Aetiology, Pathogenesis and Treatment of Retained Placenta in the Mare

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MOST authors agree that the foetal membranes are expelled from the majority of mares within 90 minutes of the birth of the foal (Jöhnk, 1952, Rossdale and Mahaffey, 1958). However, there is divergence of opinion as to what constitutes pathological retention of the foetal membranes in this species.

Suggested time limits for normal expulsion of the membranes vary from two hours (Shipley and Bergen, 1969) to between six and twelve hours (Wright, 1943, Rasbech, 1967). Moreover, although a considerable number of mares expel the foetal membranes spontaneously between eight and twenty-four hours post-partum, it is not known whether a delay of this nature retards the normal involution of the uterus or affects the general health and subsequent fertility of the mare.

The aim of this study has been to investigate the aetiology and pathogenesis of retained foetal membranes in the mare with a view to designing a useful method for the treatment of this condition.

MATERIAL

Over a period of ten years accurate measurements have been made during the clinical observation of retained foetal membranes and uterine involution in numerous cases of normal parturition, 115 cases of embryotomy, 63 cases of caesarean section and many cases of twin pregnancy and abortion in the mare. Detailed macroscopic and microscopic examination of the allantochorion and uterus has been carried out in these animals and in 150 other mares slaughtered at various stages of pregnancy. Observations made from this material form the basis of this communication.

OBSERVATIONS AND DISCUSSION

(a) General observations on retained foetal membranes

There are no exact figures available as to the incidence of retained foetal membranes in the mare. Also, without a precise definition of the condition, useful comparisons cannot be made between those figures which have been published. Roberts (1956) states that retention of the foetal membranes is less common in mares than in cattle. Solomon (1970) on the other hand reports that 10 per cent. of standard-bred mares retain their foetal membranes for more than three hours post-partum. This figure is comparable to that in cattle (Vanderplassche and Martens, 1961). Our results do not confirm the findings of Jennings (1941) and Williams (1943) that the foetal membranes are more commonly retained in draft mares than mares of the lighter breeds.

There is some disagreement as to which portion of the foetal membranes are most commonly retained in the mare. van der Kaay (1945) and Alhnelt (1960) noted that it is usually the tip of the allantochorion in the gravid horn of the uterus which is not expelled whereas Williams (1943) and Shipley and Bergen (1969) observed that the tip of the allantochorion situated in the non-gravid horn most frequently remains in the uterus. Derivaux (1951) on the other hand has found that it is the area of allantochorion situated between the two uterine horns which is most likely to be retained.

From a study of pregnant horse uteri recovered at slaughter and foetal membranes recovered after normal and difficult parturition, one of us (Vandeplassche 1957) has noted that the thickness of the allantochorion, its degree of folding, the length of the allantochorionic villi and the degree of attachment of the allantochorion to the endometrium decreases steadily from the non-gravid to gravid horn and from there to the body of the uterus (fig. 1). In the present study, it has been our experience that partial retention of the foetal membranes nearly always occurs in the non-gravid horn of the uterus (fig. 2). Furthermore, the retention appears to be a distinctly localised phenomenon.

During attempts to remove retained foetal membranes manually we have frequently encountered large circular areas of allantochorion which are quite free from the endometrium, while other circular areas remain firmly

Fig. 1. Allantochorion of mare showing an increase in thickness and folding in non-gravid horn (a) compared with pregnant horn (b).
attached to it. This observation is borne out by the presence of distinctly circular areas of the allantochorion which are devoid of villi after the membranes have finally been withdrawn.

Some authors (Wright, 1943; Jöhnk, 1952; Alhmet, 1960) mention that manual removal of firmly retained foetal membranes may give rise to serious endometrial haemorrhage. We have encountered two cases of pulmonary embolism in mares following manual removal of the membranes. However, Vandeplassche, Paredis and Bouters, (1961) observed that thrombosis may often develop in the uterine veins of mares and it seems likely that the dislodgement of one or more of these naturally-occurring emboli may have caused the pulmonary emboli we encountered.

Following normal parturition and spontaneous expulsion of the foetal membranes, the uterus of the mare involutes extremely quickly. The cervix contracts and the total uterine mass becomes rapidly reduced. However, we have almost invariably observed a marked delay in uterine involution following difficult or protracted manual removal of the foetal membranes. The uterus may contract quite well but its total mass remains unchanged and the cervix remains relaxed for at least two to three days after the manipulation (Paredis and Vandeplassche, 1959; Vandeplassche, Paredis and Bouters, 1962).

The foetal membranes are frequently retained following caesarean section. For this reason, we have, in the past, attempted to remove the membranes before suturing the uterus. However, in a total of 63 caesarean section operations, we have succeeded in manually removing the membranes in only 30 per cent. of mares from which a live foal was recovered and 65 per cent. of mares in which the foal was already dead at the start of the operation. We frequently observed the occurrence of severe subendometrial haemorrhage during our attempts to remove firmly adhered membranes at this time (fig. 3) and we have therefore formed the opinion that unless the membranes come away easily at the time of surgery, they should be left in situ and dealt with per vaginam at a later date.

(b) Factors associated with retention of the foetal membranes

When one considers the complex micro-cotyledonary structure of the horse placenta, it is perhaps not surprising that as many as 10 per cent. of mares should fail to expel the foetal membranes within three hours of parturition (Solomon, 1970). The microcotyledons are well developed by the 7th month of pregnancy (Drieux and Thiery, 1949) and the foetal membranes are very often retained if the mare aborts after this time. The failure of the normal process of loosening of the interdigital foetal and maternal portions of the microcotyledons at this time may well be the result of the unusual and presumably unsuitable balance of steroid and other hormones in the mare at the time of abortion as compared to the time of normal parturition. It may also be due, in part, to the abnormal myometrial activity occurring at the time of the abortion.

There is also a high incidence of retention of the foetal membranes following dystocia. Even relatively straightforward cases of repositioning of a malpresented foetus seen to disturb the normal loosening process and expulsion of the membranes. This association is more pronounced following embryotomy or caesarean section (Tables I and II) and these findings therefore suggest that the principal cause of retention of the membranes at term is a disturbance of the normal uterine contractions occurring at this time. Since there is frequently a marked increase of uterine tone when the foetal membranes are retained, an observation that has also been recorded in cattle (Venable and McDonald, 1958) it would seem that any form of “uterine inertia” is not involved in the condition.

(c) Pathological significance of retained foetal membranes

Severe laminitis commonly accompanies retention of the foetal membranes especially when there is a profuse uterine discharge. In these cases, it would appear that the delay in uterine involution allows increased autolysis of the placenta which, when combined with severe bacterial infection, leads to local inflammation which in turn results in septicemia and toxemia. Obel (1943) found that foaling laminitis does not result from a typical toxic capillary injury and oedema but rather as a consequence of characteristic degenerative changes in the connective tissues in the feet. We have found that large doses of antihistamines neither prevent nor cure this condition but that flushing of the uterus with...
TABLE I
RETENTION OF THE FOETAL MEMBRANES FOLLOWING EMBRYOTOMY IN THE MARE (115 cases)

| Membranes loose at the end of embryotomy | 26 (22%) |
| Membranes spontaneously expelled or easily removed within 6 hours after embryotomy | 57 (50%) |
| Difficult manual removal carried out 6-24 hours after embryotomy | 32 (28%) |

A large volume of saline containing antibiotics very often will.

(d) Treatment of retained foetal membranes
We have found that single intramuscular (i/m) or intravenous (i/v) injections of large doses of oxytocin frequently provoke intense and only spasmodic uterine contractions and are therefore of little value for the treatment of retained foetal membranes. Similar observations have been made by Wright (1943) and Arthur (1964). Also, Knaggs (1967) has shown in the sow that exogenous oxytocin has a half-life of only 1-4 minutes.

For this reason we have attempted to treat 21 mares suffering from serious retention of the foetal membranes by a slow i/v infusion over a period of 30-60 minutes of 30-60 i.u. oxytocin in 1-2 litres of normal saline. Of the 21 mares treated, 16 were carrying dead foetuses at the time when obstetrical help was commenced. In all, attempts to manually remove the membranes prior to treatment had proved extremely difficult or impossible.

The results of this trial are shown in Table III. At the end of the infusion, the membranes were easily detached in 15 of the 21 mares. Of the six mares in which treatment was unsuccessful, three were cases of late abortion, one was not treated until 48 hours after foaling, one received an infusion of 30 i.u. oxytocin over a period of only 20 minutes and in the other, a case of uterine torsion, the allantochorion still remained firmly attached in the non-gravid horn of the uterus two hours after the end of the infusion. In general, the higher dose of oxytocin (60 i.u.) infused over the longer period (60 mins.) gave the best results.

In view of the encouraging results of this trial, we would therefore propose the technique of slow i/v infusion of physiological doses of oxytocin as a useful method for the treatment of retained foetal membranes in the mare.

CONCLUSION
From our observation and study of a large number of mares, we conclude that attempts to manually remove retained foetal membranes should be commenced within three to six hours of parturition. Longer delays than this may disturb normal uterine involution and predispose to serious uterine infection. A slow intravenous infusion of oxytocin is the treatment of choice when the allantochorion cannot be easily separated from the endometrium.

SUMMARY
The findings of a prolonged study of retained foetal membranes in a large number of mares are presented. The allantochorion situated in the non-gravid horn of the uterus is the portion of the membranes most likely to be retained and the condition occurs more frequently in mares which have undergone abortion, dystocia, embryotomy and caesarean section. The most likely cause of retention of the membranes is disturbance of the normal uterine activity that occurs at parturition and delayed uterine involution, metritis and laminitis are serious sequelae of the condition. Attempts to manually remove the membranes should be commenced within 3-6 hours of parturition and a slow one hour intravenous infusion of oxytocin is the treatment of choice if this proves very difficult or impossible.

TABLE II
RETENTION OF THE FOETAL MEMBRANES FOLLOWING CAESAREAN SECTION IN THE MARE (58 cases)

| State of foetus when operation commenced | Fate of foetal membranes |
| Alive (26 cases) | Removed at operation or expelled spontaneously = 8 (30%) |
| Dead (32 cases) | Loose at time of operation = 13 (40%) |
| | Retained > 6 hrs. after operation = 8 (25%) |

TABLE III
RESULTS OF INTRAVENOUS INFUSION OF OXYTOCIN IN 21 MARES WITH RETAINED FOETAL MEMBRANES

<table>
<thead>
<tr>
<th>Time after parturition when infusion commenced (hrs.)</th>
<th>*Number of mares successfully treated</th>
<th>*Number of mares in which treatment was unsuccessful</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>2</td>
<td>4**</td>
</tr>
<tr>
<td>3-6</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>6-12</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>48</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>6</td>
</tr>
</tbody>
</table>

* Successful treatment means the foetal membranes were loose and easily removed at the end of infusion; unsuccessful treatment means that removal was either very difficult or impossible at the end of infusion

** 3 of these animals were late abortions.
Los hallazgos en los estudios prolongados de la retención de las membranas fetales en gran número de yeguas son presentadas en este estudio. La localización del alantochorion en el cuerno uterino no gravido es la más frecuente de la condición. El retención de las membranas fetales en gran número de yeguas es la alteración de la actividad normal uterina que ocurre al parto y involución retardada del útero, Metritis y laminitis, son secuelas serias de esta condición. El tratamiento de la retención de las membranas debe realizarse entre las 3 y 6 Hrs. pos-Parto y una inyección de una hora de infusión de oxitocina es el tratamiento escogido si es muy dificultoso e imposible la extracción.

REFERENCES

J. Med. vet. 125, 197.