Management of dystocia in the mare

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Abstract

A dystocia is an emergency condition in the mare. The goals of dystocia management are to save the life of the foal, save the life of the mare, and to preserve future fertility of the mare. Early detection and rapid appropriate intervention are critical for foal survival. The most common cause of an equine dystocia is an abnormality of fetal posture.

Keywords: Dystocia, foaling, mare, obstetrics

Introduction

The term dystocia refers to an abnormal or difficult birth.[1] Dystocia or difficult birth occurs in approximately 4% of Thoroughbred foalings.[2] Abnormal orientation of the fetus in the birth canal (i.e. postural abnormalities) is the most common cause of dystocia in the horse. Dystocia is more common in mares during their first foaling (i.e. maiden mares) than in mares that have previously given birth to 1 or more foals. The ultimate goals in assisting in an equine dystocia are to save the life of the foal, save the life of the mare and to preserve the future fertility of the mare.

Time management during a dystocia

Active labor (Stage II) is a rapid event in most mares, with most foals delivered within 20 - 30 minutes after rupture of the chorioallantoic membrane.[3] The average length of Stage II for mares in 1 study was 16.7 minutes, with 71.7% of foals born in less than 20 minutes.[4] An owner or foaling attendant should be concerned if a foal has not been born or if significant progress toward birth has not occurred within 20 minutes after rupture of the outer chorioallantoic membrane and subsequent release of allantoic fluid (i.e. when a mare 'breaks her water').

Dystocia and foal survival

Dystocia in mares is a medical emergency and time is critical.[4-6] It has been estimated that each 10 minutes increase in the duration of Stage II labor beyond 30 minutes is associated with a 10% increase in the existing risk of a foal being born dead and a 16% increase in risk of the foal not surviving to discharge from a referral hospital or clinic.[5] An additional study reported that the interval from rupture of the chorioallantoic membrane to delivery of the fetus was 13.6 minutes shorter for foals that were born alive and survived to discharge than for foals born dead or that did not survive to discharge.[7] A third study noted a significant increase in stillbirth, foal morbidity and foal mortality occurred when the duration of Stage II of labor was greater than 40 minutes (Table 1).[4] Combined, these statistics reinforce the concept that early accurate detection of a foaling problem and early effective intervention is critical to foal health and survival.

Early detection of an equine dystocia and rapid appropriate intervention in problem cases are critical for foal survival. Placental separation and subsequent decrease in oxygen supply in utero are likely the primary factors that lead to fetal death during a prolonged dystocia. If the fetus is still within the uterus (i.e. not fully engaged into the birth canal) and the placenta is still attached and the umbilical cord is not compressed or disrupted, the oxygen supply to the fetus may be sufficient for short-term survival. However, it is critical that the fetus be delivered as safely and expediently as possible.

Dystocia management plan

It is strongly recommended that an emergency plan be formulated prior to the foaling season to prepare for a difficult birth, a medical problem with a newborn foal, or medical issues with the mare. The plan should be the result of a conversation among the mare owner, breeding farm/ranch manager,

Table 1. Stillbirth, foal morbidity, and foal mortality associated with duration of Stage II of labor

Duration Stage II (minutes)	(n)	Stillbirth (%)	Morbidity (%)	Mortality (%)
0 - 10	173	1.7[a]	4.6[a]	4.1[a]
11 - 20	549	0.4[a]	3.3[a]	2.2[a]
21 - 30	211	2.8[a]	6.6[a]	5.2[a]
31 - 40	45	0[a]	2.2[a]	4.4[a]
41 - 50	13	7.7[b]	7.7[b]	7.7[b]
> 50	18	22.2[b]	11.1[b]	27.8[b]

[a,b]Within a column, percentages without a common superscript differed ($p < 0.05$)

foaling attendant and the veterinarian(s). All personnel actively involved in foaling mares should be trained and ready to assist. A foaling kit should be readily available near the foaling stall. Management of a dystocia is dependent on training, experience and availability of farm personnel, as well as the proximity of veterinary services.

Early communication in the event of a dystocia

It is recommended that a foaling attendant call for assistance (on-farm personnel or veterinary assistance, as appropriate) in the following circumstances:

- If there has been no progress toward delivery after 15 - 20 minutes after rupture of the chorioallantois
- If progress toward delivery abruptly stops
- If the mare becomes acutely painful or exhibits signs of shock
- If the attendant is confident that a problem with foaling exists
- If the attendant is unsure if a problem with foaling exists
- If the attendant does not have the knowledge, training, or ability to identify or correct the problem

Causes of dystocia in the mare

The most common causes of dystocia in the mare categorized by difficulty of management or correction are listed (Table 2). Mild dystocias are commonly managed on the farm by foaling personnel. More complicated dystocias may require advanced training or experience and often require veterinary intervention. Veterinary advice or assistance should immediately be sought if the problem cannot be safely and quickly corrected by on-farm/ranch personnel.

Fetal alignment in the birth canal during foaling is described in obstetrical terms as:

- Presentation - relationship of the long axis of the fetus to the dam's birth canal
- Position - relationship of the dorsum of the fetus to the quadrants of the maternal pelvis
- Posture - relationship of the fetal extremities to the fetus itself

Alignment of the fetus in the birth canal during a normal delivery is described as:

- Anterior presentation, dorsal-sacral position, with both forelimbs extended and the head extended

Failure of the fetus to be properly oriented in the birth canal as foaling progresses will almost always prevent normal passage and result in dystocia. The most common causes of dystocia in the mare are abnormalities of fetal posture (i.e. abnormal alignment of the head or forelimbs).[8] A retrospective study of over 1,000 equine births noted that abnormalities of fetal posture were associated with 37.7% of dystocias, including 1 or both front limbs retained (30.1%), retained fetal head (3.8%) or both limb(s) and

head retained (3.8%).[4] A 0.8% incidence rate of 'hip-lock' (feto-pelvic disproportion) was recorded. Premature placental separation was recorded in 1.6% of foalings. A periparturient hemorrhage event was noted in 0.8% of foalings.

Table 2. Common causes of dystocia in mares, arranged by degree of difficulty in correction

Correction difficulty	Foaling complication or issue
Mild	Elbow lock Upside-down foal Backwards foal Uterine inertia 'Red-bag' (Premature placental separation)
Moderate	Front leg(s) flexed at the knee (carpus) Neck flexed ventrally; muzzle below pelvic brim Feto-pelvic disproportion or 'Hip-lock'
Difficult	Front leg(s) flexed at shoulder Neck flexed to side; muzzle not reachable Backwards presentation, hind leg(s) flexed at hip Transverse presentation Twins (when both entering birth canal simultaneously)

Initial physical examination of the mare during a dystocia

A brief physical examination should be performed to evaluate the health status of the mare.[9] It is recommended that the examination be performed in a large stall or other open area or in stocks that can quickly and completely be taken apart with removal of a few pins. It is not recommended to examine a pregnant mare experiencing a dystocia in solid-sided stocks, because many foaling mares will attempt to lie down during vaginal examination or fetal manipulation. In addition, young inexperienced foaling mares may be exceptionally nervous, excited or scared during their first delivery and these behaviors may be even more pronounced during a difficult birth.

Safety of personnel should be of paramount concern during all examinations and obstetrical procedures. Consequently, it may be necessary to sedate the mare, apply a twitch or perform an epidural to facilitate examination, provide pain relief and/or decrease straining.

Intervention in an equine dystocia

Choices for relieving an equine dystocia include an assisted or controlled vaginal delivery, cesarean surgery (cesarean section) or fetotomy (Figure 1). The final decision may depend on the status of the fetus, duration and severity of the dystocia, economic value of the mare and fetus, clinician expertise, client preference, facilities available and other considerations. Intervention by trained personnel may save the life of a foal in the event of a dystocia. However, the undisputed key factors in foal survival are early recognition of a foaling difficulty by breeding farm personnel and an early call for assistance.

Assisted vaginal delivery

A reproductive examination is performed to identify the obstetrical problem, determine if the fetus is alive and to formulate a plan. If possible, the tail of the mare is quickly wrapped or placed in a plastic sleeve and held out of the way. A brief wash and rinse of the perineal area is performed to remove debris and manure. A manual vaginal examination is subsequently performed, with or without application of a sterile obstetrical sleeve. The goals are to determine:

- If the chorioallantoic membrane had indeed ruptured (i.e. did the mare really 'break her water'). In some cases, the mare may not actually be in Stage II of labor or the signs of abdominal pain may be colic in nature and not associated with uterine contractions.

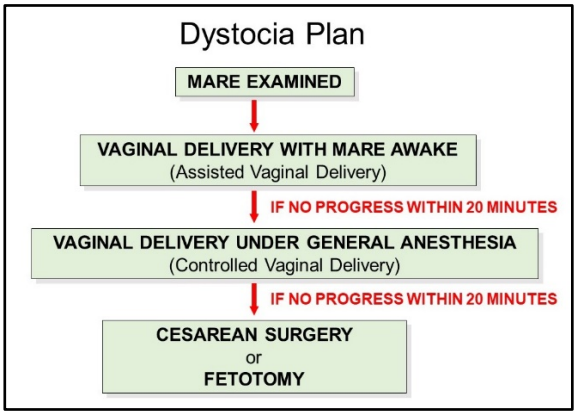

Figure 1. General plan for dystocia management in a mare

- Dilation status of the cervix
- Presentation, position and posture of the fetus (i.e. orientation of the fetus in the birth canal)
- Live/dead status of the fetus (if possible). Accurate assessment of fetal viability may be critical to subsequent obstetrical decisions. In some cases, fetal viability status cannot be determined and one should proceed assuming that the fetus is viable. Evaluation for fetal viability may include:
    - Reflex reactions upon application of pressure to the tongue or the eye
    - Detection of a suckle response after insertion of finger into mouth
    - Detection of a heart-beat in the chest (if reachable)
    - Detection of a pulse within the umbilical cord (if reachable)
    - Detection of fetal movements, etc.
- If perineal, vaginal, cervical or other problems have already occurred

If only legs or feet are presented at the vulva, one needs to determine if they are front legs or hind legs, as subsequent management decisions are dramatically different. The best way to differentiate front legs from hind legs is to assess the direction of flexion of the 2 largest moveable joints above the foot.

- In front legs, the 2 joints (fetlock and carpus) flex in the same direction
- In hind legs, the 2 joints (fetlock and hock) flex in opposite directions.

A plan for intervention (modified from a predetermined dystocia plan) should be developed for each specific dystocia, based on the information above, the health status of the mare, duration of dystocia, economic value of the mare and foal and other factors. In addition, a backup plan should always be discussed in the event that the initial plan is not successful.

Normal fetal orientation in birth canal

A vaginal delivery may be attempted with the mare awake and either standing or recumbent if the fetus is lined up or oriented normally in the birth canal (anterior presentation, dorsal-sacral position, with both forelimbs and the head extended) or in posterior presentation with both hind limbs extended. A normal fetal orientation may be present in cases of uterine inertia or in cases of fetal oversize relative to the birth canal of the mare (feto-pelvic disproportion; 'hip-lock'). The following guidelines are recommended when assisting delivery:

- If the mare is straining and will not allow a vaginal examination, consider sedation or administration of an epidural
    - Options for an epidural using an 18 gauge, 3 inch needle include:
        - Lidocaine (2%) 5 - 8 ml
        - Xylazine (0.17 mg/kg) diluted in 10 ml of 0.9% sterile saline
        - Combination of lidocaine (0.22 mg/kg), plus xylazine (0.17 mg/kg)
    - Pump obstetrical lubricant into the uterus around the fetus. The commercial product 'J-Lube' (Jorgensen Laboratories, Loveland, CO) is an excellent obstetrical lubricant,

but should be used with caution if a uterine tear is present or suspected or if a cesarean surgery is being considered. J-Lube has been reported to cause severe peritonitis if leaked into the abdominal cavity.[10]

- Repel the fetus back into the abdominal cavity (if necessary) to correct any abnormalities of presentation, position or posture
- Confirm that the fetus is correctly lined up in the birth canal
- Place obstetrical chains or foaling straps on each front leg above the fetlocks
    - Obstetrical chains are advantageous in that they are easy to place, a hook or handle can be attached at any location on the chain and the chain and hooks can be easily cleaned and either cold sterilized or autoclaved
    - Wide-webbed nylon obstetrical straps can be advantageous in that a loop can be made on each end and the strap itself becomes the handle; the disadvantage is that they are not as easy to clean or sterilize as chains
    - Thin rope, baler twine or other narrow devices should not be used on foals due to the potential for damage to skin, tendons or other structures
- Pull when the mare has a uterine contraction; stop pulling when the mare relaxes in-between contractions
- Do not exceed the force of 2 people when assisting
- Avoid use mechanical devices to pull a foal
- Pull in an outward (initially) and then slightly downward direction
- 'Walk' the shoulders of the foal through the birth canal, 1 at a time

Uterine inertia

In some cases, a mare may not provide sufficient uterine contractions (or any apparent uterine contractions) to deliver a fetus, despite the fact that the fetus is aligned properly in the birth canal. In other cases, the mare may become exhausted and unable to muster additional uterine contractions. In these instances, the following guidelines should be followed:

- Confirm that the foal is in correct presentation, position and posture
- Apply obstetrical lubricant around the fetus (if needed)
- Attach obstetrical chains or straps
- Provide traction to deliver the fetus

Abnormal fetal presentation, position or posture

If the fetus is not in a normal orientation in the birth canal, the abnormality must be corrected prior to any attempt to apply traction (i.e. do not pull on the fetus). It is imperative to accurately assess the abnormality so that proper and expedient intervention can be initiated. The most common disorders of presentation, position or posture in an equine dystocia include:

- Elbow lock
- Front leg(s) flexed at the knee or shoulder
- Head flexed laterally or (less commonly) flexed ventrally
- Posterior presentation

Elbow lock

Elbow lock is a common and relatively mild abnormality requiring minimal intervention by the foaling attendant. The foal will be in anterior presentation, usually a dorsal-sacral position, with both front feet and a nose or the cranial portion of the head visible. However, 1 front leg is clearly protruding further than the other, which may be visible only to the fetlock. The nose of the foal is positioned near the mid-cannon bone area of the most advanced front leg. Only 1 leg and the head advances with each uterine contraction; the second front leg does not advance because the elbow is 'locked against' or 'caught on' the pelvic brim. When 'elbow lock' is recognized, the foaling attendant should immediately intervene. Traction is applied to the retained limb when the mare relaxes between uterine contractions. A 'pop' is

often felt when the retained elbow is freed from the pelvis. The foal is usually delivered without further assistance with subsequent contractions.

Posterior presentation

Foals in a posterior presentation may be impeded from a smooth delivery if the tail-head becomes wedged on the dorsal pelvis of the mare. In addition, there is a possibility that the umbilical cord may be compressed on the ventral pelvis of the mare, potentially reducing blood flow and decreasing oxygen transport to the fetus. In contrast to an anterior presented foal, there is no possibility that a foal in a posterior presentation could breathe on its own if progress halts during delivery. For all of the above reasons, it is generally recommended that a posterior presented fetus be delivered as quickly and efficiently as possible, with assistance provided as needed.

Feto-pelvic disproportion

Feto-pelvic disproportion or 'hip-lock' is much less common in horses than cattle. However, it is a significant event when it does occur. Normally the 'test for delivery' in a foal in anterior presentation is passage of the second shoulder through the pelvis. In a majority of equine deliveries, if the shoulders fit through, the hips will pass uneventfully. Unfortunately, a mild to severe form of 'hip-lock' occurs in ~ 0.5 - 1.0% of foalings.[7] A recommended strategy for cases of 'hip-lock' is to infuse a generous volume of obstetrical lubricant around the fetus and into the uterus followed by rotation of the fetus ~ 30 - 45° to take advantage of a slightly wider internal pelvic diameter at that position and then apply traction. General anesthesia may be necessary if the mare becomes intolerant of the procedures.

Developmental abnormalities such as contracted tendons, wry neck or wry nose, a twisted neck or other conditions may prevent or at least delay correction of fetal posture.

Controlled vaginal delivery

If significant progress is not made within 15 - 20 minutes with the mare awake, the mare may be placed under general anesthesia and a controlled vaginal delivery attempted. General anesthesia is used to facilitate safe evaluation of the mare and to reposition the fetus into the correct orientation to allow for a controlled vaginal delivery. Induction of anesthesia is advantageous to eliminate uterine contractions and straining by the mare. However, lack of contractions means that the fetus must be delivered by traction applied from the outside.

In the field, general anesthesia can be accomplished by premedication with xylazine (1.1 mg/kg, IV) with or without addition of butorphanol tartrate (0.01 mg/kg, IV), followed by induction with ketamine (2.2 mg/kg, IV), with or without addition of diazepam or midazolam (0.05 - 0.1 mg/kg, IV). Additional doses of xylazine/ketamine may be administered as needed to maintain general anesthesia while the dystocia is being resolved.

Elevation of the hindquarters of an anesthetized mare may be beneficial to increase space in the caudal abdominal cavity and therefore make it easier to reposition fetal body parts that are not aligned properly in the birth canal. Liberal application of obstetrical lubricants along all sides of the fetus and within the uterine cavity will greatly enhance repositioning and subsequent extraction of the fetus.

In summary, a controlled vaginal delivery with the mare under general anesthesia, if successful, obviates the need for more invasive and expensive procedures such as a cesarean surgery or a fetotomy. The mare is allowed to recover and is reunited with the foal (if alive) when appropriate.

Cesarean surgery

If significant progress toward an assisted or controlled vaginal delivery is not forthcoming, a cesarean surgery or other procedures may be indicated. In the horse, a cesarean surgery is almost exclusively performed in a designated operating room at a veterinary hospital or other referral center.[11,12] Unlike the situation in cows, cesareans are almost never performed in the field or other open areas. A brief description of the cesarean surgery is as follows:

- The mare is anesthetized and placed in dorsal recumbency

- The ventral abdomen is clipped, scrubbed and draped in preparation for surgery
- An incision is made along the ventral midline through which the uterus is subsequently exteriorized
- An incision is made into the uterus and the foal is delivered and attended to by medical staff
- Hemorrhage from the uterine incision is controlled using a synthetic absorbable suture in a simple continuous pattern followed by an inverting Cushing pattern
- The linea alba is closed in a simple continuous pattern; the subcutaneous tissue is closed using synthetic absorbable suture; the skin is subsequently closed with sutures or surgical staples
- The mare is subsequently moved to a recovery stall

Terminal cesarean surgery

In exceedingly rare emergency circumstances, a pregnant mare may be placed under general anesthesia, a cesarean surgery performed and the foal delivered, and the mare subsequently euthanized while still under anesthesia. Situations may include severe musculoskeletal issues, ruptured prepubic tendon or other conditions. It is recommended that the breeding history and prospective due date be reviewed and milk samples be collected and calcium concentration measured to evaluate fetal maturation. If time permits, dexamethasone (i.e. 100 mg, as an intramuscular injection for a 450 kg mare) may be administered once daily for up to 3 days to promote fetal maturation prior to the cesarean surgery.

Fetotomy

The term fetotomy refers to the surgical dissection of a dead fetus in utero.[13,14] The procedure is performed in the event of a dystocia that cannot be resolved by standard assisted or controlled vaginal delivery techniques and when a cesarean surgery is not an option. The goal is to save the life of the mare and protect her future reproductive potential. Specialized obstetrical instruments are used to perform a fetotomy, the most common of which is a fetotome and obstetrical wire. The wire is passed around a retained fetal body part and is used to dissociate that part from the rest of the fetus to allow for delivery of the fetus. Examples of when a fetotomy might be performed on a dead fetus include:

- Breech presentation in which a fetus is in posterior presentation with both hind legs flexed at the hip
- Flexed neck that cannot be extended into a normal position
- Front leg(s) retained/flexed at the shoulder and cannot be extended

Foal care following a dystocia

Resuscitation equipment should be available on farms that foal out a lot of mares and farm personnel should be trained in the proper care and use of the equipment. A resuscitation bag (i.e. Ambu bag) attached to a face mask is a simple-to-use device that can be safely applied to foals by farm personnel to help stimulate breathing in a newborn foal. Alternatively, a device called the 'Foal Resuscitator' may be used. Special immediate attention must be given to the foal following a dystocia. The foal is at high risk of many neonatal diseases including neonatal maladjustment syndrome, failure of passive transfer, ruptured bladder and trauma, e.g. rib fractures.

Mare care following a dystocia

The mare should also be examined in due course following resolution of a dystocia. It is common for the placenta to be retained following a dystocia and preventative treatments are often instituted after a dystocia has been relieved. Finally, the reproductive tract of the mare (i.e. perineum, vagina, cervix and uterus) should be carefully examined for trauma that may lead to more severe medical issues and/or limit her future reproductive performance.

Conclusion

Dystocia is a medical emergency and time is critical to optimize foal survival. The key factors in foal survival are early recognition of a foaling difficulty by breeding farm personnel and early appropriate intervention.

Conflict of interest

There are no conflicts of interest to declare.

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