

ON PROLAPSE OF THE UMBILICAL CORD, ITS CAUSE AND
TREATMENT.

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INTRODUCTION.

THE subject of prolapse of the cord is of as great an importance to the practical obstetrician as it is of interest to the scientific accoucheur; its cause and treatment have as yet not been clearly defined. Though the literature devoted to this point is most extensive, the conclusions reached are by no means satisfactory, the results obtained by various authors differing in a number of points, and the cause of this disagreement seems to me to lie in the lack of sufficiently extensive and carefully compiled statistics.

Upon the continent of North America this dystocia claims less attention than it does in Europe, where the

deformed pelvis, which I look upon as the main cause of prolapse of the cord, is by far more frequent; fortunately for our people they do not suffer from the wretched conditions which so often affect the frame of women of the lower classes in Europe—food poor and scanty, mostly vegetable, tenements narrow and close, with a damp climate, such as England and the North of Germany offer.

In German hospital and policlinical (city poor) practice, prolapse is of comparatively frequent occurrence, and the rather unsatisfactory and superficial way in which the subject has so far been treated, must lead to the favorable reception of an investigation based upon such extensive and valuable materials as that collected in the annals of the Berlin Lying-in House, which my worthy teacher and friend, Prof. Martin, the chief of that institution, so kindly placed at my disposal. The large number of cases—the largest at the command of any one author—the careful notes, and the exact and complete measurements, permit the investigation of this question in a much more precise and methodical way than has yet been possible, and promise a satisfactory solution of the doubtful points.

I deem it of prime importance carefully to consider the conditions under which the results here given have been obtained, and to gain a thorough knowledge of the material upon which our investigation is based; this consists of the cases of prolapse of the funis observed in the royal Lying-in Hospital of the University of Berlin, and the policlinical (out-door) department of that institution from October, 1858, to August, 1871,

two classes of cases between which we must carefully distinguish.

The records of the 63 cases observed in the *Lying-in House* are alone perfect in all their details, and decisive for all points under consideration. With the exception of 13 cases of most abnormal and complex labor, transported *inter partum* from the city into the institution, these cases have been conscientiously observed from beginning to end; careful measurements of the pelvis were made in every case, and the treatment was conducted upon scientific principles throughout.

Our *out-door* (poli-clinical) cases, on the contrary, were observed and treated under less favorable circumstances. They are difficult or prolonged cases of labor among the poor of the city, to which the despairing midwife summons the aid of the *Lying-in House* staff. It is of necessity only at a later stage of parturition that these cases come under observation, mostly when the prolapse of the funis has already taken place, sometimes even after it has ceased to pulsate, so that they are but imperfectly recorded. Among these out-door cases we find notes upon 302 prolapses; though the number of cases is large, they can aid us in solving but a few of the questions we propose to enter upon, such as the relative frequency of prolapse among primiparæ (I.p.) and multiparæ (M.p.), or the position of the child. Of these 302 out-door cases 98, however, have been carefully observed from beginning to end and measurements made, so that they may be considered equivalent to those observed in the *Lying-in House*, and have been classed together with them, making the

number of our prolapse cases with pelves measured, and deliveries carefully recorded, as high as 160.*

As far as possible I shall refer to the total 365 cases from the Lying-in House and out-door department combined; this would be, as I have already mentioned with regard to the relative frequency of prolapse among I.p. and M.p., the position of the foetus, etc.

With regard to treatment and prognosis the results achieved in the Lying-in House and in the out-door department must be considered separately, the conditions under which the obstetrician labored being so very different.

A.—FREQUENCY OF PROLAPSE.

However many obstetricians have given us their experience with regard to prolapse of the funis, the data we find as to the frequency of its occurrence vary very much, as it is natural that they should, being dependent upon country, climate, and class of population.

The highest per cent. is that given by Michaelis, who finds that the Lying-in Institution of Kiel, which is supplied from a country where the rachitic pelvis abounds, produced 27 prolapses among 2,400 deliveries—1 to 90; Scanzoni cites 178,043 cases, collected from the publications of a large number of obstetricians, among which 699 cases of prolapse occurred—1 prolapse to 254 deliveries. As it is customary that the statements and figures of one authority, whether right or wrong, are

Table I., containing the pelvic measurements and condensed history of these 160 cases, will appear at the close of our article, in a later number of the *American Journal of Obstetrics*.

faithfully copied in each successive work, and translated from language to language, we find about the same statement made by Saxtorph, who gives 480 to 116,272 = 1 in 243, and Churchill, who finds 816 examples of prolapsed funis among 188,730 cases, or 1 to 231½. These are gathered from the obstetricians of all countries, the British having one prolapse to 232½ cases of labor; the French, 1 in 373; the German, 1 to 262¾.

Boivin finds but one prolapse to 521 cases.

All these calculations, even if based upon large numbers, are exceedingly superficial, and of value only so far as they approximately give us the relative frequency of the prolapse in lying-in institutions; and I myself am also unfortunately compelled to confine my calculations to the Lying-in Hospital, as we have no control over the relative number of normal deliveries to which the out-door cases of prolapse might be referred.

I must simply state that, among the 5,900 deliveries observed in the Berlin Lying-in Hospital within the last twelve years, were 63 cases of prolapse of the funis, one prolapse to 94 deliveries, 1.07 per cent., a frequency which is exceeded only by the Lying-in Hospital of Kiel, the Rotunda in Dublin giving but 1 to 168.

Even if we disregard the 13 cases which were brought *inter partum* to the Lying-in Hospital for more serious complication, 50 cases of prolapse still remain—1 to 118, or 0.85 per cent.—a ratio similar to that found by Nägele—1 to 120.

Should we desire to make general deductions, a wide margin must of course be given, in the consideration of these figures, to social and geographical conditions, to

the characteristics of the various countries and climates, and, above all, to the class of the population among whom the statistics are collected.

As I have already stated, the prolapse is **much** more rare in this country, as well as among the **higher classes**—the better housed and fed abroad—where **disease** deforming the pelvis, above all rachitis, seldom occurs; where we rarely find the flabby condition of the abdominal walls, or the early escape of the liquor amnii, so frequent among hard-working women, as the poorer of the Germans are. The class of women which frequent Lying-in Houses, often such as have before suffered from complicated labor, naturally make the frequency of prolapse in such institutions much greater than it is in general practice. On the contrary, the fact that there is a very large proportion of I.p. confined there, has *no* influence upon these figures, as we shall hereafter see, notwithstanding that great stress has been laid upon this point by many authorities.

We must, in short, seek the true proportion between the various extremes given.

TABLE II.—RELATIVE FREQUENCY OF THE VARIOUS PRESENTATIONS:

Presentations.	Lying-in House		Out-door cases.		Total.		
	No.	p. c.	No.	p. c.	No.	p. c.	
Vertex.....	35	55.5	167	55.2	202	55.3	} 208 head presentations, 57 p. c.
Face.....	1	1.6	3	1.0	4	0.8	
Forehead.....	1	1.6	2	0.6	3	0.8	
Breech.....	2	3.0	8	2.5	10	2.7	} 157 head presentations, 43 p. c.
Foot.....	16	26.4	53	18.0	69	19.0	
Transverse.....	4	6.4	43	14.0	47	12.9	
Shoulder.....	5	8.0	28	8.6	31	8.5	
	68		302		366		

B. CAUSES OF PROLAPSE.

I. PRESENTATIONS OF THE FŒTAL PARTS.

A.—Head Presentation.—The head presented in 208 of the total number of 365 cases of prolapse, in 202 the vertex presented, so that we see the number of these in excess of all other presentations combined. Although the prolapse is more frequently found complicating vertex presentations than any other, this is true only so far as absolute numbers go; comparatively speaking, the prolapse but rarely occurs in this presentation, for among normal deliveries we find the vertex presenting in 94 per cent. of the cases, whilst deliveries complicated with prolapse give us but 55 per cent. of vertex presentations; exactly what theory would lead us to expect, as the sufficiently resistant, well-rounded form of the presenting head fits upon the expanding os in its entire circumference, and closes it more perfectly than any other of the foetal parts, provided the conditions of the pelvis be approximately normal.

Not so the *presenting face* (face and forehead presentation which usually emerge into face, considered together). We find 6 such cases recorded—one face presentation among every 61 cases of prolapse of the funis, while under ordinary circumstances the face presentations are much more rare, not over 1 in 170, which would naturally lead us to suppose that face presentations tend toward causing prolapse of the funis. Yet this is not so; it is not the face presentation as such, it is the deformed pelvis which so frequently brings about

a face presentation that we must look upon as causing the prolapse. In 5 of these 6 face presentations we have distortion of the maternal pelvis; of the sixth no record is given, so that this also may have been deformed.

B.—Other Presentations.—So much for head presentation; that all other presentations—perfect breech presentations excepted—should tend more to prolapse of the funis is but natural, as size and shape of the presenting part prevents its thorough adaptation to the lower segment of the womb, thus leaving an open space through which the funis readily glides; moreover, in all these presentations the funis lies nearer the os.

We need but refer to our table to see that facts verify these theoretical deductions, as 43 per cent. of the total number of cases of prolapse here recorded come under the latter class, while under normal condition at most but 6 per cent. of the children are delivered in one of these presentations, so that malpositions, as we might almost call them, are 7 times more frequent among cases complicated with prolapse.

Breech Presentations.—Of all these presentations, so far contrasted *in toto* with the head presentation, the breech presentation is least often complicated with prolapse. The sum total of our cases giving us not more than one breech presentation to every 36 cases of prolapse—which but little exceeds the normal ratio—and seems but natural when we consider that size and shape of the breech, so similar to the cranium, permit a suitable configuration of the lower segment of the uterus.

Foot Presentations.—It is far different with the nearly allied foot presentations, the irregular small parts

which first press downward through the yielding os do not permit the close adaptation of the cervix, and we find this presentation most frequently complicated with prolapse, yet I may incidentally add, it is fortunately in this very case that the prolapse is least dangerous; were this not so, foot presentations must be the terror of obstetricians; with but 2.7 per cent. of breech presentations we find 19 per cent. of foot presentations among our cases of prolapse. In the Lying-in Hospital they even reach 25.4 per cent. of all cases, much more than in the out-door department; in the former the number of in-door patients under treatment has been comparatively large—and the longitudinal position of the foetus as produced by the normal action of a healthy strong uterus naturally predominates.

Transverse Presentations.—In the out-door department, where we deal more largely with medical practice, the number of foot presentations (presentations in the normal axis of the uterus) is smaller, only 18 per cent., the number of transverse position larger, 14 per cent. to 6.4 per cent. in the Lying-in Hospital; this is due mainly to the laxity of the tissues, uterus, and abdominal wall in multiparæ; not so much to distortion of the pelvis.

Of the total number of prolapses 12.9 per cent. occurred in transverse positions (47 cases—28 of the I. Class—the head of the foetus in the left side of the mother; 19 of the II. Class, the head of the foetus in the mother's right side).

Shoulder Presentations.—Shoulder presentations, which are almost identical with transverse positions as a cause of prolapse, in so far as in both a presenting

part, which closes the os, is lacking, constitute 8.5 per cent. of our cases—equally distributed in the Lying-in Hospital and out-door department.

Summing up, we see that among head presentations the prolapse of the funis rarely complicates vertex presentations, but is frequently found with face presentations, caused, however, as I have proved, more by the deformed pelvis than the face presentation; as such breech presentations also are but rarely complicated with prolapse, transverse positions and shoulder presentations much more commonly, and foot presentations oftener than any other.

II. FETAL APPENDAGES.

Having seen what share the foetus in its various presentations has in favoring or causing the prolapse, we shall now consider the foetal appendages in their casual relations; but in order that any results shall be as positive and as minutely exact as thorough notes enable me to give upon other points, I must here confine myself to much smaller numbers. •

1. *Placenta*.—Thus the place of insertion of the placenta is given in but 35 cases, in 16 of which it was found low down in the uterus—*i.e.*, I consider all such cases as adherent unusually near the os, in which the rupture in the membranes is less than 4 centimetres distant from the margin of the placenta. Among these I have not enumerated the extreme cases in which the placenta presents; of such, 15 were under treatment—giving us one case of *placenta prævia* among every 24 cases of prolapse, an unusual frequency; but disregarding these and confining ourselves to the other 35

cases, it is certainly most striking that in 16 the adhesion of the placenta should have been so near the os, an uncommon occurrence, as in the very large number of autopsies upon women during gestation and shortly after confinement, which I have either witnessed or myself performed, I have but rarely observed these conditions; I have almost always found the seat of the placenta toward the fundus usually upon the posterior wall of the uterus, more often to the right than to the left.

That this unusual location of the placenta favors the prolapse of the cord seems evident; but the reason of this is not, as the authorities state, because it brings the insertion of the cord so much nearer the os; the reason is a totally different one—it is the passive, mechanical action of the large, though yielding mass of the placenta in preventing the normal course of the presenting part through the pelvic canal, and in making the close adaptation of the lower segment of the uterus to the fetal head impossible. I have laid some stress upon this point, as it is new, and I deem it of considerable importance, certainly theoretically very interesting; at all events, I trust I have said enough to stimulate farther observation and investigation.

In cases of placenta prævia, complicated with prolapse of the funis, the prolapse becomes of secondary importance, the dangers threatening the life of the mother here claiming our attention; yet I may state that the placenta presenting the difficulties before mentioned, caused by its insertion upon the inferior zone of the uterus, are greatly augmented, and in addition we have the insertion of the funis so near the os, that the prolapse is made still easier.

2. *Funis*.—Unfortunately, little attention has been paid to the placental *insertion of the funis*, but among the few cases noted we find two in which the cord was attached to the lower margin of the placenta, the latter being in both cases situated near the internal os, and to these conspiring causes we should be led to attribute the prolapse, did we not find by far more serious complications in the one case (Lying-in Hospital, 20) in a deformed pelvis; in the other (Lying-in Hospital, 34) a shoulder presentation, both of which I consider as most important and primary causes of the prolapse.

It is not alone an analysis of the cases I find recorded, a comparatively small number, but above all a careful consideration of the various points involved, which convince me that the insertion of the funis upon or near the lower margin of the placenta is a matter of very little bearing on the subject before us, notwithstanding that most authorities, each copying his predecessor, consider it a complication very favorable to the occurrence of prolapse.

In the same way a great deal of stress is generally laid upon the *length of the funis*, with a vague idea, which seems sufficiently natural, that the longer the cord, the more readily will it come down.

Length of the funis in 92 cases.

In 20 cases,	less than 56 c.m.
" 72 "	more than 56 c.m.
" 37 "	betw. 56 and 70 c.m.
" 35 "	over 70 c.m.
Average length, 65 c.m.	

We have the length of the cord in 92 cases, in which all other data are carefully ascertained; thus giving us not only this one fact which alone is worth very little, but enabling us to decide upon its importance by a comparison with other complications. In 20 of these 92 cases the length of the funis is less than the normal average of 56 c.m.; whilst in the other 72 it is above this, and in 35 of these cases the length is very considerable, over 70 c.m.; so that the average length of the cord in these 92 cases of prolapse is 65 c.m.—9 c.m. longer than the normal average I accept. This is an item which claims a careful consideration, and would seem to be of importance in the question before us. Yet this is not so, and I shall justify this apparently paradoxical assertion by an examination of the extreme cases of very long and very short funis which we find among our cases of prolapse.

I may certainly call a funis of over 80 c.m. very long, of such we have 18; but in 10 of these cases we find a deformed pelvis, and this, as I have repeatedly stated, I consider the primary and pre-eminent cause of the prolapse of the funis; in the other 8 cases in which the prolapse of an uncommonly long cord took place in a normal pelvis, we find in 5 instances footling and cross presentations, which, as we have seen, greatly facilitate the prolapse—only 3 vertex presentations, and even these 3 vertex presentations show other complications which tend very much toward producing a prolapse. In one case we have a very small foetus; in another, a premature rupture of the membranes while the head was still high in the pelvis, fast upon the brim; and in the third, a

pathological condition of the uterus, as proven by the difficult labors which had preceded; we see that there is not a single instance of a prolapse which can be said to have been caused by an abnormal length of the cord, though this undoubtedly facilitates its occurrence.

To these we must contrast the 6 cases with an unusually short cord, of less than 45 c.m., among which we find 2 normal pelves both with vertex presentations: in one instance the foetal head remained stationary in the higher strata of the pelvis for some time, which prevented a close adaptation of the cervix, and thus occasioned the prolapse; in the other even a very short cord came down without any serious cause.

This seems to me sufficient to prove, what I am thoroughly convinced of, *i.e.* that great length of the funis is by no reason to be classed among the causes, with a direct bearing upon the prolapse, but that, in connection with other circumstances, it may be looked upon as an item favorable to its occurrence. Although the average length of the funis in cases of prolapse is greater than usual, a short funis is by no means a contra-indication, and an uncommonly long cord will not by itself cause prolapse.

An item which is frequently mentioned in connection with prolapse, is the *coiling of the funis* around the neck of the child; as one of the main reasons for this coiling is an undue length of the cord, which we have seen to be no rare occurrence in prolapse, we may expect to find it more frequently than usual looped around the neck of the foetus, and this proves to be the case. Coiling of the cord is mentioned in a number of the

Lying-in Hospital cases, but merely mentioned, without farther observations, so that the data are not sufficient for a proper consideration of the subject upon which the opinions of authorities are so divided.

For the study of this point it would be necessary to know from a large number of cases in which a loop of the prolapsed cord was found coiled around the neck of the child, whether this loop was at the placental or at the foetal end of the funis; this is the all-important point, so far disregarded, which would explain and unite the differing views.

They are in the right who claim that the coiling of the cord prevents prolapse, as it certainly does in a most effectual way (even if other circumstances are favorable) if in a head presentation it is the foetal end of the cord which coils. So would also the observations of those be proved correct, who maintain that the coiling of the cord favors prolapse, as a long loop of funis remains between neck and navel, in close proximity to the os, and ready to descend if the slightest chance is given when a fold from the placental end of the cord coils around the neck of the child.

3. *Premature Rupture of Membranes.*—A cause which we can discuss with more assurance, and which is not without weight, is the rupture of the membranes at an early period of labor, before the os is well dilated; this tends to prolapse, more especially if it occurs, as was frequently observed in the out-door cases, when the os is scarce permeable to the finger, in the very commencement of labor. Even if the position of the foetus correspond to the longitudinal axis of the uterus, let it be a

vertex presentation, yet the presenting part is still high up in the pelvis, and the lower segment of the womb so little conformed to it that the amniotic fluid, as it escapes, drags down with it the funis.

The rupture of the membranes is a dangerous moment, even at a time when the os is more fully dilated and the presenting part farther advanced, if the waters are abundant and escape suddenly.

The cause of a premature bursting of the sack will be found either in the severe physical exertion to which women of the working classes are subjected up to the very commencement of labor, so rupturing the membranes by simple mechanical strain, or in chronic affections of the vagina and cervix, which seem to corrode the membranes, as it were, by their secretion and make them less resistant. I have notes upon this point in 128 cases, in 65 of which, over 50 per cent., the waters escaped when the os was not dilated beyond the size of a silver half-dollar, or about 4 c.m., a very rare occurrence in normal labor.

The greater part of these cases naturally belong to the out-door department, where circumstances are so favorable to the occurrence of these accidents.

To review in a few words what has been said about the foetal appendages as causes of prolapse, we have seen that, disregarding placenta prævia, the adhesion of the placenta to the inferior segment of the uterus—perhaps the insertion of the funis upon the lower margin of the placenta—and an unusual length of the cord, especially when concomitant, may tend to favor the prolapse of the cord, but by no means to cause it directly

more dangerous than any of the circumstances here mentioned, seems to be the rupture of the membranes at an early period of labor.

The causes of prolapse which we have so far discussed, emanating from the foetus and its appendages, are either secondary or of minor importance; we now come to the *chief and primary causes, due to the maternal parts.*

III. ABNORMITIES OF THE WOMB.

To begin with the less important, I shall first consider abnormalities of the shape and position of the womb, as even these are in most cases only secondary changes; as malposition of the uterus as produced by the *venter propendens*, which was observed in a few instances among the M.p. of the poorer classes in the out-door department of the L.-in H. more frequently, in connection with a deformed pelvis.

The *venter propendens*, and the *anteversio uteri gravidi*, which mostly go hand in hand, aside from their most frequent cause, a deformed pelvis, in themselves tend to cause prolapse in so far as they favor transverse and shoulder presentations, and even in vertex presentations retard the descent of the head.

The repeated occurrence of the prolapse in the out-door department among multiparæ, with normal pelvis and full-sized foetus in vertex presentations, proves to us that a flabbiness of the uterus itself, a diminution of its muscular power, may provoke this accident.

They are cases in which the organ has been weakened by frequent child-bearing in laboring women who work to the last; unable to nurse themselves, they barely

keep their bed for a few hours after delivery, and again take up work with a tender, impressible uterus in the very beginning of involution.

So also *uterine diseases*, of which endometritis *colli* is found most frequently among the out-door cases, destroy the elasticity and muscular contractility of the organ, and render its close adaptation to the presenting part impossible,—the same effect as is produced by weakness or entire cessation of labor-pains.

Labor-pains. One Hundred and Eighteen Cases.

Normal in 62 cases; pathological in 58 cases. Pains weak or ceasing entirely in 40 cases; spasmodic, powerless contractions in 16 cases.

Thus we find that in but 62 of the 118 cases in which the character of the labor-pains is given they were normal, in a few instances of great intensity; the pathological condition of the pains in the other 56 cases was mostly owing to deformed pelvis, malposition of the foetus, premature rupture of the membranes, or disease of the womb, so that we must consider this as a complication—a concomitant—rarely as a primary cause of prolapse. Equally often with malposition, *an abnormality in shape* of the pregnant uterus is linked with prolapse of the cord; either the loss of the ovoid form by a cross or shoulder presentation, or the unusual expansion of the womb by a plurality of foetus or hydramnios.

Twin cases are frequently complicated with prolapse; we find 15 upon our records, *i.e.*, 1 twin case among 24

cases of prolapse, whereas the usual ratio is about 1.80.

In three of the four cases of twins treated in the Lying-in Hospital the mother was a lying-in patient; in all four we have a well-formed normal pelvis, without any of the pathological concomitants before mentioned; so that we may look upon the twin foetus as the uncomplicated cause of prolapse, with the exception of the fourth case of a lying-in patient, in which we have other circumstances favorable to the prolapse in the transverse position of one, and the breech presentation of the other child, and, if we will add in the length of the cords, 70 and 74 c.m. respectively.

Of the eleven twin-births among the out-door cases, only one was observed in a lying-in patient, and but one is complicated with a deformed pelvis; whilst in two instances the cords of both of the twin children prolapsed.

The reason of the tendency to prolapse in twin births lies in the diminished action and power of the uterus, due to its unusual distention; we have in fact a twofold disproportion—on the one side the cavity of the uterus enlarged, on the other the foetus and its presenting part somewhat smaller than in single births.

All this also holds true for cases of *hydramnios*, in which we have farther complications, in the difficulty with which the presenting head finds its proper position, and in the ample space which the superabundance of amniotic fluid offers to the descent of the specifically heavier funis.

I may, perhaps, add that not unfrequently hydram-

nios is found conjointly with twin foetus. Unfortunately we have but few cases of hydramnios recorded, as the out-door cases frequently did not come under observation until after the escape of the waters; among the sixty-three cases of prolapse treated in the Lying-in Hospital we have three of hydramnios, but only in one of these cases does the superabundance of amniotic fluid seem to be the only circumstance leading to prolapse (Case 41. Healthy condition of abdominal parietes and of the womb, normal pelvis, vertex presentation of well-developed foetus, and an umbilical cord of 64 c.m. with normal insertion).

IV. PREMATURE LABOR.

I will finally mention the comparatively frequent occurrence of the prolapse in premature deliveries where both uterus and foetus are in an undeveloped state, unfit to enter upon the normal relation which they should sustain toward each other; we mostly find a premature rupture of the membranes and malposition of a frequently lifeless foetus, an interesting fact theoretically, but of little practical importance; thus of the premature births here enumerated, some were in the seventh, one even in the sixth month.

Of the twenty-eight premature labors in which prolapse of the funis occurred, relatively by far the largest number (twelve) were observed in the Lying-in Hospital, which is quite natural, as in many cases premature labor was induced on account of deformed pelvis, giving us a complication of circumstances.

It is in part true of premature deliveries, as we have

seen it to be of so many other complications of labor which have been accused of causing the prolapse of the funis, that in tracing the evil to its origin we find a pathological condition of the osseous part of the pelvic canal as the primary cause of all trouble.

V. PELVIS.

That the pelvis and its abnormal deviations is of the highest importance in establishing our theories with regard to the prolapse, I have made evident enough, and it claims a most thorough and careful consideration, all the more as considerable importance has always been attached to it in its causal relations to the prolapse, but in a vague and careless way—general statements without measurements or numbers to substantiate them. It is owing to the careful records of the Berlin Lying-in Asylum and the exact measurement of the pelvis so conscientiously taken in every single instance, that I am here enabled to deal with facts, and need not limit myself to theories.

The laws here expounded are the well-weighed result of the study of 160 cases of prolapse of the funis, concerning which we have all the desirable data—pelvic dimensions, etc.; 62 of these completely recorded cases were observed in the Lying-in Hospital, the remaining 98 among the out-door cases.

In determining the capacity of the pelvis, its external dimensions are here used, and I must necessarily say a few words in explanation of this, as, unfortunately for child-bearing women, pelvimetry is still in its infancy, and in this country almost untaught; to our

shame be it said, that the average accoucheur is entirely innocent of a science upon which the life of mother or child not unfrequently depend.

The exploration of the pelvic cavity with the finger is the method practised in this country and in England, whenever an attempt is made to ascertain its dimensions, to determine irregularities upon the inner surface, as well as the length of the diagonal conjugate. When properly executed, it gives the skilled examiner, and to him alone, a very good picture of the pelvis; it is rarely definite, and is of little value to others; it cannot be concisely and precisely recorded: very different are the internal post-mortem measurements of the pelvis.

Internal explorations have always been made; but for a classification of the pelvis I have confined myself to external measurements, which can be more thoroughly made and recorded, and afford us a very good estimate of the cavity.

The measurements given are :

1. The distance between the spinæ ilii anteriores superiores, the inferior transverse diameter (inf. transv.) which in the standard pelvis is 25 c.m. or $9\frac{1}{4}$ ".
2. The distance between the cristæ ilii at the widest part of the brim, the superior transverse diameter (sup. transv.), in the standard pelvis, 28 c.m. or $10\frac{1}{2}$ ".
3. The distance from the processus spinosus of the last lumbar vertebra to the symphysis, the antero-posterior diameter (ant. post.), or external conjugate, 20 c.m. or $7\frac{1}{8}$ ".
4. If possible to determine, the diagonal conjugate,

from the pelvic arch to the promontory, is given 13 c.m. or $4\frac{3}{4}$ ".

5. The external oblique diameters, the right from the spina ilii posterior superior of the right side to the spina anterior superior of the left (R. obl.); the left vice versa—22.5 c.m. or $8\frac{1}{2}$ ".

6. The distance between both trochanters, 31. c.m. or $11\frac{1}{2}$ ".

7. The pelvic circumference, taken beneath the spinæ ilii and above the trochanters, 89 c.m. or 33".

In order to facilitate a general insight into the question before us, it is necessary to classify the various kinds of malformations we are dealing with, and herein I must follow Michaelis and the German School; it is the only rational and scientific way of elucidating this point; the method in which it is treated by most English authorities, particularly by Ramsbotham, being so

TABLE III.—CLASSIFICATION OF THE PELVIS.

		Antero-post. diam. in c.m.	No.	p.c. of the 160 pel- ves measured.		p.c. of the contracted pelvis.
Normal 65 41 p.c.	16 Moderately enlarged.	above 20 19—20		10.	48.1	72.6
	49 Standard.			30.6		
Contracted 95 59 p.c.	69 Flattened.	{ 17—19 under 17	60	37.5	48.1	72.6
			9	5.6		
	23 Simply con- tracted.	{ 17—19 under 17	22	13.7	14.3	24.1
			1	0.6		
				0.6		
1 Narrow.				1.3		
2 Oblique.						

primitive and confused, that I would needlessly annoy the reader by any reference to them. Reference to Table III. will show my method of classifying pelvic

distortions, but I beg the reader not to remain satisfied with the general distinctions given in this table, but in each individual case to refer to the pelvic measurements in Table I.

Of the 160 pelves, I regard 65 as *normal*, *i.e.* the external antero-posterior diameter being 19 c.m. or more, the inferior transverse above 25 c.m., the superior transverse above 28 c.m. both oblique 22.5 or over.

TAB. III. a. Pelves classed according to their antero-posterior diameter.

External antero-posterior diameter in c.m.	No. of pelves.	per cent.	
19 and over { over 20	16	10.0	} 70 = 43.8 p.c.
19 and over { 19—20	54	33.8	
Less than 19 { 17—19	80	50.0	} 90 = 56.2 p.c.
	less than 17	10		6.2

and the pelvic circumference 89 c.m.; 16 of these must, however, be grouped separately as *moderately enlarged*, the pelvis *æquabiliter justa major*, whose antero-posterior is above 20 c.m., with the transverse diameters especially enlarged.

The way in which these moderately enlarged pelves are distributed among our cases of prolapse is characteristic, and I might almost say self-explaining. Only two belonged to primiparæ, in whom we must expect the firmness and elasticity of the tissues to counteract the effect of a very spacious pelvis;—these two exceptional cases were twin births, which affords an explanation of the prolapse; among the remaining 14 cases of multiparæ, many of them having very frequently borne, we mostly find cross and footling presentations; and here we have the simple explanation of the conflicting opinions ex-

pressed by different authors—as is so often the case—both parties are partially right, the error being due to an incomplete study of the subject. If Scanzoni and others consider the moderately enlarged pelvis as a contra-indication to prolapse of the funis, they are right in so far as the preternaturally large, regularly formed pelvis affords the same advantage to the passage of the normal foetus in a vertex or breech presentation as the standard pelvis (yet it cannot be called a contra-indication) [if there is too great a disproportion between pelvis and cranium, as in cases of premature delivery—or unusually small foetus and enlarged pelvis]; on the other hand, the contrary opinion, that the moderately enlarged pelvis is one of the causes of prolapse, is justifiable, as in cases of cross and footling presentation, or an unusual extension of the uterine cavity (hydramnios or twins), then it is certainly a circumstance favorable to the occurrence of the prolapse, though I can by no means class it among the causes.

As *standard pelves*, with an antero-posterior diameter between 19 c.m., 20 c.m., other dimensions corresponding, I have enumerated 49—less than a third—31 per cent., and even among these there are some which I have been forced to group under this head by reason of their external dimensions, although I very much suspect some abnormality on account of difficult or lingering labor in the present or previous births; we must let this pass, as it is impossible for me now to determine the cause of the trouble.

2. *Contracted Pelves*.—We now come to the consider-

ation of the largest and most important class, the *contracted pelvis*; and under this general head I place all whose external dimensions are less than those of the standard pelvis, whose antero-posterior is less than 19 c.m., be they distorted or simply (uniformly) contracted.

59 per cent. of the 160 pelves measured are contracted; among those observed in the L-in H., 52 per cent. are contracted (33 among the 62 births), whilst the out-door cases show 63 per cent. of contracted pelves (62 in the 98 deliveries).

Even if we bear in mind that of the 13 cases transported *inter partum*, on account of most complex labor, into the L-in H., most every single one exhibits a highly contracted pelvis; even taking into account that of the out-door measurements, some were merely made on account of an evidently deformed pelvis, nevertheless the number of contracted pelves remains a very large one, which we can only appreciate in recalling to mind the comparatively rare occurrence of the contracted pelvis. Michaelis, in his excellent work on the contracted pelvis, describes 72 cases of this deformity which he has observed among 1,000 deliveries,—Lying-in Hospital deliveries, be it remembered; this gives a contracted pelvis in about 7 per cent. of the cases—6 per cent., if we disregard cases brought *inter partum* into the institution.

Although the Lying-in Hospital of Kiel, which is supplied from a country suffering greatly from rickets, may even show a rather large number of contracted pelves, I think that I am justified in saying that about 7 per cent. of the child-bearing women in the northern part of the European Continent possesses a pelvis

varying so much from the standard as not to permit the ready delivery of a well-developed foetus at full term.

About the same result is obtained by Dr. C. Martin (*Zur Kenntniss der Engen-Beckens bei Gebärenden*), who finds among 2,034 pelves measured in the Berlin Lying-in Hospital, 135, somewhat less than 7 per cent., with an external antero-posterior of less than 19 c.m. If we add to these the oblique and narrow pelves with an antero-posterior diameter of over 19 c.m., the number of contracted pelves observed in the Berlin L-in H. will also reach 7 per cent.

Notwithstanding the very rare occurrence of this malformation, we have, as our tables show, in labor complicated with prolapse, a contracted pelvis in 59 per cent. of the cases (this gives us one case of prolapse of the funis to every 12 cases of labor complicated with contracted pelvis).

I need say no more; these facts suffice; they conclusively prove the contracted pelvis to be one of the main causes, directly as well as indirectly, of the prolapse; a truth which, though often surmised, is here for the first time proven by the logic of numbers.

According to the dates of the L-in H., the frequency of the prolapses is 16 times greater in the contracted than in the normal pelvis, and it is above all in vertex presentation, as we shall see, that the pathological pelvis asserts itself as a cause of the prolapse.

We have so far only considered the contracted pelvis as contrasted with the standard; but in order to fully understand its bearing upon the dystocia in question—

a purely mechanical one—we must study the *frequency of the various contractions and distortions* to which the pelvis is subject, as the different forms affect the process of parturition in a very different way. Of the 95 contracted pelves, by far the largest number, 69, or 72.6 per cent., are antero-posteriorly contracted, *flattened pelves*. 23, 24.2 per cent., I have called *simple contracted*; these it is often difficult to separate from the flattened pelves, as but few of them are strictly uniformly simple contracted, the diminution in the antero-posterior being usually somewhat more than in the other diameters, and it is owing to this unusual scope which I give the simple contracted pelvis that its numbers here are so large.

The *oblique pelvis* is a rare distortion; and among our number of contracted pelves we have but 2 which are distinctly characterized as such, *i.e.*, which show a considerable difference in the dimensions of their oblique diameters.

In a number of instances I find a lateral dislocation of the promontory noted. This was of course found in the digital exploration of the pelvic canal, made more especially for the determination of the diagonal conjugate; unfortunately the statements are too general, and as the external oblique diameters do not show sufficient variation, I am not justified in placing such pelves among the oblique, but have classed them according to their external diameters, mentioning the dislocation of the promontory.

But one *narrow*—transversely compressed—pelvis was found complicating prolapse; this is clearly marked

as such by the external dimensions, and the conditions of the present as well as the history of previous childbirth prove it to have been a serious obstacle. We have seen that the *flattened pelvis* is for us the most important of the contracted; not only is it the most common of the malformations of the pelvis which complicate prolapse, but also in a general average it is the most frequent of the pathological forms of the pelvis; this was first proved by Michaelis, who finds 70 per cent. of the 72 contracted pelvises described by him to be antero-posteriorly contracted; my result is a very similar one. I have shown 72.6 per cent. of the 95 contracted pelvises complicated with prolapse to be flattened; I have enumerated as flattened pelvises only those which were very decidedly compressed antero-posteriorly, excluding those pelvises which, diminished in all diameters, were somewhat more contracted antero-posteriorly, and notwithstanding placed by me among the simple contracted—which in their general features they resemble more than the flattened pelvis. We see that among contracted pelvises complicated with prolapse, the per cent. of flattened pelvises is greater than ordinary; a fact which readily explains itself, as neither the narrow nor the simple contracted pelvis—provided that the diminution in their diameters is but moderate—cause as much obstruction to the normal descent of the presenting head as an antero-posterior shortening.

Even if the disproportion between the transverse diameters of the foetal cranium and the conjugate of the pelvis is but slight, the head descends, the vertex presenting as usual, but with its longitudinal diameter

in the transverse of the brim; in this position the head is held fast for some time before entering the cavity of the pelvis; it cannot descend upon the os and the cervix—though its elements be strong and active; cannot adapt itself and closely fit to the fetal part held fast so high up in the pelvis; the comparatively oval mass of the cranium, placed in the transverse axis of the brim or superior part of the cavity of a flattened pelvis, leaves the sacro-iliac fossæ unoccupied, and this is the locus minoris resistentiæ in which the cord glides down.

By far the larger number—60 of the 69 flattened pelves—have an external antero-posterior diameter of from 17 to 19 c.m.; the remaining 9 are so very much contracted, their antero-posterior being less than 17 c.m., that they lose their importance for the prolapse of the cord—the life of the child being endangered by other and more serious complications. I should like to add, with regard to the *ætiology of the flattened pelvis*, though it is a question more of scientific than of practical importance in this place, that among the 69 antero-posteriorly compressed pelves, in 28 the distortion is clearly the result of rachitis. This leads me to an opinion contrary to the one expressed by Michaelis, who takes the pelvis plana Deventeri to be more common than the pelvis plana rachitica. The 28 flattened pelves which I have called rachitic, are either such as show the characteristics of the rachitic pelvis in a very marked way, or they are cases in which it is especially stated in the history of the mother that in her childhood she suffered from the “English disease,” as this affection is popularly termed in the north of Germany.

These 28 cases by no means cover the entire ground, and there is no doubt in my mind but that the greater number of the flattened pelvis here observed are the result of rickets, a disease so very common in that portion of Europe, and more especially so among the class of people to whom we owe our cases. I have spoken of the direct relation which the contracted pelvis bears to the prolapse of the funis, and it now devolves upon me to show the effect it has, with regard to the dystocia in question, upon other circumstances connected with the progress of labor—so, first of all, upon the position of the foetus.

TABLE IV.—DISTRIBUTION OF THE CONTRACTED Pelves AMONG THE PRESENTATIONS.

Presentations.	Normal.		Contracted Pelves.								No. of the Present.	Presentation complicated with contracted pelvis.	
	Enlarged +20	Standard 19-20.	Flattened Pelves.				Simple Contracted		Narrow. Oblique.	No.		p. c.	
			17-19		-17		17-19	-17					
			Not Rachit.	Rachit.	Not Rachit.	Rachit.							
Vertex . . .	8	26	27	18	8	3	18	1	1	96	71	72.5	
Forehead . . .	1	1	1	1	1	1	1	1	1	1	1	100	
Face . . .	1	1	1	1	1	1	1	1	1	2	2	100	
Breech . . .	2	2	2	2	2	2	2	2	2	6	6	83	
Foot . . .	3	13	6	1	1	1	1	1	1	25	9	36	
Transverse . . .	6	8	1	3	1	1	4	1	1	23	9	39	
Shoulder . . .	2	3	1	1	1	1	1	1	1	6	1	16.5	
	16	(60) 49	36	24	5	4	22	1		(161) 160	95	59	
		65	60				9		28				
			69						1 2				
			95										

Normal, 66; contracted, 95 = total 161.
 One normal pelvis being twice counted on account of twin-birth, with prolapse in both cases.
 Normal, 65; contracted, 95 = total 160.

3. *Relations of the Pelvis to the Presentation.*—Reference to Table IV. shows us that by far the greater part, 78 per cent., of the contracted pelvis occurs in combination with head presentation of the foetus; transverse shoulder and breech presentations together are found in the remaining 22 per cent. It must be distinctly understood that the cause of this combination is not to be looked for in an overpowering number of head presentations—it is not that we have more head presentations combined with contracted pelvis, because we have so many more head presentations. We have seen that a little over half, 57 per cent., of our cases of prolapse were with the head of the foetus presenting; the other presentations combined, almost equal them in number. If we lay the main stress upon the presentation, we shall find that of the 101 head presentations observed among the 160 measured pelvises, 74—73.3 per cent.—occurred in combination with contracted pelvis, whilst of the 60 cases of all remaining presentations only 35 per cent. are linked with malformation of the pelvis. I have before shown that the contracted pelvis is found with unusual frequency in cases of prolapse, and we now see that it attains its highest importance as a primary cause of prolapse in head presentations; a fact already known to Michaelis, who was led to the conclusion, by the study of 849 head presentations treated by him, that prolapse of the cord in head presentations was ten times more frequent with contracted than with normal pelvis; 7 cases of prolapse having been observed by him among 776 cases of normal pelvis, and 7 among 73 contracted pelvis.

Here the distortion of the pelvis is in itself the direct cause of the prolapse; but there are other cases still, in which it tends indirectly to bring about the same mishap. I refer to the venter propendens, to the malpositions and deformities of the uterus which so frequently complicate the contracted pelves, and in themselves again favor the occurrence of the prolapse. The fact that malposition of the foetus is so frequently engendered by contraction of the pelvis is of no great weight; we should be inclined to lay some stress upon this point, as it gives us a combination of two very important causes of prolapse. Though each is dangerous in itself, when concomitant they lose in effect.

I must here diverge a moment from my subject to establish the point I have just touched upon, a disputed question in which I most thoroughly concur in the views of Michaelis, who says that malpositions of the foetus are by four times more frequent with contracted than with normal pelves; this I have found to be the case, contrary to the ground held by Naegele, who maintains that such positions are never brought about by distortion of the pelvis.

4. *Influence of the Contracted Pelvis upon the Prolapse in I.p. and M.p.*—We must finally consider the distribution of the contracted pelves in cases of prolapse among primiparæ and multiparæ, as I must here again refute a theory which is quite freely accepted, namely, that the contracted pelvis has but little to do with causing the prolapse of the cord among I.paræ, that it only attains its full importance in this respect upon the advent of the second child.

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Now, we naturally inquire, how does this commonly accepted statement harmonize with our data? What are the facts?

Among 44	I. p. we find 30	contr. pel.	= 68.2	44	I. p. 30	contr. pel.	= 68.2
" 51	II. p. "	30	" = 58.8	} 116	M. p. 65	"	= 56
" 65	M. p. "	35	" = 53.8				

Only 27.5 per cent. of the 160 women in labor (our cases of prolapse with measured pelves) are primiparæ, and upon these come 31.5 per cent. of the contracted pelves, the same quantity which is distributed among a large number of secundiparæ—32 per cent. of the 160 prolapses; and in cases of prolapse among multiparæ in general, the contracted pelvis is still more rare; thus we have malformation of the pelvis in 56 per cent. of all cases of prolapse among multiparæ, whereas of primiparæ 68.2 per cent. are so affected.

(To be continued.)



ON PROLAPSE OF THE UMBILICAL CORD, ITS CAUSE AND
TREATMENT.

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(Continued from page 442, Vol. VI.)

VI. RELATIVE FREQUENCY OF THE PROLAPSE IN PRIMIPARÆ AND MULTI-
PARÆ.

As to the relative frequency of the prolapse among primiparæ and multiparæ, no average has as yet been accepted, the statements made by various investigators differing so very much; that at least my results may be precise, I must, in the discussion of this point also, con-

fine myself to the deliveries observed in the Lying-in House.

TABLE V.—RELATIVE FREQUENCY OF THE PROLAPSE AMONG PRIMIPARÆ AND MULTIPARÆ.

Lying-in House.	Out-door cases.
$\begin{array}{l} 35 \text{ cases of prolapse to } 2,977 \text{ multiparæ} = 1 : 85 \\ 27 \text{ " " " " } 2,923 \text{ primiparæ} = 1 : 108 \\ \hline 62 \text{ " " " " } 5,900 \text{ deliveries} = 1 : 94 \end{array}$	$\begin{array}{l} 248 \text{ prolapses among multiparæ} \\ 57 \text{ " " " " } \text{ primiparæ} \\ \hline 305 \end{array} \left. \vphantom{\begin{array}{l} 248 \\ 57 \\ 305 \end{array}} \right\} 4.26 : 1$
Prolapse 1.27 times more frequent among multiparæ than among primiparæ.	Relative frequency of prolapse among multiparæ and primiparæ = $\frac{4.26}{3} : 1 = 1.4 : 1$

Among the 5,900 parturient women there waited upon we have 2,923 primiparæ, in 27 of whom labor was complicated by prolapse of the cord; compared with these we find an almost equal number of multiparæ, 2,977, with 35 cases of prolapse (21 of which occurred in secundiparæ and 14 in pluriparæ).

So we see that the Lying-in House cases give us 1 prolapse to 108 parturient primiparæ, whereas among the multiparæ the ratio is as 1 : 85, making the occurrence of the prolapse somewhat more frequent among multiparæ than among primiparæ (1.27 : 1).

Though I have said that only the above compilation was to be thoroughly relied upon, I cannot refrain from giving the result of my calculations from the out-door cases, which are, to say the least, interesting, and claim a certain importance from their remarkable coincidence with the numbers obtained in the Lying-in House.

Among the out-door cases of labor in which we have prolapse of the cord, multiparæ were afflicted with this

complication in 243 cases, whilst it occurred but 57 times among primiparæ, this being a ratio of 4.26 : 1.

As I have no statistics which would give me the distribution of primiparæ and multiparæ among cases of normal labor in Berlin during the same time, I must take the generally accepted statement that upon an average 3 of every 4 parturient women are multiparæ: that cases of labor are 3 times more frequent among multiparæ than among primiparæ. We have found the prolapse in our out-door cases actually to occur 4.26 times more frequently among multiparæ, which would make the relative frequency of its occurrence among multiparæ and primiparæ as $\frac{4.26}{3} : 1$, or as 1.4 : 1, a ratio very similar to that obtained from the Lying-in House records.

Our cases show that *relatively* the prolapse occurs as a complication of labor almost as often among primiparæ as among multiparæ; I must acknowledge that when the contracted pelvis is excluded as a cause, the prolapse will become less frequent, but especially among primiparæ, as those of the causes which we have traced more particularly to multiparæ then become prominent.

This is a point which I must discuss more at length, it being of great importance in the ætiology of the prolapse.

Among the first to combat the assertion made by most authors, that the prolapse of the cord was by far more frequent among multiparæ than among primiparæ, was Martin, then at Jena, who had observed its

occurrence relatively almost as often in cases of first labor. It is this compilation of ours, of a very fair number of prolapses, justifying us in rather conclusive deductions, which has shown that the prolapse of the cord is almost as frequent an accident in the strong, rigid uterus of the primipara as in the more yielding womb of the multipara, and this is one of the urgent reasons which lead me to deny most positively that the main and primary cause of the prolapse is to be sought in the condition and action of the uterus.

Hildebrandt (*Beiträge zur Aetiologie und Behandlung des Nabelschnurvorfalles bei Kopflagen*, *Magazin für Geburtshülfe*, xxiii, p. 115), says that the most frequent and most important cause of the prolapse is found in a pathological condition of that organ, and *not* in any malformation of the pelvis.

This view he bases upon his observation of probably but a small number of cases in which he found the prolapse of the cord a very rare occurrence among primiparæ; a premise which we have seen is false—false even if we limit ourselves, as he has done in his article, to the cases of prolapse with head-presentation of the foetus. He says that it is by far less often the contracted pelvis which prevents the head from descending upon the os than it is a deformity of the womb, or a malposition of the foetus, caused perhaps by a pathological condition of the pelvis.

So much for his data; ours differ. In the Lying-in House the relation of primiparæ to multiparæ in the prolapse cases is 1 : 1.27; and even if we consider our vertex presentations separately, we find that 15 of the

36 occur in primiparæ, and 21 in multiparæ, which is no great increase in the proportion of multiparæ, the ratio here being 1 : 1.4.

It is certainly true that in multiparæ the occlusion of the os is more or less imperfect ; dilatation takes place at a much earlier period of labor than in primiparæ, whilst the presenting head is still high in the pelvic canal, thus greatly favoring the occurrence of the prolapse by giving space through which the cord may readily glide, if more potent causes are acting which lead to this mishap. Moreover, among multiparæ we more frequently have transverse and shoulder presentations, and also the *venter propendens*, the result of repeated labors—circumstances which indeed greatly favor the occurrence of the prolapse, and but rarely occur in primiparæ. In these the contracted pelvis is the main cause of this dangerous accident ; and we find this to be the case in 60 p. c. of all the primiparæ observed in the Lying-in House whose labor was complicated with prolapse of the cord.

As another argument to prove his theory that the prolapse is due mainly and primarily to a pathological action of the womb, Hildebrandt cites those cases in which the prolapse has been repeatedly observed in the same woman ; he admits that a contracted pelvis frequently complicates these cases, but according to his reasoning it is not this, but the always equally insufficient action of the uterus which causes the prolapse of the cord. I will not deny the possibility that the prolapse of the cord in several successive cases of labor may be in connection with, or dependent upon, a pathological condition

of the uterus; yet I know of no single instance in which I could confidently assert this to have been the case.

In all such labors, whether observed in the Lying-in House or among the out-door cases, we find a contracted pelvis, and this is certainly the primary cause of the prolapse; how far the uterus may have suffered from this condition of the pelvis, and in what way its diseased state may have affected the prolapse, I, at least, cannot say.

One case only (No. 11 of the out-door cases) is an exception: the pelvis is moderately enlarged; it was the sixteenth child; several of the last had come as footling cases, with prolapse of the cord in one. Here we must indeed admit that the laxness of the tissues of the womb and abdominal walls, with malposition of the foetus, were causes of the repeated accident. Another case in which prolapse was repeatedly observed (No. 17 of the out-door cases), I have placed among the normal pelvises, as the measurements given show nothing decidedly abnormal, ant. post. 19 cm., inf. transv. 27.5, sup. transv. 28.5, oblique 21 cm. The somewhat insufficient length of the latter, but more particularly a consideration of the whole, lead me to look upon it as a somewhat contracted pelvis.

Michaelis and others have also observed the repeated occurrence of the prolapse in the same woman, always in combination with contraction of the pelvis. This very fact, observed by eminent authorities, and thoroughly established by our own cases, is to my mind a most striking proof that the contracted pelvis is one of the main causes of the prolapse, primary and pre-eminent.

It is interesting to study the various circumstances

to which the different authors, each searching for something new, have attributed the prolapse of the cord: thus Hohl accuses all such conditions which serve, temporarily or permanently, to change the normal and regular position of the fœtus *in utero*; he lays the main stress upon the position of the fœtus, as others do upon the condition of the uterus.

This is but an idle war of words. The difference between these various opinions is not an essential one, as all may be traced to the same fundamental cause.

C. APPEARANCE AND CONDITION OF THE PROLAPSED CORD.

The circumstances which complete the picture which the prolapse of the cord presents to us, the conditions under which it appears, the complications which surround it, are all of importance, more especially so for the treatment, and hence claim our attention. It is necessary that I should define the terms here employed, as they have heretofore been used indiscriminately, whereas I make a well-marked distinction between prolapse and presentation, and trust that it will be more universally adopted.

Prolapse of the Cord.—So far I have always spoken of the *prolapse of the cord*, that is, the appearance of the cord in the os, or its descent through the os, after the rupture of the membranes, as this really is the point of clinical importance, the condition which threatens the life of the child and calls forth our most active efforts for its relief.

Presentation of the Cord.—If the labor is under observation from the very beginning, we may often, in its

early stages, detect a *presentation of the cord*. By this term I understand its appearance in the os, within the *still intact membranes*, so that it may be reached by the examining finger.

In the Lying-in House we have 7 cases recorded in which the funis was found presenting, 7 of the 50 cases observed throughout from the very commencement of labor; thus showing that among every 7 cases of prolapse the funis had been presenting in but one. In all such cases, prolapse inevitably follows the rupture of the membranes and the escape of the waters, unless active measures are taken and circumstances prove very favorable for treatment.

Among the out-door cases the presentation of the cord was discovered in several instances, but these cases are useless to us for any comparison with regard to frequency of occurrence, as it was mostly the very fact of the cords having prolapsed which caused the attending midwife to summon medical aid; very few were observed from the commencement of labor. We see that the cases are rare in which the cord presents, where a loop of the soft, slippery, pulsating funis lies in the os, still enclosed within the foetal membranes. The life of the foetus is threatened in this situation, when the head presents, as the descending cranium may compress the cord notwithstanding the shielding presence of the waters.

It sometimes happens that the funis is not to be reached by digital examination, that we do not suspect it of presenting, and yet the foetal heart ceases to beat, and with the escape of the waters a pulseless funis

prolapses, indicating that a small loop which had slipped down, though not far enough to present plainly, had been compressed by the descending head.

Ordinarily the threatening danger is not suspected until the waters escape, and with these the cord is forced down. Rarely does the cord prolapse *after* the rupture of the membranes. Of such cases we have but 4 on record among our entire number of prolapses; they occur under peculiar circumstances, when the waters escape at an early period of labor, while the os is still imperfectly dilated and the foetal membranes tightly stretched across the small opening; the rupture in the membranes being but slight, and high above the os. Under such conditions it is impossible for the cord to prolapse until the os is more fully dilated and the membranes have been forced aside.

Extent of the Prolapse.—Usually one loop lies in the os or descends through it into the vagina, yet the cord may prolapse to a much greater extent, and protrude from the genitals; in a very much contracted pelvis, or in foot and cross presentations; several loops of the funis sometimes lie in the vagina; yet all these varying circumstances are of little interest and without importance either for the prognosis or treatment.

TABLE VI.—LOCATION OF THE PROLAPSED LOOP IN 86 CASES OF VERTICAL PRESENTATION.

	Positions			
	I.	II.	III.	IV.
Left sacro-iliac fossa.....	7	2	1	1
Right sacro-iliac fossa.....	5	3		
Left acetabular region.....	2	5		
Right acetabular region.....	5	1	1	
Behind the symphysis pubis.....	2	1		

Location of the Prolapse.—I define the locality of the prolapse as that part of the pelvis in which, either by an irregularity in the configuration of the maternal parts, or by an abnormal position of the presenting foetal part, an unoccupied space is left between the two, through which the cord escapes. The determination of this point is of importance, as upon it depends to a great extent the pressure to which the funis will be subjected during the progress of labor.

In the discussion of this subject I shall confine myself to vertex presentations. I merely mention, that in foot, cross, or shoulder presentations the locality of the prolapse is more difficult to determine and is of far less importance for the prognosis; the prolapse in these cases usually takes place in that part of the pelvis to which the foetal insertion of the funis, the abdominal front of the foetus, is directed; this mostly being the sacrum, the cord is thus thrown into the shelter of one or the other of the sacro-iliac fossæ.

In vertex presentations as well purely theoretical considerations lead us to suspect the sacro-iliac fossæ as the space in which the funis most frequently finds room to descend, and for the following reasons:

The nerve of the pelvis in the sacro-iliac fossæ is such as to leave one of these recesses unoccupied in any position the head may assume; moreover, those vertex presentations predominate in which the face of the child looks towards one of the sacro-iliac synchondroses, placing the foetal insertion of the cord in the posterior part of the uterine cavity, where we also find its placental insertion in by far the greater number of

cases; this throws the mass of the funis into the posterior part of the cavity, everything tending to guide a descending loop into the sacro-iliac fossa.

In the first vertex presentation in which the right oblique diameter* of the pelvis is occupied by the longitudinal axis of the foetal head, the occiput near the left acetabulum, the forehead in the right sacro-iliac fossa, we would naturally seek the path of the prolapsed cord at one of the extremities of the unoccupied diameter, in the region of the right acetabulum, or of the left sacro-iliac synchondrosis.

In a second vertex presentation we should expect the prolapse to take place in the right sacro-iliac fossa or in the region of the left acetabulum.

Such are the theoretical deductions which have forced themselves upon me, and which, I am proud to say, I have been amply able to verify by a review of our cases.

Notwithstanding that the prolapse of the cord in vertex presentations so often occurs while the foetal head is still high in the pelvis, occupying the transverse diameter, or that a deformed pelvis complicates the case, somewhat changing the normal course and the relation of the various diameters of the foetal head to those of the pelvis, to a certain extent liberating the diameters theoretically occupied, we still find (Tab. VI.) that when the prolapse takes place in the first vertex presentation, the cord descends most frequently in the left sacro-iliac fossa and in the region of the right ace-

* I have named the diameters right and left oblique, according to their posterior terminal point.

tabulum. Among 12 cases with the foetus in second position, the cord was in 8 instances found where we should theoretically expect it—thrice in the right sacro-iliac fossa, and five times in the left acetabular region; in 2 cases the prolapse took place in the left sacro-iliac fossa, a place which may easily become the seat of the accident when the course of the foetal head is a somewhat abnormal one; in one instance the cord was found behind the symphysis, and in one case in the right acetabular region—a very rare occurrence.

We see that in the 36 cases of vertex presentation in which the location of the prolapsed loop is given, there are but three instances in which the prolapse took place in that section of the pelvis originally occupied by the occiput; one of these is the case just mentioned of a second position in which the cord prolapsed in the right acetabular region, which we may perhaps explain by the fact that in the very commencement of labor the presenting head, which in a later stage assumes the second position, occupies the right diagonal diameter of the pelvis, with the occiput in the right sacro-iliac fossa. Here the cord, subjected to pressure in a confined space, prolapsed pulseless; so also in one of the two cases of first position in which the prolapse occurred in the left acetabular region. The other case, in which a pulsating cord prolapsed in the section of the pelvis occupied by the occiput, we can only explain by the fact that the head first presented in fourth position, with the occiput in the left sacro-iliac fossa, leaving the left acetabular region unoccupied; in this the cord descended, and was probably

preserved from pressure by the rapid descent and delivery of the head after assuming a first position.

As far as our cases go, facts prove my theory; and I am warranted in stating that the prolapse of the cord, in vertex presentations, as a rule, takes place in one of the terminal points of that diagonal diameter of the pelvis which is not occupied by the foetal head—the sacro-iliac fossa being the one which is most frequently the seat of the accident, on account of the formation of that section of the pelvis; less often is it the acetabular region. Very rare, and in most instances fatal, is the occurrence of the prolapse in any region occupied by the occiput, as its rounded shape, adapted to the formation of the pelvis, leaves but little space for the cord to descend, and subjects it, once prolapsed, to an unavoidable and fatal pressure. Equally dangerous, and not often met with, is the prolapse of the cord directly behind the symphysis pubis, where there are no soft parts to protect the funis, which must inevitably be crushed, forced between cranium and symphysis in the descent of the head.

Pressure upon the Cord.—The prolapse of the cord imperils the life of the child, not, as has often been supposed, by the exposure of the prolapsed loop to the atmosphere, but by the pressure to which it is subjected; and this depends upon the condition of the maternal parts, the kind of pains, the foetal part which presents. In head-presentations where a hard unyielding part endangers the cord for a longer time, the location of the prolapsed loop, with regard to the pelvic diameter occupied by the foetal head, is

the most important of all those points which determine the pressure to which the cord is subjected.

In all other presentations less danger threatens the cord, as it is often not subjected to pressure until the very last stage of parturition, and then not for any length of time; in many cases the pressure is so slight, scarce affecting the circulation in the umbilical vessels, that the powers of nature suffice to develop a living child, unaided by the hand of the obstetrician. Several such cases were observed in the out-door department, some few in the Lying-in House; one of these latter was even a case of vertex presentation, a first position, in which the cord was found presenting while the head was still in the brim, and the os not more than 1.5 cm. in diameter. The patient was placed upon her left side, the side occupied by the occiput, to hasten the descent of the head. The condition of the cord and the course of the labor were continually watched, and the patient directed how to assist its favorable progress by all means in her power; yet as there was no direct interference by the hand of the obstetrician, we may still call it a case of natural labor. The patient was forbidden to press with her abdominal muscles, and thus the membranes were preserved until the os was fully dilated. With the escape of the waters the cord came down in the right acetabular region, the anterior terminal point of the unoccupied pelvic diameter. The head being rapidly developed by a healthy action of the uterus and abdominal muscles, a strong, living child was born.

The two other cases in which the cord escaped any

serious compression were foot-presentations, in which no further assistance was rendered than is usual in such cases—manual delivery of the head.

Unfortunately, these are but exceptional instances, as the prolapsed funis is inevitably subject to a pressure which is greater or less according to the relative condition of the antagonistic powers; thus the compression of the cord may be but slight yet continued, or sudden and severe, causing either a slow diminution, or a rapid cessation of the interchange between the fœtus and its source of life, the placenta. The child no longer receives the full amount of purified, oxygenized blood, necessary for its existence. The accumulation of carbonic acid causes the fœtus to seek its oxygen from other sources; intra-uterine inspirations are the result; but it is not oxygen, not air, it is meconium and liquor amnii which fill the expanding lung. As long as the medulla oblongata is still stimulated to increased action by the accumulating mass of CO₂, a morbidly increased activity of the heart, a few rapid, weak inspirations follow, and the fœtus succumbs to the CO₂ intoxication—perishes in an asphyctic state.

Prolapse of Extremities.—Presentation, or prolapse of the superior or inferior extremities, not unfrequently complicates the prolapse of the cord, yet it is by no means to be considered as one of the causes, as Scanzoni takes it to be. The prolapse of the extremities is equivalent to that of the cord; both are brought about by the same causes, and those cases are exceedingly rare in which we are forced to look upon the one as the cause of the other.

In 3 of our 63 prolapse cases, from the Lying-in House the descent of one or the other of the extremities was noticed by the side of the presenting head, and in head-presentations alone is the prolapse of the extremities in combination with prolapse of the cord of interest. Among the out-door cases this combination is noticed much more frequently, as the conditions for its occurrence are by far more favorable in the greater number of multiparæ. In 50 of the 302 cases of prolapse of the cord, one of the extremities, of course mostly an arm, had prolapsed with the funis on account of the irregularity of the pelvic canal, or its incomplete obstruction by an abnormality in the descent of the advancing head.

Saxtorph, in his compilation, obtains a similar result; he finds prolapse of an extremity complicating prolapse of the cord in head-presentations 41 times out of 253 cases of prolapsus funiculi.

D. POST-MORTEM APPEARANCE OF THE CHILD.

We have seen in what way the prolapse of the cord endangers the life of the fœtus, and we must next ask, What are the anatomical changes which a child presents whose death has been caused *inter-partum* by compression of the prolapsed cord? Is the post-mortem condition such that the pathological anatomist can with certainty point to prolapse of the cord as the cause of death? These are questions of the utmost practical importance, which I can, unfortunately, answer in a but very indefinite way.

Hoping to obtain some definite and positive results,

I made very thorough post-mortem examinations of children whose death had been caused, during labor, by prolapse of the funis; at the same time, as a check upon my investigation, I examined, with equal care, the bodies of those who had perished *inter-partum* from other causes. The result was a negative one, so that I desisted from farther pursuit of an investigation which looked so unpromising.

I shall refer in my statements more particularly to the post-mortems of 13 thoroughly examined cases in which death had been caused by compression of the prolapsed cord. Some of the cases are taken from the books; the autopsies not having been made with special reference to the question now before us; the points here of importance have not always received the necessary consideration; yet the notes suffice to give us an understanding of the subject.

The pathological conditions found in the different subjects vary considerably; we mostly find a more or less marked venous hyperæmia of the internal organs, especially of the lungs, liver, and kidneys; the surface of the liver was frequently found to be very dark, congested along the margin, and pale, sometimes marbled in the centre. In two cases the organs were found exquisitely anæmic. Among the most constant findings are numerous small ecchymoses; in only 3 of the 13 post-mortems none were discovered; in several instances they were quite scarce, only a few small ones being found in the heart and in the kidneys. Ecchymoses most frequently occur in the lung and pleura, in the heart and pericardium, in the thymus gland as well as

upon the liver; they are more rarely found in the spleen and kidneys, and in the mucous membrane of the stomach. In a few of our cases small extravasations had occurred in the galea, beneath the periosteum, and in the brain.

The serous membranes of the large cavities of the body principally are threatened with ecchymoses, above all the pleura, for with every intra-uterine inspiration, which is an expansion of the thorax without a corresponding expansion of the lung on account of the lack of air; the external pressure upon the congested vessels, which counteracts the force of the blood from within, is diminished, the delicate walls of the capillaries can no longer resist, they burst, blood extravasates, and we have the ecchymosis. The œdema, which has been considered one of the most characteristic and most constant appearances in death caused by prolapse of the cord, we find in but 6 of our cases, and affecting very different localities, most frequently the scrotum, the umbilical vessels, the *porta hepatis*, and the lungs; in 5 cases the fact is especially mentioned that no œdema was found.

Small extravasations, of blood, ecchymoses, occur, as we have seen, more frequently than the œdema; and this is to be expected, as in most instances where pressure is exercised upon the prolapsed cord, the circumstances which favor the production of ecchymoses are given, whatever the individualities of the case may be, be it a slight and continuous or a sudden and severe pressure which constricts the cord. The œdema, on the contrary, is dependent upon a slight but long-continued

compression of the umbilical vessels, the increased pressure in the arterial system. Sudden and thorough compression prevents its appearance by the too rapid destruction of life.

The lungs are mostly found in a state of complete atelectasis; very rarely they contain a little air, and then only in but few of the alveoli.

Meconium and liquor amnii were, in two cases, found in the bronchi, probably not oftener because the air-passages were not in all cases carefully opened. Twice they contained a sero-hemorrhagic fluid, and twice they were found quite empty, normal.

The stomach, in one case, contained meconium and amniotic fluid.

The cavities of the pleura, pericardium, and peritonæum are in most cases more or less filled with a serous, slightly hemorrhagic fluid.

We see that these various cases have, to a certain extent, some changes in common, yet not one which we find throughout, not one which we might call pathognomonic; and yet we must ask, Is there nothing which is characteristic for a death caused by prolapse of the cord? the œdema? the ecchymoses? My own investigations, as well as the records of the Berlin Lying-in House, records of a large number of post-mortems, prove that the very same changes are also found in children who have perished from other causes during parturition.

I have found the same œdema, even the œdema of the genitals, in head-presentations; in breech-presentations it is, of course, a usual occurrence; ecchymoses are quite frequent, even in connection with complete

atelectasis of the lungs, and they occur in the same places, upon the pleura, the pericardium, and the peritonæal covering of the liver. The exudations in the serous cavities are likewise found. This may at first seem strange, yet it is readily explained when we remember that the same conditions prevail in a breech-presentation as in a prolapse of the cord; the same anatomical changes are called forth. But when the organs of a foetus which has perished while passing the pelvic canal in a head-presentation display the same complication of symptoms—œdema, ecchymoses, meconium, and liquor amnii in the bronchi—we must naturally suppose, though no prolapse was observed, that a compression of the cord has taken place *in utero*, where it was more exposed, being coiled around the neck; this seems to be proved by the post-mortem condition of two cases, which appeared very striking to me.

Lying-in House, 22, 2, '72. Child of Otilia H.; vertex presentation; cord coiled twice around the neck; œdema scroti; lungs containing air; ecchymoses in all organs; vernix caseosa and meconium in the bronchi; œdematous condition of the umbilical vessels.

Out-door cases, 26, 10, '71. Child of Agnes T.; vertex presentation; pressure upon the coiled cord; bloody serum in the abdominal cavity; atelectasis of the lungs; ecchymoses upon liver and lungs.

The same anatomical changes are also produced by premature detachment (expulsion) of the placenta (out-door cases, Ferd. H., 6, 2, '72); yet they may even occur, and it is my duty to point out this fact, in simple cases of head presentations in which it is impossible for

us to refer them to any of the above-mentioned complications.

I cannot concede that one of the umbilical vessels, veins or arteries, is more subject to pressure than the other on account of their anatomical conditions, as has been asserted by many; they are enveloped by the same protecting tissue, Wharton's gelatine, and the difference in the structure of their walls is so slight, that no theories can be based upon these circumstances; the one cannot resist compression more than the other. It is the position of the cord, the shape of the parts between which it is crowded, and the part of the cord which is most compressed, which causes the flow of blood through veins or arteries, or through both, to be checked. This gives us an explanation for the varying appearances of hyperæmia and anæmia.

To conclude, I must again state that the post-mortem examinations of the children whose death was caused by prolapse of the cord has given us but a negative result, as it is nothing more than a death from asphyxia, which the foetus suffers from so many other causes; the circulation of the blood is hindered, checked, the all-important oxygen is no longer supplied, and the foetus perishes in a CO₂ intoxication.

E. DIAGNOSIS.

The prolapse of the cord is easily diagnosed, so also a simple presentation of the cord, provided it is a pulsating loop we are dealing with, and not too high in the pelvis, at a very early stage of labor, or protected from touch by great tenseness of the foetal membranes.

A possibility of a mistake in the diagnosis may arise if the presenting cord has ceased to pulsate and the os is but little dilated; but this will easily be rectified upon more perfect dilatation of the os.

F. PROGNOSIS.

The risk to the life of the child from the prolapse of the cord would seem great, according to our results from the Lying-in House and out-door cases; the mortality is indeed large in itself on account of the unfavorable circumstances under which the obstetrician is forced to act, but not large, on the contrary favorable, as compared with the results of others.

TABLE VII.—MORTALITY.

Presentations.	Lying-in House.				Out-door Cases.				Total.			
	Saved.		†		Saved.		†		Saved.		†	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Vertex presentation.	11	31.4	24	68.6	65	39.	102	61.	76	38.7	126	62.3
Face "	1	100.	0	0.	3	60.	2	40.	4	66.	2	44.
Breech "	2	100.	0	0.	2	25.	6	75.	4	40.	6	60.
Foot "	13	81.	3	19.	36	68.	17	32.	49	71.	20	29.
Transverse "	0	0.	4	100.	23	54.	20	46.	23	50.	24	50.
Shoulder "	4	80.	1	20.	11	42.	15	58.	15	50.	16	50.
	31	50.	32	50.	140	46.6	162	53.5	171	47.7	194	52.3

Of the total number of 365 cases of prolapse 171 of the children, 47.7 per cent., were saved (Tab. VII.); in the Lying-in House the number saved is greater, a little over 50 per cent.; in the out-door department only 46.6 per cent.

This looks unfavorable, but the result is a very fair one for hospital practice, and very fair when com-

pared with the average results of most obstetricians; thus, out of the 743 cases of prolapse of the cord compiled from various authorities by Scanzoni, only 335 of the children were saved, 45 per cent.; even less fortunate than our out-door cases. Michaelis did not save over 26 per cent. Churchill, in his work, has gathered a large number of cases of prolapse of the funis from all possible sources, and finds that 47.9 per cent. of the children were saved. To account for this favorable result, I need but state that Churchill has followed the good old custom and cited the cases of Mesdames Boivin and Lachapelle, which are so wonderfully successful. I for my part can place no faith in them, and deem it time that these myths be stricken from our roll of facts.

Our results are least fortunate in cases of *vertex presentation*; out of 202 such, the life of the child was saved in only 76, 36.7 per cent. This is accounted for, not only by the fact that the foetal part, which already threatens the cord at an early stage of labor, is large, hard, and unyielding, but also by the serious troubles which complicated these cases—the 22 craniotomies, and the cases of placenta prævia. Then we have quite a number of the out-door cases in which assistance was asked after the cord had ceased to pulsate. Deducting all these, we have left 111 cases of vertex presentation complicated with prolapse of the cord, which were amenable to treatment, and which were treated for the prolapse and not for any complication. Out of these 111 simple cases, 65 per cent. of the children were saved—a result which, as we will soon see (Tab. IX.),

was achieved in the out-door department as well as in the Lying-in House.

The mortality among the *face-presentations* is smaller, strange to say, than among vertex presentations; of the 6 face-presentations observed among our cases, 4 of the children were saved.

The number of cases being so limited, I should not deem myself justified in making any general deductions, more particularly so as it does not seem rational that the face-presentation, dreaded under ordinary circumstances, should, when complicated with prolapse of the cord, be less dangerous to the life of the child than the vertex presentation. The reason for this strange result is to be sought in the fact that in these cases medical assistance is procured as soon as the face is found presenting, often long before the prolapse takes place. The case thus comes under observation in a much earlier stage of labor than a case of prolapse in an ordinary vertex presentation, thus giving greater promise of success to the efforts of the obstetrician in behalf of the threatened existence of the child.

But few *breech-presentations* are recorded, and these remarkably unfortunate, the life of the child being saved in but 4 (40 per cent.) of the 10 cases which came under observation. The 2 cases treated in the Lying-in House, twin-children in each instance, were both successful.

Foot-presentations are our most successful cases, and fortunate it is, as they are very frequent, ranking in number next to vertex presentations. Among our 365 cases of prolapse, we have 69 foot-presentations,

with 49 of the children, 71 per cent., saved; even in the out-door department 68 per cent. were saved—68 per cent. of all cases observed, including those in which the obstetrician found the prolapsed cord cold and pulseless upon his arrival.

Of the foot-presentations complicated with prolapse, which were observed in the Lying-in House, 81 per cent. were saved, in fact 100 per cent., for among the 3 still-born in those 16 cases, we have 2 premature deliveries (foetus of not much over 6 months), and one child, probably syphilitic, already in process of maceration: these we can certainly exclude. In the remaining 13 cases the children were all saved; so that in the Lying-in House not one of the viable children was lost in the cases of foot-presentation complicated with prolapse of the cord.

The prognosis offered by *transverse and shoulder presentations* is very much the same, and more fortunate than we might expect it to be. In the 47 transverse as well as in the 31 shoulder presentations which we find among our total number of prolapses, 50 per cent. of the children were saved. This fortunate result I account for by the fact that in these cases the cord is less endangered by pressure, and that medical assistance is sought betimes.

We see then that in the prolapse of the cord the prognosis is most favorable to the life of the child when the latter enters the pelvic canal with the feet presenting. Next to foot-presentations, but with by far more risk to the child, come transverse and shoulder presentations; the most dangerous are vertex presentations.

The number of carefully observed breech-presentations is so limited that I cannot accept the result they give us as a standard. The prognosis in breech-presentations is at least equally favorable with that offered by transverse and shoulder presentations.

So much for the risk to life as affected by the condition of the child itself. The points most important for the prognosis, however, are those which we find on the side of the mother. A prolapse which takes place in a primipara gives a prognosis much less favorable to the life of the child than one which occurs in a multipara. To only 34 per cent. of deliveries complicated with prolapse of the cord in primiparæ, which terminated favorably for the child, we have 50 per cent. of the children of multiparæ saved.

That a first labor should be so much more dangerous to the child in cases of prolapse, is partially accounted for by circumstances already mentioned, which I here recapitulate :

1. The contracted pelvis, which prolongs and endangers labor, is more frequent in primiparæ than in multiparæ: 68 per cent. of the primiparæ showed a deformed pelvis, while only 56 per cent. of the multiparæ were so affected.

2. Vertex presentations, which render the prognosis more unfavorable, occur more frequently in primiparæ than in multiparæ.

3. The rigidity of the parts in primiparæ causes a prolongation of labor which greatly increases the risk to the child; the os but slowly dilates, and, being firm and rigid, renders any operation more tedious and diffi-

cult. It is especially the greater laxness in the tissues of the uterus and the circular fibres of the os which makes the prolapse of the cord a much less dangerous accident when occurring in a multipara; labor goes on more rapidly, the cord, if compressed, is endangered for a shorter space of time; the os, being more yielding, not only dilates more readily, but causes less compression, and, above all, gives ready entrance to the hand of the obstetrician at a comparatively early period of labor.

The contracted pelvis causes increased risk to the life of the child by making the labor more tedious and rendering any operation undertaken for the preservation of the child more difficult. In extreme cases it is of course the deformity of the pelvis in itself, and not the prolapse of the cord, which necessitates an operation mostly difficult and dangerous.

Taking into account the various points considered, we must say that the prolapse of the cord, *with all its complications*,—the contracted pelvis and the operations consequent thereupon, the premature deliveries and placenta præviæ, the tardy arrival of the obstetrician, etc.,—make the prognosis for the life of the child an unfavorable one, over 50 per cent. of the children having perished. If we consider the prolapse of the cord as such, theoretically, if we take those cases in which the prolapse is the only danger which threatens the child, and when obstetrical aid is at hand, we may call the prognosis a passably fair one. In cases of this kind, as observed in the Lying-in House, 72 per cent. of the children were saved. In foot-presentations the safety

of the child can be predicted with an almost unflinching certainty. In transverse and shoulder presentations the result is but a trifle less favorable than it usually is in these presentations, when not complicated with prolapse of the cord. Vertex presentations are the most dangerous, and even in pure cases of prolapse, free from any complication, they give a rather unfavorable prognosis. In cases of this kind (Tab. IX.) 65 per cent. were saved, and this I consider a true average per cent., as it is the result achieved in those 111 simple cases of vertex presentation, complicated with prolapse, excluding all cases in which the labors of the obstetrician were not confined to the preservation of the child.

The prognosis in each individual case, of course, varies with the attending circumstances, position, presentation, stage of labor, pressure of the waters, size of the os, location of the prolapse, kind of pains, condition of the mother, etc.

Finally, in view of the data here presented, we can give a somewhat better prognosis for the life of the child, in cases of prolapse of the cord, than most authorities have hitherto ventured to do.

Among the large number of our cases we have not a single instance in which the life of the mother was in any way endangered by the prolapse of the cord as such; for instance, by hemorrhage occasioned through premature loosening of the placenta in cases where the cord is drawn over the head, as some authors relate them.

That the death of the mother followed in a number of our cases, which include so many very much contracted

pelves and placentæ præviæ, is not surprising ; but it was caused in every instance by the complication, and never by the prolapse itself.

ON PROLAPSE OF THE UMBILICAL CORD, ITS CAUSE AND
TREATMENT.

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(Concluded from page 568, Vol. vi.)

G. TREATMENT.

THE number of our cases is large, they are unusually successful, and I here propose to give the methods by which these favorable results have been achieved; to the discussion of these methods I shall confine myself, avoiding theoretical speculations on treatment, which may be found elsewhere.

I. *Methods of Treatment in General.*—There are cases of prolapse in which it is not desirable to leave the progress of labor wholly to the powers of nature, cases in which interference is necessary, yet no indications for operation exist: here the

first and most simple assistance we can render is by properly directing the patient's voluntary efforts; either, as the state of the case demands, to keep her quietly in one position, refraining from pressure with the abdominal muscles, or, when labor is far advanced, to encourage her to aid the passage of the head by the exertion of all her energies.

1. *Postural Treatment.*—Equally simple, and on that account probably neglected in clinical teaching, as well as in the text-books, is the Treatment by Position, which is a valuable aid to the practitioner in conducting any case of labor, and the obstetrician who carefully follows the progress of his case can often, by this more elegant and delicate method, guide to a safe and natural termination a labor in which instrumental interference would otherwise have been unavoidable.

By directing the patient to assume an appropriate position, and to carefully manage her voluntary efforts, we may, if circumstances are favorable, save the child without reposition of the cord or any manual interference.

By an appropriate position I mean the placing of the patient upon the side opposite to that in which the funis has prolapsed, so that the cord may be relieved from pressure, at least to such an extent as the influence of gravity in child and womb will permit, and may perhaps be so far released that, slippery and yielding as it is, it may glide back into the cavity of the womb.

Thus when the prolapse takes place in one or the other of the sacro-iliac fossæ, which is most commonly the case, as we have seen, we would naturally seek to throw the weight of the child forward upon the abdominal parietes, and this we accomplish by placing the patient on her hands and knees, in the knee-elbow position. I have achieved good results by this method, but the position is unfortunately very tiresome, and difficult to retain for any length of time, moreover cannot always be resorted to in private practice. In case we cannot make use of the knee-elbow position, or that it has proved too fatiguing, the patient must be placed in the corresponding side position, on the left side if the cord has prolapsed in the right sacro-iliac fossa.

In some cases of prolapse we may succeed with this treatment alone, but we most frequently have recourse to it as a preliminary measure, and as such it is our main, I may say our

only resort in the early stage of labor to relieve the cord from pressure, to preserve it well pulsating until the os is sufficiently dilated to undertake delivery.

Thomas, in a paper in the *New York Journal of Medicine*, as early as 1858, warmly advocates postural treatment in cases of prolapse; great credit is due our eminent countryman, who was one of the first to have called attention to this method, and it would have been well had his teachings been more carefully followed.

By postural treatment he, however, understands exclusively the knee-elbow position, which is an undue restriction of the term; his conclusions, too sweeping in some instances, were based upon only two successful cases, and were very properly modified in a later paper in which he says that "position alone will rarely, if ever, cause the return of the cord without the aid of manipulation, unless the bag of water is unbroken, and even then it may not."

This is a very just delineation of the value of postural treatment, which is not so much a method of treatment in itself as an adjuvant necessary in the majority of cases—sometimes, indeed, our only resort.

3. *Reposition of the Cord.*—Reposition of the cord, the carrying back of the prolapsed loop into the cavity of the womb beyond the presenting part, is a treatment which has been given up as ineffective by some and is most warmly recommended by others.

In our cases the results achieved by this method are not the most favorable; reposition was accomplished in only 7 of the 11 cases in which it was attempted in the Lying-in House, and though apparently successful in these 7 cases, the cord not reappearing, only 4 of the children were saved. In the out-door department the result gained by this treatment was but little better; reposition of the prolapsed loop having been practised in 32 cases, and, notwithstanding that the operation seemed to have succeeded in 26 of these, not more than 16 of the children were saved—in fact, by reposition of the cord alone only 13, as delivery was hastened by operation in the 3 other cases.

The life of the child was saved in 50 per cent. of the cases in which reposition was apparently successful, and in 40 per cent. of all the cases in which it was attempted; bearing in mind

that this treatment was only resorted to in the more favorable cases, with well-pulsating cord and normal pelvis, we must acknowledge that the results achieved were not such as to encourage us in giving it a more liberal trial.

Reposition has been freely resorted to in the cases here treated wherever it seemed indicated; it has perhaps been even too frequently tried because recommended by eminent obstetricians, and I must add by such, whose average results in cases of prolapsus funiculi are less favorable than those here achieved, but who, basing upon a small number of probably picked cases, have sought to prove reposition a most successful method of treatment.

Thus Michaelis, in his main series of prolapse cases, saves but 26 per cent. of the children, and in his treatise on the reposition of the cord (*Die Ursache des Vorfalles der Nabelschnur, und die Reposition derselben*) cites 11 cases of prolapse, in 9 of which he practised reposition with success; how is this to be explained? why was not this method equally successful in a larger number of cases?

Reposition is justifiable in many cases; in some it is preferable to any other mode of treatment; it has its strictly defined indications which I acknowledge and uphold, but at the same time I wish to see it restricted within these well-marked bounds, and not too freely resorted to.

Should the cord have prolapsed and the labor still be in such a stage that delivery is out of the question, reposition will under certain circumstances be in place, but more frequently we must resort to postural treatment and to a strict control of the patient's voluntary efforts.

Reposition of the cord must, with very few exceptions, be confined to cases of prolapse with head presentation; only when the rounded and resistant head presents can we expect a successful reposition of the prolapsed loop, so that after the loop has been carried back into the womb, beyond the greatest circumference of the head, the uterus can adapt itself closely to the advancing foetal part, and by its firm contraction prevent the immediate return of the prolapse, and guide the head into the most favorable position. Often, when reposition has apparently been effected, the cord again descends as soon as the hand is removed; in such cases the efforts at repo-

sition must not be too persistently continued, even if it be with the hand alone, which I consider preferable to any of the various instruments recommended.

Not unfrequently a life is lost by too obstinate perseverance in this one method of treatment, as the cord is endangered during a forced reposition by compression and traction, so that when the obstetrician has finally accomplished his object with considerable labor, the cord he has replaced is pulseless; this is an accident which should not be permitted to occur. In other cases in which reposition appears to have been successful, a small loop, high in the brim of the pelvis, still remains exposed to pressure, and the operator who, deeming his object accomplished, permits labor quietly to progress, will be surprised to find the child born dead, notwithstanding all his endeavors. We see with what care the reposition of the prolapsed cord must be attempted, and when presenting still greater circumspection is necessary in the treatment.

Hueter (*Ueber Reposition der Vorliegenden Nabelschnur bei unverletzten Eihäuten. Zeitschr. für Geburtsh. vi. p. 222, 1831*), who wishes to have reposition performed while the membranes are still intact, describes one successful case of this kind, and gives this method the preference over that of reposition after rupture of the membranes, after prolapse has actually occurred. As the time most favorable for his operation he describes that period of labor when the os has attained the size of a silver half-dollar or dollar, and when the membranes are still lax in the interval between the pains.

The chances for the success of the operation are certainly much smaller than those for a rupture of the membranes in the attempt; and the escape of the waters at this period of labor, with presentation of the cord with the head, is an occurrence so dangerous to the life of the child that I must rule out this doubtful and hazardous method.

The reposition of a presenting cord should only be undertaken when the os is so far dilated that the escape of the waters is no longer to be feared, that, in case of necessity, delivery by forceps or turning can be immediately resorted to; in other words, this operation is superfluous; it is only to be attempted at a period of labor when there is no longer any danger from a rupture of the membranes, and delivery is possible and of

course preferable. If the presentation of the cord is discovered at an early stage of labor we must endeavor to force its return by a favorable posture of the patient, and the gradually increasing contraction of the circular fibres in the lower segment of the womb; in addition to this the presenting loop may be gently pushed upward while the head is being pressed down into the pelvis; the parts all being rounded, smooth, and slippery, the cord glides upward into the more spacious cavity of the womb as it is forced aside by the slowly descending head; postural treatment alone may sometimes suffice to accomplish the result.

Michaelis gives the following very excellent description of the condition of things in this early stage of labor: "In the commencement of labor the contractions of the lower segment of the womb force the os toward the presenting foetal part. Tensely and closely it draws around this, and, if there be no abnormality, the presenting loop yields to the increasing pressure from beneath; slowly receding, it glides upward away from the os." Under unfavorable circumstances, in footling cases or abnormal position of the head (deformed pelvis), or if no part presents, the cord must retain its dangerous position. As labor progresses the os begins to dilate, and the labia, as the most tense part of the cervix, most firmly encircle the presenting part; the more regular and round the foetal part, the closer do they affix themselves to it.

This presenting part must of course be the head in order to secure perfect adaptation; it must be in normal position and sufficiently far down in the pelvis—conditions not easily fulfilled in a contracted pelvis.

We therefore see that the reposition of the cord should not be attempted; that it would be useless and even dangerous in any case other than a vertex presentation with the head descending in the canal of a pelvis which must deviate but little from the normal dimensions. If the pelvis be any way contracted, deformed, the uterus cannot so readily adapt itself so closely to the descending head, the cavity having lost that symmetry of form to which all the parts have been moulded, and little or nothing is to be accomplished by the introduction of sponge or colpeurynter, by which some would simply close the space made by the irregularities of the pelvis, in which the

cord threatens to descend. In transverse and shoulder presentations reposition is, as a rule, not to be undertaken; it is justifiable only if the funis descend in a region where it is more than usually endangered, for instance, behind the symphysis pubis; such cases, however, are rare; in the above as well as in vertex presentations we generally find the prolapsed loop in one of the sacro-iliac fossæ, where it may be preserved intact by the proper postural treatment until delivery by turning can be accomplished.

Reposition is by no means to be resorted to as the first attempt at treatment in a case of prolapsus funis, as has been vaguely recommended by some authorities; we must be guided in our treatment by the circumstances of the case, the stage of labor, condition of the pelvis and the uterus, by the position which the presenting part occupies, and the cause which had brought about the prolapse; if a deformed pelvis, no time need be lost in futile attempts to return the prolapsed loop; if laxness of the tissues, a womb enfeebled by frequent pregnancy, the cord may be returned without difficulty, the head forced downward well upon the os by external manipulation and there retained until the uterus, stimulated to action by the irritation of the operation and friction of the fundus, contracts more firmly, and the recurrence of the prolapse is no longer to be dreaded; as soon as the os is sufficiently dilated we should, however, resort to the more rapid and safe method of turning.

The operation itself is sufficiently simple. The obstetrician introduces that hand which corresponds to the side of the patient in which the cord has prolapsed, well into the vagina, and with two or three fingers carries the loop above the largest circumference of the head; with the other hand, manipulating externally, he presses the head down upon the os and retains both in place during at least one pain, taking care to force the head firmly down from without, while removing the hand from the vagina, and to continue the external pressure until the head has been so firmly grasped by the lower segment of the uterus that a return of the prolapse becomes impossible.

The various instruments devised to aid in reposition are well known; the simplest and best adapted to the purpose is the catheter, with mandrin, which in Germany is known as Braun's repositorium, in England as Robertson's funis replacer;

yet this should only be resorted to in case of a very small and rigid, or retracted os, as the hand will generally be found more serviceable. Reposition accomplished, the foetal heart must be closely observed; auscultation must guide the obstetrician in those anxious moments in which the success or failure of the operation becomes apparent.

It is by auscultation alone, when the pulsation of the foetal heart grows weaker and more faint, that we can diagnose those treacherous cases where reposition seems to have been accomplished, yet a small loop remains compressed high in the pelvis, where it cannot be detected by the examining finger, and where speedy delivery is the only hope, if practicable, and if not, where postural treatment, our first and last resort, must be attempted.

If the foetal pulse again becomes strong and regular, continuing so after several pains, we may be assured of success.

3. *Anæsthesia*.—The use of chloroform was frequently resorted to, and proved a valuable adjuvant in achieving reposition of the cord.

All more serious operations were, whenever at all practicable, performed under the influence of chloroform, and it is to a great extent to the careful and consistent use of this anæsthetic that I ascribe the successful results obtained. Chloroform not only renders the operation painless, but above all, causes complete relaxation of the muscular fibres, voluntary as well as involuntary, and this is the important point. The patient well under the influence of the anæsthetic, the uterus and abdominal muscles are at rest and yielding; the womb no longer offers that intense resistance to the introduction of the hand; the manipulation of hand or instrument in its cavity no longer causes irritation and reflex action, and the conditions are thus by far more favorable for a rapid and successful operation.

In such cases only where pulsation of the cord had almost ceased and speedy delivery was necessitated, was version performed, or the forceps applied, without the use of chloroform. I have spoken of chloroform throughout, upholding the necessity and the advantages accruing from the use of an anæsthetic, without reference to the bitter strife now waging between the

partisans of ether and of chloroform, which has remained comparatively remote from the field of obstetric operations.

I myself give preference to chloroform, as in labor cases it is equally harmless with ether, and less liable to produce nausea.

4. *Forceps*.—The forceps was not used as freely as we might expect; its application, as a means of saving the child, was resorted to about as often as the reposition of the cord. In 15 of the 30 cases in which it was applied, the child was saved, which is about the same result as that achieved by reposition of the cord, if we deduct those cases in which manual or instrumental delivery was resorted to after reposition had been made or attempted.

Among our Lying-in House cases we find only two instances in which the forceps was used; both in a contracted pelvis, and both unsuccessfully. In one of these cases version had first been performed, but extraction by the feet being impossible, the forceps was used; and this is the only instance we have of its application to the after-coming head, its use having been restricted to head presentations and to such mal-positions as were reduced to normal vertex presentation during the progress of labor, either spontaneously or by external manipulation.

5. *Extraction by the Feet*.—Extraction by the feet simply (not following version) was practised in 65 cases, in 47 of which, 72.3 per cent., a living child was developed. The success of this operation naturally depends upon the favorable prognosis offered by breech-first labors, in which alone it can be resorted to.

The treatment in foot and breech presentations, as in all other cases, if presentation of the cord has been detected, is mainly a postural treatment, the patient being so placed that a return of the presenting loop may be facilitated; all muscular strain must be avoided, the membranes must, if at all possible, be preserved intact until the os is sufficiently dilated; when this is the case, the parts being yielding, we must not wait for threatening signs on the part of the foetal pulse, but at once deliver.

Extraction by the feet was practised in 14 of the Lying-in House cases, and in only one was the child delivered dead, putrid; a case which should justly be excluded. We see that here the success of the operation is perfect, as might well be

expected ; less favorable are the results among the out-door cases, where the accoucheur, not unfrequently being called in too late, was often forced to extract an already lifeless child, the indication for the operation existing on the part of the mother.

6. *Version*.—The operation which was most frequently resorted to, which proved, comparatively speaking, most successful, is turning by the feet, immediately followed by extraction.

Of the 125 cases so operated, 72 were favorable, 57.6 per cent. of the children were saved, and this result holds good not only for transverse and shoulder presentations, but also for head presentations ; with regard to the latter I shall make especial mention of the operation when we come to discuss more at length the treatment of head presentations complicated with prolapse of the cord.

In transverse and shoulder presentations, turning, and, if the prolapse has already taken place, turning by the feet, is the treatment naturally followed ; yet when the cord presents, or has prolapsed in the early stages of labor, the same rules must be adhered to in these as in all other presentations : if the os is but beginning to dilate, and the cord threatened with compression, a change in the position of the prolapsed loop, an attempt at reposition, and postural treatment are called for ; as soon as the hand can be readily introduced we must turn and extract if possible, with the assistance of full surgical anæsthesia.

TABLE VIII.—TREATMENT.

Method of Treatment.	Lying-in House.			Out-door Cases.			Total.		
	Number Operated.	Saved.	†	Number Operated.	Saved.	†	Number Operated.	Saved.	†
Turning, followed by Extraction....	16	8	8	109	64	45	125	72	53
Extraction by the feet.....	14	18	1	51	34	17	65	47	18
Forceps.....	2	0	2	28	15	18	30	15	15
Reposition of cord.....	7	4	3	26	16	10	33	20	13
Operations for saving the child....	39	25	14	212	129	83	251	154	97
Perforation followed by Cephalotripsy.....	10	....	10	15	....	15	25	....	25
Spontaneous, with postural treatment.....	14	6	8	2	....	....	14	6	8

7. *Cephalotripsy*.—Craniotomy can certainly not be classed among the operations called for by prolapse of the funis, yet I

cannot avoid making mention of this operation, as it was so often necessitated for the preservation of the mother, and as the large number of these operations, 25 among 365 deliveries, complicated with prolapse of the cord, most forcibly proves the frequency of the highly contracted and the distorted pelvis as cause of the prolapse. In all those cases in which the sacrifice of the child was demanded, the presenting part of the foetal head was perforated with the trepan-shaped perforator, the skull then crushed by the cephalotribe, and delivery completed by extraction with the same instrument.

In the Lying-in House cephalotripsy was resorted to in 10 of the 62 cases—17 per cent.—but less frequently, in only 5 per cent. of the out-door cases.

TABLE IX.—136 CASES OF HEAD PRESENTATION COMPLICATED WITH PROLAPSE OF THE CORD.

Lying-in House.		Out-Door Department. (Cases in which operation was resorted to.)	
Cases of Prolapse amenable to treatment.....	20	Cases of Prolapse amenable to treatment ...	91
Cases of Prolapse not amenable to treatment as such :—		Cases of Prolapse not amenable to treatment as such :—	
Highly contracted pelvis. Cephalotripsy.....	10	(Cephalotripsy).....	12
Placenta previa.....	2		
Child dead when received.....	3		
Prolapse of pulseless cord.....	1		
	—		
	16		
	36		103

II. *Treatment of Head Presentations.*—Such were the operations employed in the treatment of our prolapse cases, and in transverse, shoulder, and breech-first presentations no choice is given us as to the method of operation; the skill of the accoucheur is here shown by a careful preparatory treatment, and the judicious selection of the time of operation.

In head presentations only is a wider range given to the treatment directed toward the preservation of the child, and it is in these cases that the course pursued in the Berlin Lying-in House and Out-door Department varies somewhat from that adopted by most German obstetricians, especially those of the present day.

In order to demonstrate this more readily, I have compiled those uncomplicated cases of head presentation in which the treatment was confined to the prolapse of the cord, and directed solely to the preservation of the child.

Table X. gives us 111 such cases, that may be considered pure and uncomplicated cases of prolapse of the funis ; although they embody a number of moderately contracted pelves ; it shows that the life of the child was saved in 65 per cent. of the cases, a very handsome result, being equally favorable among the 91 out-door and the 20 lying-in house cases.

TABLE X.—111 CASES OF PROLAPUS FUNICULI WITH HEAD PRESENTATIONS, UNCOMPLICATED AND AMENABLE TO TREATMENT.

Treatment.	20 Lying-in House Cases.			91 Out-door Cases.			Total 111 Cases.		
	Number of Cases.	Saved.	†	Number of Cases.	Saved.	†	Number of Cases.	Saved.	†
Postural treatment.....	6	5	1	....	....	....	6	5	1
Reposition of cord.....	6	3	3	17	13	5	23	15	8
Forceps.....	1	....	1	26	13	13	27	13	14
Version, with extraction.....	7	5	2	48	34	14	55	39	16
	65 per cent. saved.			65 per cent. saved.			65 per cent. saved.		

Here also turning truly proved “the master-stroke of the obstetric practitioner,” being resorted to most frequently, and proving most successful, the child being saved in 70 per cent. of the cases. We see the forceps brought into requisition next, in 27 cases resulting less favorably, not more than 50 per cent. proving successful. Reposition of the cord gave an average result, preserving the child in 65 per cent. of the 23 cases in which it was resorted to.

It is scarce necessary to state, what figures so plainly show, that version, preceded by judicious postural treatment, is the method to be followed which promises most for the life of the child in prolapse of the cord when complicating head presentations ; of such cases we have so large a number, and so favorably developed, that the undeniable logic of facts and figures, far more than theoretical reasoning, sustain me in the high importance I attach to this operation. At what period and to what extent reposition may be attempted, we have already seen.

Hildebrandt, who greatly favors the latter operation, bases his theories on 195 cases compiled from those of Hohl, Grenser, Elsaesser, Braun, and others, head presentations, in which 116 of the children were saved, 51 per cent. He has, of course, only

taken such cases in which the treatment was directed solely to the presentation of the child, and comparatively simple cases, as the frequency of reposition and of spontaneous delivery shows. These cases may be compared with our 111 simple cases of head presentation (Table X.) which proved far more successful, 65 per cent. of the children being saved.

CASES COMPILED BY HILDEBRANDT.

	Number of cases.	Saved.	†
Reposition	111	73	38
Turning, with Extraction	26	12	14
Forceps	31	8	23
Spontaneous delivery	27	15	12
	195	108	87

In these cases of Hildebrandt's, turning was but rarely resorted to, and with very unfortunate results. Equally unsatisfactory are the results of this operation as given by other authorities. So Michaelis, in discussing the treatment of prolapse of the cord as adopted in various lying-in institutions, points to the fatal results of turning in order to let the reposition appear, by contrast, in so much fairer a light.

	Number of cases.	Saved.	†	} 24 per cent. saved.
Postural treatment	10	4	6	
Turning, followed by Extraction	20	4	16	
Forceps	16	3	13	
	46	11	35	

It seems indeed strange that the operation of turning by the feet, in head presentations complicated with prolapse, should be so disparagingly spoken of by most authorities, and should have given them such unhappy results, whereas in our cases it was mainly this very same operation which enabled us to save an unusually large number of the children imperilled by that dangerous accident.

Hohl, with his very unfavorable results, saving but 30 in 95 cases of prolapse, speaks most discouragingly of the operation, directly asserting that by turning after escape of the wa-

ters a living child was never delivered; he would only turn when the membranes are still intact. Very good, when possible; but under such favorable circumstances we must not turn by the feet unless the os is fully dilated, but by external manipulation, an operation as yet but little practised, which will yield most excellent results when more thoroughly studied and more freely applied. This method of turning is called for in head presentations when the cord is found presenting and the os but imperfectly dilated.

No more do Hohl's results speak in favor of his theory of not operating while the pulsation of the cord is still unimpaired: such teachings are dangerous; it is imperative upon us to operate as soon as labor has so far advanced that we may expect to operate successfully and deliver the child alive.

I should deem it criminal neglect to hesitate until the very last moment, to wait until the pulsation of the foetal heart becomes faint, and life is oozing away. In the 12 spontaneous head-first deliveries observed in the Lying-in House, reposition of the cord had been practised in 6, yet only 3 of the children were saved; whereas of the other 6 cases, in which protection for the cord was sought by postural treatment alone, 5 escaped, a result which again admonishes us to devote more careful study to this method of treatment than is at present accorded to it.

The time of operation can but rarely be chosen by the accoucheur, the case being but too often given into his hands at the very last moment, and he must act as the stage of labor and the condition of the child demand, and act at once; postural treatment with membranes still intact can therefore but rarely be practised.

The patient usually comes under observation when advanced in labor, when the waters have escaped, and the cord has prolapsed, and now, if the os be sufficiently dilated, and the head unable to enter the brim, or still high in the pelvis, turning by the feet is in place, especially if the pelvis be a somewhat irregularly contracted one, as the occiput may then be guided through the more spacious part of the canal. Should the forceps be applicable, we must not wait until the pulsation of the foetal heart grows faint, but seize upon the auspicious time, while the child is still vigorous, and extract, administering

chloroform to complete surgical anæsthesia, just as we would in turning. Worse still it is if the waters have escaped, the parts being still rigid, the os not dilatable; in this case, provided the head present a normal position, reposition may be attempted; if successful, it must be followed by postural treatment: if not, it is equally postural treatment to which we must resort as our only chance to save the cord from compression until the forceps or turning is possible.

H. RÉSUMÉ.

In conclusion, I will sum up in a few words the facts attained and the laws established by the examination of our prolapse cases.

The causes of the prolapse of the umbilical cord have mainly proved to be such circumstances as prevent the complete filling of the pelvic brim, and the close adaptation of the lower segment of the uterus to the presenting part. One of the more important of these circumstances is the shape of the presenting foetal part itself, and we thus find that foot presentations are most frequently complicated by prolapse, whereas vertex presentations are least threatened.

The foetal appendages are of secondary and minor importance; undue length of the cord, its marginal insertion or attachment of the placenta low down in the uterus can never be direct cause of the accident; excess of liquor amnii is alone to be feared.

Some stress is to be laid on abnormality in shape and position of the womb, much more upon twin births. More dangerous than any of these is the contracted pelvis, which I have proved by measurements and numbers to be the main cause of prolapse of the funis, directly and indirectly; a fact hitherto generally accepted, but never as yet clearly established. Another such vague, general statement, that the prolapse is by far more frequent among multiparæ than among primiparæ, our cases disprove; they show that primiparæ are, comparatively speaking, almost as frequently afflicted as multiparæ.

The law governing the location of the prolapse is of importance, and here for the first time touched upon; it will, I trust, be verified by the investigation of other observers.

The post-mortem examinations revealed only the lesions due

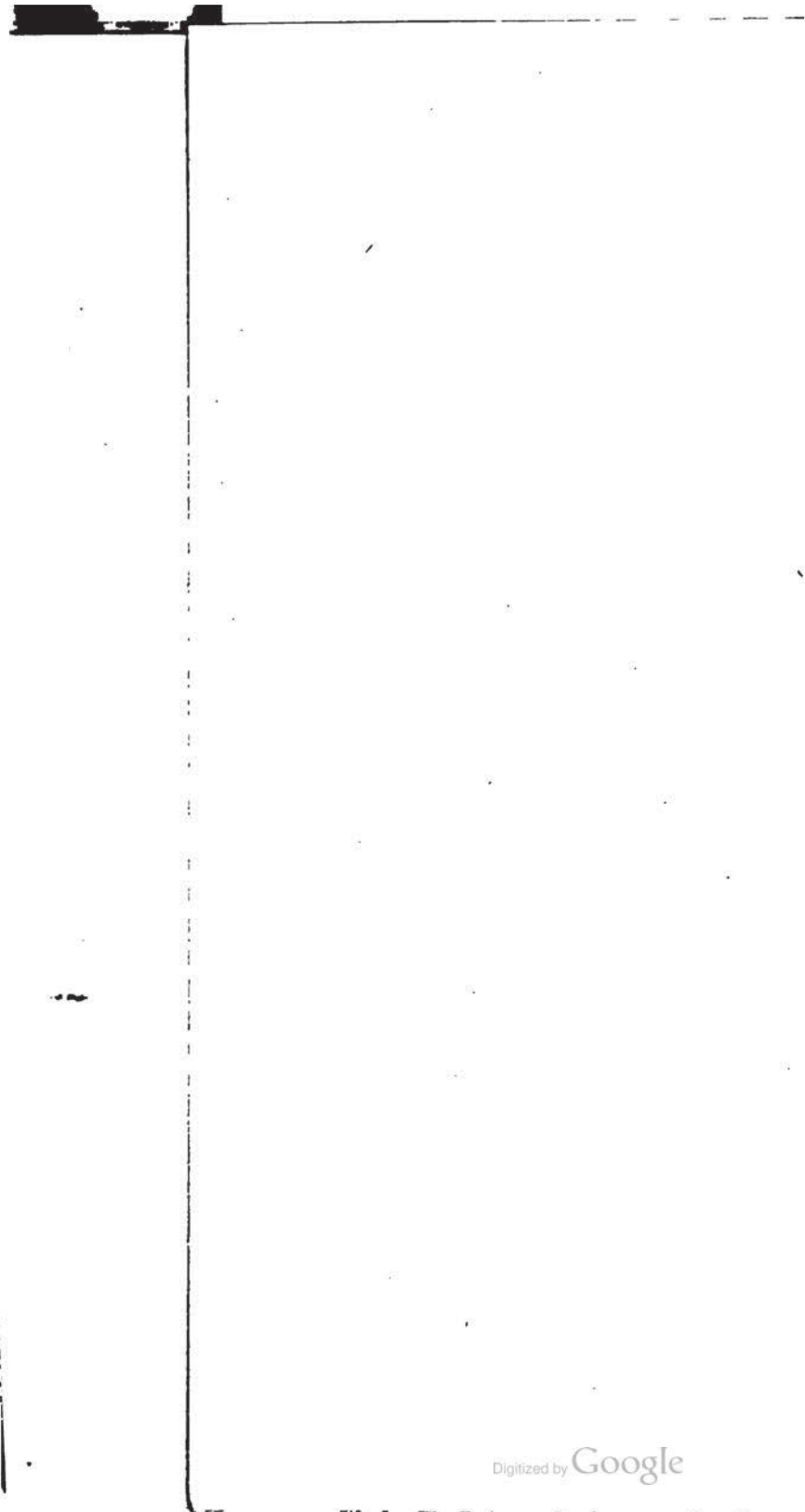
Case No.	Placenta	Stage of labor	Character of labor	Duration	Delivery	Remarks
23 81 6		At a very early stage of labor.	Healthy.	Full term.	Natural.	Normal. Int. tr., 26.5 Sup. tr., 27.5 Ant.-post., 19 Troch., 31.5 L. obl., 21
24 34 2	Promontory-um very prominent; labor was pressed against it during labor and delivery.	At an early stage of labor.	Painful.	Full term.	Natural.	Ant.-post., contracted Int. tr., 25 Sup. tr., 28.2 Ant.-post., 18.2 Diag. conj., 10.4 Troch., 32 L. obl., 21.4
25 27 2		Vigorous.	Vigorous.	Full term.	Natural.	Normal. Int. tr., 26 Sup. tr., 28.2 Ant.-post., 19.5 R. obl., 23 H. obl., 25
26 42 8		Dilated.	Healthy.	Full term.	Natural.	Oblique. Int. tr., 25 Sup. tr., 30 Ant.-post., 19 H. obl., 23 R. obl., 25
27 4		Dilated.	Strong.	Children.	syphilitic.	Normal. Int. tr., 25 Sup. tr., 28.5 Ant.-post., 19.5 L. obl., 22
28 38 9		Vigorous at first; weak toward close.	Vigorous at first; weak toward close.	Full term.	Natural.	Moderately large. Int. tr., 27 Sup. tr., 29.5 Ant.-post., 22 Obl., 24.5 Troch., 34.5 Circ., 98
29 4		Almost full.	Vigorous.	Full term.	Natural.	Normal. Int. tr., 25 Sup. tr., 30 Ant.-post., 23 Circ., 95
30 45 12		Early stage of labor.	Strong.	Full term.	Natural.	Moderately large. Int. tr., 27 Sup. tr., 28.2 Ant.-post., 21 Troch., 33.3
31 30 1		4.0 cm.	Strong.	Full term.	Difficult.	Ant.-post., contracted Int. tr., 25 Ant.-post., 18.6 Obl., 23.6
32 36 6		Early stage of labor.	Painful.	Difficult.	operation; assistance.	Ant.-post., contracted Int. tr., 25.5 Sup. tr., 27 Ant.-post., 18.5 Troch., 31.3 H. obl., 23
33 28 4	Placenta firmly adherent.	2.0 cm.	Ceased after rupture of membranes.		Natural.	Normal. Int. tr., 30 Sup. tr., 31.6 Ant.-post., 19 Obl., 24
34 31 8		Early stage of labor.	Painful.	Full term.	Natural.	Ant.-post., contracted Int. tr., 27 Sup. tr., 29.5 Ant.-post., 17.5 Conf. diag., 10 Obl., 22
35 26 3		Early stage of labor.	Spurious.	Full term.	Natural.	Normal. Int. tr., 27 Sup. tr., 29.8 Obl., 23
36 26 2		Early stage of labor.	Strong.	Full term.	Natural.	Moderately large. Int. tr., 26.7 Sup. tr., 29.8 Ant.-post., 21.2 Obl., 24

METH. OR MANNER OF DELIVERY.	CHILD.				Condition after Birth of Mother.	Condition after Birth of Child.	Notes and Post-mortems.
	Living or Dead	Male or Female.	Weight in Grammes.	Dimensions of the foetal Head.			
Rupture of membrane; version; extraction.	Dead.	♂	.....	Ant. tr., 8. Post. tr., 9. Long., 11. Long diag., 13.	Good.	.....	Funis 140.
Version; extraction.	Living.	♂	.....	Ant. tr., 7.5 Post. tr., 9. Long., 11. Long diag., 12. Circ., 84.5	Good.	Good.	Funis 41.
Extraction.	Living.	♀	4,000	Ant. tr., 8. Post. tr., 10. Long., 12. Long diag., 12.2 Circ., 87.	.....	.....	Funis 65.
Forceps.	Living.	♂	.....	.....	Good.	Good.	Funis 85.
Version; extraction.	Dead.	♂	.....	.....	Good.	.....	.....
Spontaneous.	Dead.	♂	.....	.....	Good.	.....	.....
Spontaneous.	Dead.	♀	.....	Ant. tr., 7. Post. tr., 8.5 Long., 11. Long diag., 12. Circ., 35.	.....	.....	Funis 48.
Extraction.	Living.	♂	.....	.....	.....	.....	.....
Version; extraction.	Dead.	♂	.....	.....	.....	.....	Syphilia.
Spontaneous.	Dead.	♀	.....	.....	.....	.....	.....
Version; extraction.	Living.	♂	.....	.....	Good.	Good.	Funis 80.
Perforation; cephalotripsy.	Dead.	♂	.....	.....	.....	.....	.....

71 33 1	W				Int. tr., 22 Sup. tr., 15 Ant.-post., 17.5 Diag. conj., 10.8 Troch., 38.8 H. obl., 30 L. obl., 19 Circ., 84
71 33 1					Hachito: lardo-eco moas: sample com- tracted.
71 33 1					Int. tr., 22 Sup. tr., 15 Ant.-post., 17.5 Troch., 30 H. obl., 21 L. obl., 22
71 33 1					Int. tr., 22 Sup. tr., 26 Ant.-post., 18 Diag. conj., 10 Troch., 30 Obl., 18.8
71 33 4					Hachito: ant.-post. contracted.
71 33 4	Good				Int. tr., 27 Sup. tr., 28.5 Ant.-post., 17.5 True conj., 8.5
74					Ant.-post. contract. Int. tr., 26 Sup. tr., 22 Ant.-post., 19 Troch., 32 Obl., 30
74					Natural Fall term
74					Funds 50.
75 30 5					Hachito: ant.-post. contracted.
75 30 5					Int. tr., 27 Sup. tr., 28 Ant.-post., 17.5 Diag. conj., 10.7 Obl., 22 Circ., 81 Venter propendens.
75 30 5					Tedious Fall term
75 30 5					Funds 50.
76 35 1					Ant.-post. contract. Int. tr., 24 Sup. tr., 27 Ant.-post., 16 True conj., 7 Troch., 28
76 35 1					Ant.-post. contract. Int. tr., 24.8 Sup. tr., 28.8 Ant.-post., 18.2 Diag. conj., 11 Troch., 31.2
76 36 2					Hachito: ant.-post. contracted.
76 36 2	Good				Int. tr., 29.7 Sup. tr., 30 Ant.-post., 17 Diag. conj., 10.5 Troch., 31 H. obl., 22.5 L. obl., 21.5
76 36 2					Foreign Fall term
76 36 2					Funds 68.
77 30 2					Ant.-post. contract. Int. tr., 24.8 Sup. tr., 28.8 Ant.-post., 18.2 Diag. conj., 11 Troch., 31.2
77 30 2					Natural Premature
77 30 2					Funds 68.
79 29 8					Ant.-post. contract. Int. tr., 26 Sup. tr., 28.7 Ant.-post., 18 Troch., 30 H. obl., 21 L. obl., 20.5
79 29 8					Natural Premature
79 29 8					Funds 81.
80 21 2					Hachito: ant.-post. contracted.
80 21 2					Int. tr., 26.8 Sup. tr., 29 Ant.-post., 17 R. obl., 21.3 L. obl., 23 Diag. conj., 8.5-9 Double pronomenory.
80 21 2					Natural Fall term
80 21 2					Funds 81.

TREATMENT.		CHILD.						
the Discovery prolapse up to delivery.	Mode of De- livery.	Living or Dead.	Male or Female.	Weight in Grammes.	Dimensions of the fetal Head.	Condition after Birth of Mother.	Condition after Birth of Child...	Notes and Post-mor- tems.
position.	Spontaneous.	Dead.	♀	.....	.....	.....	.....	.....
osition at- empted.	Spontaneous.	Dead.	♀	.....	.....	.....	.....	.....
.....	Version; ex- traction.	Living.	♂	.....	.....	Good.	Death from trismus.	Premature loosening of placenta.
.....	Extraction.	Living.	♀	.....	.....	.....	.....	Funis 82.
ure of mem- s followed by elivery.	Version; ex- traction.	Dead.	♂	.....	.....	Parametri- tis; recov- ery.	.....	Funis 44.
.....	Version; ex- traction.	Living.	♂	.....	.....	Good.	Good.	Funis 85.
.....	Forceps.	Dead.	♂	.....	.....	Good.	.....	.....
Opiate.	Forceps.	Dead.	♀	.....	.....	Good.	.....	.....
ine injection.	Version; ex- traction.	Living.	♂	.....	.....	Good.	Good.	Funis 72.
nce summon- too late.	Spontaneous.	Dead.	♂	Funis 66.
.....	Version; ex- traction.	Living.	♀	Funis 70.

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to death from asphyxia, nothing characteristic for death caused by prolapse of the cord.

The prognosis we can give is somewhat better than generally allowed; most favorable for foot presentations, after these for shoulder and transverse presentations, while vertex presentations are more dangerous than any; the case being, under all circumstances, more threatening when occurring in a primipara.

In the treatment of our cases the high importance of the postural method has been developed, more as an adjuvant, however, than as a method in itself of dealing with the prolapse.

Version is comparatively the most successful of all operations, and should be more frequently resorted to when any choice of method is given, as in head presentations: the application of the forceps and reposition of the cord are less to be relied upon; but whatever may be the course determined upon, it must be borne in mind that the success of all operations, by which we seek the preservation of the child, whose life is threatened by compression of the prolapsed cord, is in a measure dependent upon the judicious use of chloroform, its application to full surgical anæsthesia.