

How to approach dystocia in the field

James R Crabtree
Equine Reproductive Services (UK) Limited

Introduction

Dystocia is encountered in approximately 10% of births (McCue and Ferris 2012). Many of the author's clients can deal with simple dystocias by themselves and as a result the rate of attendance is approximately 5% of all births. In the large majority of dystocias an assisted vaginal delivery will be effective in correcting the foetal maldisposition and delivering the foal. In certain circumstances it may be appropriate to perform a controlled vaginal delivery with the mare under a general anaesthetic (GA), with or without the hind limbs elevated, and in others referral for caesarean section.

Retrospective studies looking at dystocia and correction techniques all agree that the shorter the duration of dystocia the greater the foal survival rate (Byron *et al.* 2002, Norton *et al.* 2007, McCue and Ferris, 2012). McCue and Ferris (2012) reported the results of 1047 births over eight years at a private foaling facility and demonstrated a significant increase in stillbirth, foal morbidity and foal mortality when the duration of Stage 2 labour was greater than 40 min. In a referral population of mares, Norton and colleagues (2007) estimated that for each 10 min increase in duration of labour beyond 30 min, there is a 10% increased risk of the foal being born dead and a 16% increase in risk of the foal not surviving to discharge. and survival rates have come to the same conclusion: early referral and short duration of dystocia significantly improve outcome. In another referral population, Byron and co-workers (2002) reported a 91% mare survival, 42% delivery of a live foal and 29% foal survival to discharge. Despite this much lower survival rates of 5-13% have been reported (Freeman *et al.* 1999, Norton *et al.* 2007).

The role of fetotomy in equine dystocias is decreasing however it will always remain an important technique which, in the hands of an experienced clinician, can be very successful for dead fetuses with certain maldispositions. To be proficient with a fetatome, the veterinarian must be able to recognise when the procedure is indicated and have the technical knowledge to know where the cut or cuts should be made (Fraser 2001). If the clinician is not familiar with correct fetotomy technique, then the best option for the mare's reproductive future may well be a caesarean section (Frazer 1997).

The field approach

The approach to dystocia in the field setting is governed by the level of experience of the attending clinician and assistance provided by mare owner or stud manager. If manipulation of the foetus (manipulation) does not rapidly correct the malposture one has to decide if it is appropriate to refer the mare with a view to controlled vaginal delivery or caesarean section, if appropriate. Many referral centres will have a dystocia management protocol (Lu *et al.* 2006, Norton *et al.* 2007), designed to minimise the time from admission to foal delivery or surgical incision, to maximise foal survival rates. In some cases, economic and geographic considerations mean that there is not an opportunity to refer and clients look to the attending clinician to resolve the situation one way or another.

One needs to quickly take control of the situation. A brief physical examination of the mare should be performed to determine her physical status, followed by evaluation of the reproductive tract to identify the problem. If the chorioallantoic membrane is intact it should be ruptured immediately and the foetus delivered as quickly as possible. Premature separation of

the placenta may occur during normal labour or during a dystocia and has been reported to occur in 1.6% of equine births (McCue and Ferris 2012). Clearly it is important to determine if the foetus is alive and this is determined using signs such as limb withdrawal, ocular reflex, swallowing reflex, heartbeat, and anal reflex, however simple it may sound it is not always easy to determine. Whilst this assessment is being performed a history should be taken from the attendees; when was she due, when was she last observed, how long has she been foaling for, what actions have been taken, has the mare had any previous problems?

In order to restrain the mare intravenous sedation with an α -2 agonist will likely be indicated, choices are xylazine (0.5-1.0mg/kg) and romifidine (50-100mcg/kg), the author prefers romifidine for initial sedation over xylazine because of the reduced levels of ataxia at the higher doses and this is advantageous if the situation progresses to anaesthesia. Due to the possibility of general anaesthesia the author avoids detomidine out of preference.

Assisted vaginal delivery

Any abnormal combination of the extremities, single limb, fore and hind limbs, three limbs, absence or presence only of the head indicates a maldisposition. The duration of the dystocia, state of the reproductive tract and foetal viability will dictate what happens next. The ability to deal with these cases quickly lies not only in experience with techniques but in the decision-making process. It is important for the attending clinician to ask themselves have they got the equipment and the expertise to deal with this within the next 15 to 20 minutes, if not, does one need to have an alternate plan? In order to even start the following obstetrical equipment should be available:

- Clean obstetrical chains (or ropes) with handles
 - 2 x leg @ 1100mm
 - 1 x head @ 1400 to 2000mm
- Obstetrical lubricant (J-lube) and buckets
- Clean stomach tube and pump
- Tail bandage

Liberal application of lubrication around the foetus and within the uterus will greatly aid in foetal repositioning and subsequent extraction. The author prefers to use a polyethylene polymer based lubricant (J-Lube; Jorgensen Laboratories) for ease of use and the ability to make large volumes of lubricant. One must consider the potentially irritant properties of this type of lubricant (Frazer 2004). However, the author commonly performs uterine lavage as part of his routine post dystocia management.

The big challenge for the equine obstetrician is dealing with the strong abdominal contractions that the mare can produce. Sedation with an α -2 agonist will calm the mare but will rarely prevent the abdominal strain. This is especially important if repulsion of the foetus is necessary to correct the malposture. Clenbuterol hydrochloride (Beta-2 sympathomimetic) administered at 0.8mcg/kg by slow IV injection may provide some benefit via uterine smooth muscle relaxation. If the situation allows epidural anaesthesia may provide enough anaesthesia of the caudal reproductive tract to facilitate manipulations, in these scenarios the author does not use his usual combination of xylazine (0.17mg/kg) plus lignocaine (0.15mg/kg) which for a 500kg mare equates to 8ml of solution (Crabtree 2012), rather the author uses lignocaine (2mg/kg) only, giving 5ml of a 20mg/ml (2%) solution to a 500kg mare to minimise the risks of ataxia due to anaesthesia of hindlimb motor nerves.

Once the foetus has been correctly aligned traction can be applied, as a general rule the force applied to should not exceed that which can be applied by two people; excess force inevitably leads to damage to the reproductive tract of the mare. Traction is best applied along with

straining of the mare, if the mare is not straining it is the author's opinion that traction should be applied intermittently and until the limbs are fully extended traction should be applied to one limb then the other. The use of a head rope will spread the tractional forces between the extremities and offers a significant advantage in tight situations. Ideally two assistants will apply traction under direction of the clinician allowing them to have hands free to monitor progress of the delivery. Traction should be applied in a downward direction and if the mare is recumbent this can be applied towards or between the mare's hind legs resulting in flexion of the foetal spine which is advantageous when the foetal hindquarters engage. Rocking of the foetus from side to side can aid extraction also.

If during the 15 to 20 minutes of assessment and manipulation progress towards delivery is not being made then it is likely that Stage 2 labour is being delayed beyond 40 minutes and the chance of a live foal is decreasing. A technique has been designed to support foals during prolonged Stage 2 labour. The EXIT (ex-utero intra-partum treatment) allows more time to safely correct the dystocia (Palmer and Wilkins 2005). The technique involves naso-tracheal intubation of the foal whilst in-utero and the attachment of a self-inflating Ambubag®. This requires some preparation so that the clinician has the appropriate equipment on hand and in many instances may be too much to arrange in a single-handed emergency situation in the field. It may however prove beneficial for a viable foal which is going to be referred after assisted vaginal delivery has failed.

Controlled vaginal delivery

If the foal is viable and assisted vaginal delivery is not possible one could consider a controlled vaginal delivery under GA, however beware maldispositions such as anterior ventro-vertical with bilateral hip flexion (dog-sitter), posterior bilateral hip flexion (breech) and transverse presentations, as they can be extremely difficult if not impossible to correct even with the benefits of anaesthesia.

The author induces anaesthesia using ketamine (2.5mg/kg) with or without diazepam (0.05mg/kg) and has top-ups of ketamine and romifidine at approximately one third of the induction dose available as required. Circulating levels of diazepam are detectable in the neonate however these levels do not appear to produce consistent respiratory depression in the neonate (Bidwell et al. 2008). Skilled assistance in such situations is extremely valuable so if professional assistance is available, it should be called for. Triple drip anaesthesia could be employed using guaifenesin, ketamine and xylazine (GKX) using the following ratios: 250mg xylazine and 500-1000mg ketamine to 500ml of 5% guaifenesin (50mg/ml G, 1-2mg/ml K, 0.5mg/ml X) infused at a rate of 1.5ml/kg/hr (Lerche 2013) however, in the authors opinion this adds a level of complication often beyond the control of a single clinician in the dystocia scenario. Elevation of the hindlimbs during anaesthesia can be advantageous to increase the space available in the caudal abdominal cavity enabling the clinician to repel foetal parts to correct a maldisposition and align the foetus. It is important if the hindlimb are elevated by shackles on the feet that they are separated using a spreader bar. In the field situation lifting can often be provided by a loader tractor.

The author does use a rope with pulleys to aid the extraction in controlled vaginal deliveries. This allows the clinician to apply traction with one arm whilst the other is used to check the progress of the delivery. This technique does require a fixed anchor point which can be a vehicle if the delivery is taking place in the paddock. This is not however possible if the mare is conscious and has the potential to move or has had her hind limbs elevated.

Anaesthetic recovery is especially important in the post-parturient mare as she has an increased risk of fracture in recovery because of decreased bone density and weakness (Glade 1993,

Bidwell *et al.* 2007). For this reason, the author chooses to recover the mare as slowly as possible and administers a dose of romifidine as the mare is starting to recover and kneels on her head to keep her recumbent as long as possible. Mares are often disorientated and are either be frantic for the foal or not recognise it as their own.

Fetotomy

If the foal is dead or dies during mutation then fetotomy can enable an experienced clinician with the appropriate equipment to rapidly deliver a foal in the standing mare. A correctly applied fetotomy procedure can avoid the additional costs and risks of a controlled vaginal delivery or caesarean section. If the clinician opts to attempt a controlled vaginal delivery and cannot achieve this, fetotomy may be the only option remaining to save the mare's life.

Partial fetotomy (less than three cuts) has been suggested as the method of choice to rapidly and safely resolve over 80% of cases that are not amenable to mutation alone (Vanderplasse 1980). In study by Frazer and co-workers (1997) of the cases not resolved by mutation alone, 66% were corrected by fetotomy and 34% by caesarean section. Fifteen of the 70 fetotomies performed required more than three cuts, however one or two cuts were sufficient to correct 57% of dystocias. Of the reported case series, the most common type of foetal malpostures successfully managed by fetotomy are deviation of the head and neck and/or carpal flexion, with 60-70% of the cases (Carluccio *et al.* 2007, Nimmo *et al.* 2007, Raš *et al.* 2014).

Fetotomy is often referred to as a last resort, a salvage procedure once all other options have failed. When this is the case a large degree of trauma has likely already been caused to the mare's reproductive tract and complications are often significant, compromising future fertility. However if a partial fetotomy is performed quickly, by an experienced clinician with an atraumatic technique, complications are minimised and future fertility maintained (Nimmo *et al.* 2007, Raš *et al.* 2014). Of the recent case reviews, the largest studies report a survival rate of 84 to 95% (Carluccio *et al.* 2007, Raš *et al.* 2014). These figures compares favourably against caesarean section where survival rate is reported to be 84% (Abernathy-Young *et al.* 2012). Interestingly of the caesarean sections, 15 mares had undergone partial fetotomy prior to surgery and 6 of these did not survive (Abernathy-Young *et al.* 2012). Complications of fetotomy include retained foetal membranes (5.5%), laminitis (6.9%), vaginal and cervical lacerations (2.8%), and delayed uterine involution (2.8%) (Carluccio *et al.* 2007). In another population of mares, predominated by heavy draft horses, Raš and co-workers (2014) reported complications of endometritis (32.5%), retained foetal membranes (27.9%), soft tissue damage to the genital tract (8.1%), mastitis (8.1%), distention of the uterus with retained lochia (6.9%) and laminitis (5.8%). The prevalence vaginal trauma is relatively low compared to the bovine patient where it is encountered in 12% of cases (Wehrend *et al.* 2002), this is largely due to the greater time to presentation and the trauma previously caused to the reproductive tract.

If the procedure is atraumatic the future fertility of mares can be good. Carluccio and co-workers (2007) reported that mares bred 2-3 months after fetotomy had a pregnancy rate of approximately 80% at 45 days which is not significantly different from mares that foaled naturally. However, it is important to emphasise that in this study mares were attended by clinicians experienced in the technique. The mean time required for assessment, induction of local anaesthesia, and fetotomy was 12.8 minutes. Raš and co-workers (2014) reported survival rate of 90.5% for mares treated in the field and 74.4% for those treated in the clinic and attributed this to the prompt attendance in the field versus a delayed presentation at the clinic. In this study 52.3% of mares were bred with 31.1% becoming pregnant in the year that fetotomy was performed and 44.4% of the mares became pregnant within two years of fetotomy. The author cannot provide a like for like comparison with caesarean section however a reported foaling rate of 56% for the three years after caesarean section (Abernathy-Young *et al.* 2012).

could reasonably correspond to an approximate 45-day pregnancy rate of 66%. The author has experienced delayed referrals where fetotomy has been attempted in the field without success; in these cases the prognosis for future fertility has been guarded.

Fetotomy equipment

In order to perform the procedure with minimal trauma to the mare's reproductive tract it is highly recommended that one uses a commercially available fetatome (Utrecht fetatome, Jorgensen Laboratories). In order to perform the procedure proficiently the following equipment should be available in addition to the basic kit (above):

- Fetatome and wire threader
- Fetotomy wire and wire cutters
- Wire handles
- Wire introducer
- Obstetrical hook(s)
- Rope and pulley or alternate foaling aid (calving jack)
- Palm Knife
- Krey hook (certain procedures only)
- Kuhn's crutch (optional tool)

Case scenarios

To illustrate the decision making processes a few case scenarios in the same mare will be discussed: We are presented with a multiparous Thoroughbred mare which has had unprogressive Stage 2 labour for 40 minutes. The mare has a tail bandage on and clean perineum; you have two buckets of clean warm water. She is both physically and chemically restrained.

Anterior presentation with bilateral carpal flexion: Assessment of the mare per-vaginum reveals a dead foal in anterior presentation with bilateral carpal flexion. The vagina is drying and the mare is straining intermittently but quite hard.

Can this foetus be delivered after mutation? Perhaps, copious volumes of lubrication would be required before repulsion of the foetus and mutation can be performed. Chemical agents such as clenbuterol could also be administered to aid in repulsion of the foetus. Between 5-10L of lubricant are pumped into the vagina and uterus. Ten minutes of manipulations do not enable retrieval of the distal limb(s).

Could this foetus be delivered if the mare is anaesthetised? Perhaps and if the foal was alive this would be a reasonable next step in delivery of this foetus. If the mare was referred at this stage a controlled vaginal delivery may be attempted with the mare's legs elevated prior to caesarean section. However, if the foal is dead one could consider fetotomy to avoid the need for a general anaesthetic. Relative foetal oversize is far less common than in the bovine species, so in most cases, once the malposture is corrected, the foal can be delivered. One must also consider the contracted foal whose legs cannot be straightened; in such cases correction of the malposture and controlled vaginal delivery may not be possible.

The owner does not want the mare to be referred for surgery for economic reasons and so fetotomy is not only indicated it is a logical next step in the absence of referral. Transection of the limb through the intercarpal joint is one of the most straightforward fetotomy cuts to make and with the correct approach and equipment can be done very quickly. The mare in this case is standing and calm under sedation. One could consider administering an epidural to provide analgesia to the perineal region. This will not stop abdominal straining but it may stop straining

in response to manipulations. More lubricant is added as required. Do you need professional assistance?

Using a wire guide a length of fetotomy wire is passed around the back of the foetus' flexed carpus. The wire on is passed up one channel of the fetatome using the wire threader and attached to a wire handle. The other end of the wire is passed up the other channel. The fetatome is advanced up to the front of the carpus and the wire pulled tight. Allowing approximately 1m spare wire the wire is cut and the free end attached to the other handle. The wire placement is double checked and the fetatome held firmly in position by the clinician. The cut is made in front of the fetatome head. An assistant then pulls the wire in a steady to and fro motion until the limb is transected. The clinician should ensure that the head of the fetatome is in the correct position at all times but must not place one's finger near the wire whilst cutting is in progress. Cheap wire and jerky motions will likely result in snapping of the wire so both should be avoided. Cutting through the limb at this point means that the formation of sharp bone edges is minimised and the thicker end of the distal radius is present for an anchor point for an obstetrical chain or rope. The distal limb is removed. One must NOT cut through the radius or metacarpus as this will likely result in a sharp point of bone which can lacerate the reproductive tract of the mare. Occasionally enough room is created from making this one cut that the contralateral limb can then be retrieved. If not, the cut is repeated on the contralateral limb prior to delivery of the foal. The author recommends checking the limb stumps when traction is being applied as they can catch/tear as they are generally not smooth.

Post fetotomy management of the mare will depend on the duration of the dystocia, the trauma caused to the reproductive tract and state of the placenta however the author would routinely administer analgesia/anti-inflammatories, systemic antibiotics and low dose oxytocin and re-examine the mare the following day with a view to uterine lavage.

Anterior presentation with unilateral carpal flexion and lateral neck deviation: This is a more complex presentation; we have one leg, which we have confirmed is a right fore leg, engaged in the vagina. The neck is felt to deviate to the left. The left fore cannot be felt. Is the foal alive? Based on the lack of foetal withdrawal reflex, yes. The vagina is moist.

Can this foetus be delivered after mutation? Possibly, if the head can be retrieved aided by repulsion of the right leg. In the authors experience with a neck deviation (as opposed to a head deviation) retrieval of the head and straightening of the neck is very difficult. If the eye socket is within reach of the clinicians arm an extended hook can be placed in the eye socket to aid retrieval of the foetal head. Once this is done the other leg may be retrieved. The author would proceed with this for 15 to 20 minutes and if no significant progress can be made a decision needs to be made on the next step. These would be: referral with a view to an attempt at controlled vaginal delivery prior to caesarean section or continued treatment in the field.

Referral is not an option as the nearest facility is 100 miles away and the trailer has a puncture. If the mare was agitated and/or straining hard, or if one was not sure the foal was dead the author would administer an anaesthetic and try a controlled vaginal delivery with fetotomy as backup. If the mare was calm and quiet and one was convinced that the foal was dead the author would progress to fetotomy by first removing the head and a variable portion of the neck. After copious lubrication the wire is passed around the neck and fetatome placed on the side of the neck away from the deviation. To aid passing of the wire some traction of the extended leg may be required. Although a vertebral stump will remain it is often not too sharp as it is surrounded by tissue, despite this it will need guiding by a hand through the cervix and vagina. The left leg is retrieved by mutation the foal delivered.

If the neck is out of reach and the wire cannot be passed round the neck it may be necessary to remove the extended fore leg first. The wire is passed through the fetatome first creating a loop at the end. This loop is passed over the extended leg with the head and body of the fetatome being passed on the lateral aspect of the limb until the wire is seated in the axilla. The fetatome is then advanced beyond the elbow in a direction towards the top of the scapula. A chain is attached to the fetlock and the fetatome anchored to it, holding the leg in extension. The cut is made behind and to the side of the fetatome head. The clinician should ensure that the fetatome remains in position and does not rotate. In addition the author recommends pausing cutting on a couple of occasions to apply additional traction to the forelimb ensuring that the cut is made behind the scapula rather than through it or the proximal humerus. The assistant performing the cutting should give the clinician feedback as to the ease of cutting. If cutting is strenuous or difficult one may be cutting through bone as opposed to the muscular attachment of the fore limb to the thorax. If so the fetatome position should be checked and repositioned. Once the limb is removed there may be enough room to retrieve the head by traction or remove it as described above.

If the mare is under anaesthesia don't neglect her anaesthesia whilst performing the fetotomy. Have a plan and a back-up, and a back-up to the back-up. Did you call for professional assistance?

Posterior presentation with bilateral hock flexion: It's backwards and stuck but is it dead? If one gets an anal reflex it's alive but if one is not sure one has to assume the foetus is alive. If one could refer it would be recommended but what if one is the referral centre? The owner can not afford a caesarean section but has consented to an attempt at controlled vaginal delivery.

A second opinion confirms that the foal is dead. Dead or alive these can be particularly difficult to mutate and so if one has the necessary skills one could opt to perform a fetotomy. The cuts are essentially the same as for a flexed carpus except in this case one is cutting through the lower rows of tarsal bones. It may be necessary to repel the foetus to extend the stifle joints into the pelvic canal prior to applying traction. If delivery is unsuccessful the mare may have to be euthanased.

Summary

The clinician should aim to be methodical and have a strategy if progression is not being made with delivery of a foetus. Controlled vaginal delivery in the field is an option however this may mean that caesarean section is no longer an option unless the mare is recovered and then transported. Fetotomy can be an extremely valuable procedure that can avoid the need for prolonged manipulations or caesarean section. In the hands of a clinician experienced in the technique, mare survival and future fertility can be better than caesarean section. However in inexperienced hands it has the potential to damage a mare, compromising future fertility or put the mare's life at risk. Although one may find oneself requiring the technique as a last resort, for the best outcome for the mare the decision to perform a fetotomy should be made as early as possible. The author suggests that if the opportunity arrives one should try gain experience in the technique in either bovine or equine patients. The appropriate equipment is essential for anything but the simplest of cuts.

References

Abernathy-Young KK *et al.* Survival rates of mares and foals and postoperative complications and fertility of mares after caesarean section: 95 cases (1986-2000). *Journal of the American Veterinary Medical Association* 241: 927-934, 2012

- Bidwell LA et al.** Equine perioperative fatalities associated with general anaesthesia at a private practice - a retrospective case series. *Veterinary Anaesthesia and Analgesia* 34: 23-30, 2007
- Bidwell LB et al.** Diazepam levels in foals after dystocia birth. *Proceedings: the 54th Annual Convention of the American Association of Equine Practitioners* 54: 286-287, 2008
- Byron CR et al.** Dystocia in a referral hospital setting: approach and results. *Equine Veterinary Journal* 35: 82-85, 2002
- Carluccio A et al.** Survival rate and short-term fertility rate associated with the use of fetotomy for resolution of dystocia in mares: 72 cases (1991–2005). *Journal of the American Veterinary Medical Association* 230: 1502-1505, 2007
- Crabtree J.** Peripartum problems in mares 2. Post-partum problems. *In Practice* 34(8): 462-471, 2012
- Frazer GS.** Review of the use of fetotomy to resolve dystocia in the mare. *Proceeding of the American Association of Equine Practitioners* 43: 262-268, 1997
- Frazer GS.** Fetotomy technique in the mare. *Equine Veterinary Education* 13: 151-159, 2001
- Frazer GS.** Systemic effects of peritoneal instillation of a polyethylene polymer based obstetrical lubricant in horses. *Proceedings Society for Theriogenology*. Lexington, KY, pp93-97, 2004
- Frazer GS et al.** Prevalence of fetal maldispositions in equine referral hospital dystocias. *Equine Veterinary Journal* 29: 111-116, 1997
- Freeman DE et al.** Caesarean section and other methods for assisted delivery: comparison of effects on mare mortality and complications. *Equine Veterinary Journal* 31: 203-207, 1999
- Glade MJ.** Effects of gestation, lactation and maternal calcium intake on mechanical strength of equine bone. *Journal of the American College of Nutrition* 12: 372-377, 1993
- Lerche P.** Total Intravenous Anaesthesia in Horses. *Veterinary Clinics of North America: Equine Practice* 29: 123-129, 2013
- Lu KG et al.** Dystocia - A True Equine Emergency. *Clinical Techniques in Equine Practice* 5: 145-153, 2006
- McCue PM, Ferris RA.** Parturition, dystocia and foal survival: a retrospective study of 1047 births. *Equine Veterinary Journal Suppl.* 41: 22-25, 2012
- Nimmo MR et al.** Fertility and Complications After Fetotomy in 20 Brood Mares (2001–2006). *Veterinary Surgery* 36: 771–774, 2007
- Norton JL et al.** Retrospective study of dystocia in mares at a referral hospital. *Equine Veterinary Journal* 39: 37-41, 2007
- Palmer JE, Wilkins PA.** How to Use EXIT (Ex-Utero Intra-Partum Treatment) to Rescue Foals during Dystocia. *Proceedings of the 51st Annual Convention of the American Association of Equine Practitioners* 51: 281-283, 2005
- Raś A et al.** Fertility after fetotomy: a clinical study focusing on heavy draft mares. *Veterinary Record* 174(16): 407-410, 2014
- Vanderplassche M.** Obstetrician's view of the physiology of equine parturition and dystocia. *Equine Veterinary Journal* 12: 45-49, 1980
- Wehrend A et al.** Fetotomy in cattle with special reference to postoperative complication – an evaluation of 131 cases. *Dtsch Tierarztl Wochenschr* 109: 56-61, 2002