time of each patient would be valuable additional information.

DR. FRED L. ADAIR, CHICAGO, ILL. (closing).—I am sorry that I cannot answer Dr. Falls' question as to the parity of the patient upon whom the observation of nursing was made.

With reference to Dr. Davis' question, the two cases shown are individual ones. The immediate postpartum observations are graphs which were selected from some twenty-five different cases. The eighth day postpartum observations are other individual cases which were selected from a larger series. I do not believe that we feel in a position to draw any very definite conclusions from what we have shown in these graphs, and obviously one is not eager to run an unlimited series of these cases. They all represent selected cases, in some of which the observation was part of a therapeutic procedure that was deemed necessary, or else was a substitute for other methods as in the case where a hydrostatic bag was used instead of a uterine pack. The introduction of the bag on the eighth day postpartum was a procedure which might be regarded as being unwarranted, but we selected the cases very carefully and felt that we incurred no great risk to the patient. I should dislike having this interpreted as a feeling that we were carrying on experiments which entailed risk to the patient or that we were advocating absolute freedom of experimentation in order to determine what occurs physiologically and as a result of the use of therapeutic agents. I would most earnestly urge very great caution in carrying out any work of this kind. So far, we have had no occurrences which apparently modified the convalescence of these patients, but to say that it was not possible to have some untoward results would be, I think, an overstatement of the truth.

I think we can, however, draw certain definite, at least temporary, conclusions. One of those is that ergot is certainly not reliable in its results in individual cases. We feel that there are probably two factors, one the individual patient and the other the preparation itself.

With regard to the use of the pituitary preparations, the pitressin certainly had a definite oxytocic principle. Any one who uses this preparation with the idea that it has no effect on uterine contractions should use it with very great caution. When quinine is used there seems to be no definite action on uterine muscle. Of course, we all know that patients vary in their reactions to quinine. Some patients may respond very actively. We were not able to demonstrate any effect on uterine contractions with gynergen. Here again we would not want to say that gynergen never produces any contractions. Histamine had no apparent effect on uterine contractions. We were very cautious in its use because of its systemic effects. We gave a dosage about twice that used in histamine tests and far in excess of any amount which could be contained in the dose of ergot which was administered. We did not go into the question of uterine sedatives very extensively. We did try adrenalin, without very marked results, on uterine contractions. We observed the effect of pitressin in two hysterotomies and one cesarean section. We got very marked uterine tetany with definite contractions of the uterus. We were able to see the effect of pitressin, which also corroborates our findings with the hydrostatic bag.

DR. LEROY A. CALKINS, KANSAS CITY, Mo. (closing).—I perhaps did not state clearly at the outset that our object in making these records and presenting this analysis was to show that interns and general practitioners could make use of a method such as this to determine the probable duration of labor in the individual patient. Our experience has demonstrated this method practicable in this way. I also failed to state that we do not regard methods such as this as having the intimate accuracy of some of the other more cumbersome methods requiring apparatus for their use. No doubt the Western Reserve method is more accurate, but it is hardly practicable for a man out in the country and in the private home. What we wanted was something that could be applied to the individual patient, to determine prognosis and to determine management of labor.

Dr. Davis referred to the question of constitutional types. That was not gone into except as far as that point was covered in two previous communications, where we did take up those factors and found, contrary to our former belief, that they have no appreciable effect on the length of the labor.

Dr. Falls referred to an important consideration, namely the spasm of the cervix. That is a part of cervical consistency, of course. A spastic cervix is one that feels tough and unyielding. We know that morphine will relax the cervix in some cases—not always. Whether this is because of difference in the dose of morphine or difference in the individual reaction to the morphine I do not know. He also referred to another important consideration, namely, the change in the character of the labor pains, and felt that perhaps our figures were not in accordance with his own experience. Every one recognizes that as labor progresses the pains do become more frequent, of longer duration and of greater intensity, and that was so stated in my paper. At least, that happens frequently, but not in anything like all of the cases. However, the reverse happens relatively infrequently. We do know that pains that have once become good do not become poor. There may develop secondary inertia, but otherwise if the pains be good at the beginning of the labor they do not become poor. In this short series it was shown that in only one case did the pains become poor after having been good at the beginning.