

THE RELATIONSHIP EXISTING BETWEEN THE  
MECHANISM AND MANAGEMENT OF THE  
THIRD STAGE OF LABOR.<sup>1</sup>

A REPORT OF 600 CASES FROM THE ROTUNDA HOSPITAL, DUBLIN,  
IRELAND.

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IN reviewing reports of observations on the mechanism of the third stage of labor one is met with the difficulty of interpretation not so much as to the original meaning of the two men whose names are so closely associated with the theories of separation and expulsion of the placenta, but because various divergent views have become read into and incorporated with the opinions and name of one or other of these authors.

It is customary to speak of the mechanism of separation as that of Schultze or Matthews Duncan, but it is not always clear just what the individual observer considers the distinguishing features of each mechanism. Personally, I understand Schultze's mechanism to be the separation of the placenta by the formation of a retroplacental hematoma and the escape of the placenta from the uterus, fetal surface first, inverted through the membranes. By Matthews Duncan's mechanism, the placenta is separated at the edge first, without the formation of a retroplacental hematoma, and escapes from the uterus edgeways or maternal surface first, not inverted through the membranes. When the placenta is separated by Matthews Duncan's mechanism the edge always passes out of the uterus first, after which it may present at the vulva in one of three different positions, viz., some portion of the maternal surface appearing first; second, edgeways folded back on the fetal surface; third, edgeways more or less folded on the maternal surface but not inverted through the membranes.

The conflicting statements by equally reliable observers as to the frequency of occurrence of these two mechanisms indicates the existence of some factor that is not common to the different series of observations, and on this factor the varying results depend. I

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think that the method of managing or conducting the third stage is this varying factor, and is responsible for the extreme differences of opinion as to the comparative frequency of the occurrence of Schultze's and Matthews Duncan's mechanisms.

The method of conducting the third stage in the Rotunda Hospital, where these observations were made, is as follows:

Within two or three minutes after delivery, which was conducted in the left lateral position, except in extraction after version and in difficult breech cases, the patient was turned on her back with her knees drawn up and separated. The attendant "controlled" the uterus by sinking his hand, ulnar surface down, into the abdomen above the uterus, so that the fundus fitted into the hollow of his palm. The uterus was not interfered with as long as it contracted and relaxed normally and showed no disposition to fill up with blood. Here it may be noted that, as far as statistics are concerned, this method of "control" which, however, must not be confused with massage of the uterus, has no effect on the mechanism of separation, as in a series of 150 cases where the uterus was not "controlled" the relative percentage of occurrence of the two mechanisms was the same as in the larger series from the Rotunda Hospital. One point that did appear, a matter of clinical observation and not direct measurement, was that the amount of blood poured out behind the placenta was greater in the cases in which the uterus was not "controlled."

The placental stage is as much a part of labor as the first and second, and is as much subject to the laws of uterine action; consequently, the latter should not be disturbed in a normal case. Throughout the first and second stages the uterus contracts and relaxes rhythmically and regularly. If this is normal uterine action during the first and second stages, why should it not be considered normal for the third stage? The usual teaching, massage of the uterus to stimulate and maintain tonic contraction during the time while the placenta is being separated, introduces a new and irregular, if not abnormal, factor in the mechanism of separation.

In normal cases, *i.e.*, those in which no bleeding occurred, thirty minutes were allowed to pass before any attempt was made to learn if the placenta had been expelled from the uterus. This rule was made to prevent premature attempts to "express," which is one of the commonest causes of retention of parts or all of the placenta and membranes. At the end of thirty minutes, if the fundus had risen and the uterus had become smaller, more globular, and freely movable in the abdomen; if the cord had descended

further through the vulva and failed to pull up when the uterus was pushed up toward the diaphragm, then it was considered time to "express," as the placenta was no longer subject to uterine action, but was lying in the lower uterine segment and upper portion of the vagina. If these signs were not obtained, no effort was made to express the placenta unless the patient showed some evidence of shock or hemorrhage. Occasionally, at the end of an hour, even if these signs were not obtained, attempts were made to deliver the placenta, but it was no uncommon occurrence to wait one and one-half to two hours and find that, even after this time, normal separation (Schultze's) occurred.

This was what we considered the rational method of managing the third stage of labor and is, fundamentally, the same method that has been practised in the Rotunda Hospital since its establishment in 1745.

In a series of 2600 cases in which the third stage was conducted as above described (with some exceptions to be mentioned later) the following results were obtained:

Fetal surface first—Schultze's mechanism: 2145 times or 82.5 per cent.

Edgeways or maternal surface first—Matthews Duncan's mechanism: 455 times or 17.5 per cent.

These observations were made as the placenta escaped from the vulva and show that, for cases managed by noninterference with uterine action, escape of the placenta fetal surface first is preponderantly more frequent than an edgeways or maternal surface presentation.

In 100 cases of Schultze's mechanism the exact point on the placenta that appeared first at the vulva was marked and the distance from the nearest margin measured. Contrary to Champney's results, our cases showed that this point varied from the placental center to half an inch from the margin, and no part showed markedly greater frequency than another. The figures were:

1/2 inch.....	= 13
1 inch.....	= 13
1 1/2 inches.....	= 8
2 inches.....	= 19
2 1/2 inches.....	= 12
2 1/2 inches.....	= 35
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Total.....	100

When the placenta appeared with a portion near the edge showing first, rotation usually took place while it was escaping from the vulva and the rest of the fetal surface was delivered before the membranes came away. This rotation might take place in either axis. Such action of the placenta would appear to lend strength to Holzapfel's contention that even when the placenta escaped frankly fetal surface first, it had presented edgeways at the internal os and had been converted subsequently.

To determine the truth of this assertion, I examined forty-three women by manual exploration. In all of these cases the portion of the fetal surface of the placenta that presented first at the internal os also presented first at the vulva, after which, however, rotation in either axis might take place. It was not until the placenta had traversed the vagina and was being expelled through the vulva that a change in the relative position occurred. The exception to this rule was found in those cases in which the maternal surface appeared first. In all of these the maternal edge of the placenta presented and came through the internal os first, rotation then occurring in the vagina, frequently from adhesion of the membranes. The results of these forty-three examinations were:

Fetal surface first, same point at os and vulva..... = 23

Edgeways internal os and vulva..... = 10

Edgeways internal os, maternal surface at vulva.... = 10

At first sight this would look as if our percentages of occurrence of Schultze's and Matthews Duncan's mechanisms, mentioned above, were wrong; but it must be remembered that these observations were made on operative cases, many of them having accidental hemorrhage or placenta previa. Only operative cases were chosen, because examinations in these cases would not interfere with the clinical teaching material, intrauterine manipulations had already been carried out, consequently further exploration did not materially increase the risk of infection, and, finally, the fact that the patient was anesthetized freed her from the pain of the manual exploration and its possible effect on uterine action. On account of the danger of infection from too prolonged uterine manipulation, I did not attempt to determine the exact spot at which separation of the placenta began, but contented myself with observing that point on the placental surface that first presented at the internal os. In each instance, except those already referred to, the point's relation to the rest of the placenta was unaltered until the placenta was passing through the vulva, when rotation might or might not occur.

Recently I have had two opportunities for observing directly the

beginning separation of the placenta. In two cases of extraperitoneal Cesarean section, I waited long enough to see where the placenta first showed signs of separation, and in each instance it was close to the center. Implantation in one instance being on the fundus and anterior wall, in the other, on the fundus and posterior wall. Of course, two cases are not at all convincing but they furnish us with a visual observation of what may be termed practically normal uterine action, because in extraperitoneal Cesarean section the contractile portion of the uterine wall is not directly interfered with.

One other point of great importance in determining the normal, or at least the desirable mechanism, is to compare the percentages of incomplete membranes in the two classes. In the 2145 cases where Schultze's mechanism obtained, the membranes were incomplete in 108 or 5 per cent. On the other hand, in the 455 cases of Matthews Duncan's mechanism, the membranes were incomplete in 70 or 15.4 per cent.

Adhesion of the membranes has been advanced as an explanation for the occurrence of Matthews Duncan's mechanism, their unequal attachment being supposed to cause the placenta to turn over during its expulsion. This is undoubtedly a factor in turning an edgeways presentation to one in which the maternal surface comes first but cannot cause a change from a fetal surface presentation to one in which the placenta comes edgeways or maternal surface first. If adherent membranes were a factor in determining a Matthews Duncan's mechanism, they would be expected to be incomplete in more than 15.4 per cent. of cases, and how could a fetal surface presentation be accounted for when, as happens not infrequently, large portions, or all, of the chorion is missing?

I personally believe that the greater frequency of incomplete membranes in Matthews Duncan's mechanism is the effect and not the cause, the membranes being torn more often simply because of the unequal pull of the placenta in this mechanism, in contradistinction to the equal pull exerted by the descending placenta separated according to Schultze's mechanism.

Before drawing any conclusions from the foregoing figures, an examination of the class of cases in which Matthews Duncan's mechanism of separation occurs will bring out some more facts tending to show that it is proportionately even less frequent in normal labor than appears from the figures already quoted.

Separation of the placenta by the Matthews Duncan's mechanism can always be obtained by causing the separation to begin at the

edg  instead of the middle. Naturally such a state of affairs obtains in cases of antepartum hemorrhage due either to accidental hemorrhage or placenta previa, and artificially it can be brought about by massage of the uterus. If well-marked antepartum hemorrhage, showing tangible separation of the placental margin, were to occur and be followed by presentation of the fetal surface of the placenta at the internal os and vulva, then the above statement as to the cause of Matthews Duncan's mechanism would not be correct; but it receives marked corroboration from our figures. There were twenty-eight cases of antepartum hemorrhage. In every one of these cases the placenta came edgeways, or maternal surface first, not inverted through the membranes. Always, in my experience, antepartum hemorrhage of any moment is followed by separation of the placenta according to the mechanism of Matthews Duncan.

Further evidence to the truth of the statement that Matthews Duncan's mechanism is the result of separation beginning at the margin of the placenta is that in three cases, during the performance of internal version, once accidentally and twice intentionally, I separated from the uterine wall a portion of the edge of the placenta about  $4 \times 1$  inches. In these three cases the placenta came away maternal surface first.

Two other abnormalities of the third stage associated with an edgeways or maternal surface presentation are retention of the placenta and postpartum hemorrhage. In fourteen cases of postpartum hemorrhage it became necessary to express the placenta directly from the uterine cavity and in each instance it escaped edgeways, followed by a maternal surface presentation at the vulva. The same statement is true of thirteen cases of retained placenta in which the placenta had to be expressed directly from the uterus by Cred 's method. That the placenta had not left the uterine cavity was demonstrated by the fact that pressure on the fundus drove the cervix down so far that it was visible and the placenta could be seen as it was expressed through the os. Expression of the placenta for postpartum hemorrhage occurring after it has left the uterus will, of course, have no effect on the manner in which the placenta presents.

In seven cases I demonstrated that, when the placenta is still in the uterus, with the fetal surface near the edge beginning to present, the presentation could be changed by massage and attempting Cred 's method of expression. The retroplacental hematoma was squeezed out from behind the placenta, burst through the membranes at the lower margin and sent the edge of the placenta through the os first, when continued expression caused the placenta to escape

with the maternal surface presenting. Thus a primary Schultze's mechanism was changed into a Duncan's mechanism.

This change can be obtained whenever premature escape of the retroplacental hematoma is caused. The condition of affairs is then comparable to a case of antepartum hemorrhage in that the placental margin is separated first. Herein lies the reason why no attempt should be made to maintain tonic contraction of the uterus during the third stage of labor, as the massage necessary to stimulate uterine action is very likely to cause premature escape of the retroplacental hematoma. That Schultze's mechanism occurs with considerable frequency in those clinics where uterine massage is practised is explainable. The massage may not be vigorous enough to cause the escape of the retroplacental hematoma, or it may not be started until the placenta has already separated, as this sometimes occurs with the first postpartum contraction. This is shown in those cases in which the delivery of the placenta immediately follows that of the child.

To sum up—that mechanism of the third stage which results in the greatest percentage of cases in which there is complete delivery of the placenta and membranes, without trouble and without hemorrhage, must be considered normal.

Our results show that when the separation of the placenta is left to the unaided action of the uterus, Schultze's mechanism occurs not only with greater frequency (more than four to one) but also has the added advantage of having a smaller proportion of incomplete membranes (less than one to three). Therefore the conclusion is apparently justifiable that Schultze's is the more desirable mechanism. As by the Rotunda method of managing the third stage placental separation by Schultze's mechanism occurs in the great majority of cases, this mechanism must be considered the normal one where uterine action is not interfered with.

Although it must be admitted that there are a certain number of cases in which the placenta separates by Matthews Duncan's mechanism without discoverable cause, yet the fact that this is the mechanism obtaining in abnormal cases (antepartum hemorrhage, postpartum hemorrhage and retained placenta) furnishes sufficient ground for stating that Matthews Duncan's is the mechanism of abnormal cases, even if it is not to be considered abnormal itself. In addition, as the membranes are incomplete in a much greater number of cases it is also undesirable. To avoid its occurrence it is necessary to prevent as far as possible premature escape of the retroplacental hematoma, and this is attained by not interfering in

any manner with uterine action during the third stage, as it has already appeared that separation by Schultze's mechanism occurs in 82.5 per cent. of cases in which the uterus is not interfered with, and of the 17.5 per cent. of cases in which the placenta separates by Matthews Duncan's mechanism 2.2 per cent. were associated with some abnormality, leaving 15.3 per cent. of cases in which Matthews Duncan's mechanism occurs for no demonstrable reason when placental separation is left to the unaided uterine action. The introduction of an abnormal factor, massage or attempts to express the placenta from the uterine cavity, causes Matthews Duncan's mechanism to occur in the majority of cases, an undesirable result because of the increased percentage of incomplete membranes and their effect on morbidity in the puerperium.

In conclusion I wish to express my thanks to the Past Master of the Rotunda Hospital, Dr. Hastings Tweedy, at whose suggestion this investigation was undertaken, for advice and help throughout and for permission to use the hospital material and records; to the present Master, Dr. Henry Jellett, for permission to continue the use of the hospital material and records during my association with him; to Dr. B. A. H. Solomons, my colleague for three years in the Assistant Mastership, for much help in collecting the data; and to the nursing staff of the Rotunda Hospital, without whose help and hearty cooperation this study could not have been completed.