

Dystocia - a Review of Fetotomy in the Cow

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Introduction

Percutaneous fetotomy is the dissection or dismemberment of a fetus with a wire saw by sectioning through the skin, muscle and bone. Subcutaneous fetotomy is performed with chisels and hooks such that the fetal parts are removed while leaving the skin attached to the remainder of the fetus. This paper will review the percutaneous technique using the Utrecht method. To perform a successful fetotomy the obstetrician must have technical knowledge, have adequate training and experience, possess correctly designed instruments, and use copious amounts of lubricant.

If assisted vaginal delivery is not possible, a cesarean section is the method of choice if the fetus is alive and viable. If the fetus is dead then fetotomy should be given first consideration, especially if it is emphysematous and the cow is toxic. However fetotomy should not be regarded as a substitute for cesarean section. Both procedures have a place in veterinary practice and should be used at the appropriate time. The obstetrician must be decisive and fetotomy should not be used as a last resort. A common fault is the application of too great and/or too prolonged extractive force before the decision to perform a fetotomy is made. This is not only inhumane, but often results in subsequent musculoskeletal complications. Fetotomy is commonly utilized to correct dystocia due to fetopelvic disproportion, to correct fetal maldispositions (presentation, position, posture), and occasionally to remove a pathologically enlarged fetus. In practice "time is money" and it should be remembered that most dystocias only require partial dismemberment of the fetus (eg. head and/or limb removal) to facilitate safe and rapid extraction. "Hiplock" in anterior presentation is a classic example of the type of dystocia best corrected by fetotomy.

If there is sufficient room in the pelvic canal to correctly place the instruments, fetotomy offers an alternative to major abdominal surgery. When the proce-

cedure is performed using correct technique the recovery time and amount of aftercare are generally considerably less than that necessary following cesarean section. An added advantage is that the cow can be salvaged for slaughter much sooner, without a reduction in market value due to the presence of clipped hair and an abdominal incision. The potential disadvantages all relate back to the expertise of the obstetrician. Although the procedure may be perceived as physically exhausting and time consuming by a novice, one should be cognizant of the old saying that "practice makes perfect". The author doesn't feel that the procedure is likely to cause injury to either the clinician or the cow provided that correct instrumentation is available, that proper technique is used, and - most importantly - that adequate lubrication is employed. Certainly an incorrectly placed cut can expose sharp bone fragments that can easily lacerate the reproductive tract.

The author uses a Utrecht model fetotome which is essentially a two-barreled flat tube. The head is made of tempered steel and hardened chrome. There is a handhold to permit a strong grip. The notched, oval ring-plate immediately behind the handle permits the anchoring of obstetrical chains under tension (this greatly facilitates maintaining accurate position of the instrument). A fetotome threader is necessary to thread approximately 5 m of saw wire through the barrel of the fetotome. The type that has a small brush attached is very useful for cleaning out hair and tissue debris afterwards. The wire saw handles should permit quick and secure attachment of wire, and the hand-holds should permit a strong, comfortable grip. I prefer the "fold-over" type as they are both simple and comfortable to use. A Krey hook is an essential piece of equipment. It is attached to an obstetrical chain and used to clamp onto the severed portions of the fetus, especially the vertebral column. A safety feature is the "stop" which prevents exposure of the points when the hooks are closed. If this is worn or missing there is a high probability of a

laceration occurring if the hook accidentally slips off during traction. A wire saw introducer is another essential piece of equipment. It is used to pass the fetotomy wire around a fetal part - typically the neck or limb. Although a fetotomy knife is only used for certain cuts, I would not leave this out of my obstetrical kit. It is used to cut a "notch" for the wire saw when removing a retained forelimb. Clean side cutting pliers or tin snips are needed for cutting the saw wire.

I prefer to perform fetotomy procedures on a standing cow whenever possible. Epidural anesthesia is routinely administered. Although this does not prevent a cow from mounting an abdominal press, it does reduce the sensitivity of the vagina. Thus, the reflex straining associated with vaginal manipulations is eliminated (Ferguson reflex). Another important consideration is the humane aspect.

Lubrication is the key to success, especially in the USA where uterine relaxant drugs are not available. These tocolytic agents (isoxsuprine and clenbuterol) are used in other countries to relax a tightly contracted uterus, thereby permitting fetal repulsion and mutation. The author prefers to use a powdered polyethylene polymer product (J-Lube) that is mixed with water and infused into the uterus with a pump and sterile stomach tube. Ideally the water should be warm as it has been my experience that this enhances the amount of uterine relaxation achieved. Frequent reapplication of lubricant is necessary to ensure a safe, atraumatic delivery. Apart from the obvious advantages of increased room to work, the lubricant protects the delicate tissues of the reproductive tract as well as the hands and arms of the obstetrician. Many clinicians advocate the use of petroleum-based lubricants because of their tendency to cling to tissues but I have found the polyethylene polymer to be superior. Water-soluble lubricants that are routinely used for palpation per rectum are of little value because they are rapidly diluted by the fetal fluids. Insufficient lubrication can be, and often is, the cause of failure.

The obstetrician's task is to cautiously guide the threaded fetotome into the uterus, ensuring that the wire is not crossed over itself. It is imperative that the wire saw is not pressing against maternal tissue. During the fetotomy procedure the operator must ensure that the head of the instrument remains seated at the intended site of the cut. Although some clinicians like to have an assistant hold the external portion of the fetotome, I prefer to have complete control of the instrument myself. With either approach an assistant is necessary to control wire tension during placement of the wire saw, and to perform the actual sawing procedure. Once the obstetrician has confirmed that the wire is snugly seated around the fetus, and that it is not crossed or kinked, sawing can begin. Initially there

should be slow, short, continuous strokes with an application of moderate pressure. As the wire becomes firmly seated, long continuous sawing strokes should be applied using heavy pressure. The long strokes spread the wear over more wire, thus decreasing the amount of heat generated and reducing the likelihood that the wire will break. If correctly performed, the cutting action is rapid and the procedure can be completed in a short time.

Anterior Presentation

The fetal head may sometimes need to be removed to permit access to a retained forelimb. Typically both channels of the fetotome are threaded and the wire loop is then passed over the head and seated behind the ear cartilage. If there is adequate room the fetotome is then advanced under the jaw such that it is positioned between - and posterior to - the mandibles. When space is limiting the instrument is positioned laterally with the fetotome head caudal to the ramus of the mandible. If a lateral or ventral head and neck flexion is not amenable to mutation, the wire saw is attached to a curved introducer and this is passed around the neck. Once the second channel of the fetotome has been threaded the instrument is advanced until the head of the fetotome lies adjacent to the thoracic inlet. Tension is then applied to the wire so that the obstetrician can ensure that the loop is positioned as close to the thorax as possible. Once the cut is completed the severed neck is grasped and withdrawn, either by hand or after attaching a Krey hook.

If the dystocia is due to uni- or bilateral carpal flexion then removal of the head and neck may provide the extra space necessary to permit repulsion and mutation. However, if the dystocia has been prolonged and the uterus is tightly contracted, it may not be possible to repel the fetus and correct the malposture without risking a uterine rupture. In these cases a relatively easy fetotomy cut through the distal portion of the carpal joint can facilitate safe and rapid fetal extraction. After threading one channel of the fetotome the wire is attached to the curved introducer and passed around the flexed carpal joint. Once the second channel of the fetotome is threaded the head of the instrument is positioned against the distal row of carpal bones. If performed correctly there are no sharp bony fragments and an obstetrical chain can be anchored against the tuberosities of distal radius. If the cut is made too high there is a sharp piece of bone and there is nothing to anchor the chain to, and if the cut is made too far below the joint there is a sharp piece of bone to contend with.

In some cases of fetal oversize removal of an entire forelimb (shoulder joint) may reduce the diameter of the fetus sufficiently to permit extraction. An obstetrical chain is placed around the forelimb and the leg pulled into extension. Once both channels of the fetotome

tome are threaded the chain is passed through the wire loop, and the wire saw is placed between the claws as a temporary anchor point. The obstetrician then advances the head of the instrument along the lateral aspect of the forelimb until it lies over the mid-to-upper portion of the scapula. The obstetrical chain is then seated in the notched plate such that the forelimb is held in extension and the wire loop is removed from the interdigital space. The obstetrician guides the wire up the medial aspect of the limb while the assistant applies gentle traction. The chain is then detached from the notched plate and the head of the fetotome advanced above and behind the scapula. The wire saw should be seated in the axilla. The limb is then subjected to traction such that when the chain is anchored back into the notched plate the forelimb is held in full extension. It is important that the obstetrician ensures that the head of the fetotome remains dorso-caudal to the scapula during the amputation procedure. This will ensure that the wire dissects through the muscular attachments such that the entire scapula is removed. If the instrument is pulled caudally by the assistant's sawing motions it is possible to miss the entire scapula and cut through the proximal humerus. This can be disastrous as the diameter of the fetus has not been reduced (shoulder joint remains) and there is now a very sharp piece of bone to contend with. Additionally, there is no suitable traction point remaining on that side.

If there is shoulder flexion it is possible to remove the entire forelimb by a fetotomy cut if the obstetrician is unable to reach forwards and successfully correct the malposture. The fetotomy knife is used to make a cut through the skin dorsal to the scapula, and then down into the connective tissue between the scapula and thorax. One channel of the fetotome is threaded and the wire attached to the curved introducer. This is passed over the scapula and down between the thorax and retained humerus. The wire is retrieved from below and the second channel of the fetotome is threaded. The fetotome is introduced up to the medial aspect of the shoulder and held there by the external arm while the hand seats the wire loop into the previously created dorsal cut. Tension is applied to the wire to ensure that the loop is seated medial to the blade of the scapula. The hand then grasps the head of the fetotome and holds it medial to the shoulder joint while the saw motion cuts down through the muscular attachments of the scapula.

If an oversized fetus can not be removed after these three cuts (head/neck and both forelimbs), an additional four cuts may be necessary to completely dismember the fetus. A Krey hook is attached to the severed vertebral column and the chain passed through the wire loop of the pre-threaded fetotome. The loop is held externally while the head of the instrument is advanced along the dorsal aspect of the fetus to just behind the exposed

muscular attachments of the scapula. After the Krey hook chain is pulled tight and anchored into the notch plate, the wire loop is advanced ventrally to the mid-sternum of the fetus. Short strokes should be applied until the wire becomes seated, and the obstetrician should anticipate some movement of the fetotome head. Extraction of the amputated portion of the anterior thorax is generally easily accomplished by traction on the Krey hook. The next cut is performed in a similar manner, with the fetotome positioned over the lumbar spine. This portion of the chest may be too large to extract and a second cut may be required. The wire from one fetotome channel is removed and attached to the wire introducer. This is pushed through the diaphragm and the wire looped back to be rethreaded through the fetotome. The head of the fetotome is held adjacent to the vertebral column and a cut made through the ribs near their vertebral attachments. The remainder of the thorax is then easily collapsed and withdrawn.

The final cut in a complete anterior presentation fetotomy involves sectioning the pelvis. The wire introducer is passed over the dorsum of the fetus and then retrieved ventrally. The author places the wire on one side of the tail and then ensures that the head of the fetotome is held against the opposite side of the vertebral column. This ensures that the cut is made diagonally across the pelvis. If the wire is not placed on the opposite side of the tail to the fetotome it is possible for a cut to be made through the proximal femur instead. This can occur if the head of the fetotome moves forwards and the wire is pulled to the side. The width of the hips has not been reduced and there is no very sharp piece of bone to contend with. In some cases the forequarters of an anteriorly presented fetus are delivered and then a "hiplock" develops. If this occurs the forepart of the fetus is removed by a transverse cut through the lumbar vertebrae. The fetus is eviscerated and a wire introducer is then passed over the dorsum of the pelvis and retrieved ventrally. The cut is completed as described above.

Posterior Presentation

Breech (bilateral hip flexion) and hock flexion postures can be extremely difficult to correct if the uterus is contracted down on the fetus. Injudicious attempts to straighten the hock can easily rupture the uterus. It is often safer to resolve these malpostures by fetotomy. If bilateral hip flexion is present the cow seldom progresses into normal second stage labor and the cervix will be incompletely dilated. The fetus is often emphysematous before the owner seeks veterinary attention. After pumping in copious volumes of lubricant the wire introducer is passed over the dorsum of the fetus and down between the body wall and retained hindlimb. The intro-

ducer is retrieved ventrally and the second channel of the fetotome threaded. I prefer to place the head of the fetotome against the ischium on the opposite side of the tail to the leg being amputated. If there is hock flexion present a similar cut to that for carpal flexion is used - the key being to retain a point of traction for the chain, and to have no sharp bone fragments.

If the hindlimbs are extended but the fetus can't be extracted, a limb can be removed by positioning the prethreaded fetotome in a similar manner to that described for amputation of an extended forelimb. The fetotome is advanced up the lateral aspect of the limb until the head rests near the greater trochanter. The obstetric chain is anchored into the notched plate, and the wire loop is then removed from between the claws and moved up medially. Traction is then applied to the chain while the head of the fetotome is advanced dorsal to the head of the greater trochanter, and the chain anchored back into the notched plate. I prefer to place the wire loop on the opposite side of the tail to the fetotome. If correctly placed, the cut will be diagonal across the pelvis, removing the entire hip joint and thus decreasing the size of the remaining fetus. If the fetotome is allowed to move caudal during the amputation procedure then the cut may be through the proximal portion of the femur. This does not reduce the size of the pelvis and there is now a sharp piece of bone to contend with. If the fetus can't be extracted after removing one limb, the second can be removed in a similar manner, and a Krey hook anchored to the severed vertebral column. Alternately the prethreaded fetotome can be advanced up over the lumbar spine and the wire loop guided up ventrally until it lies caudal to the last rib. This transverse cut then permits extraction of the hindlimb and remainder of the pelvis. If both limbs have been removed, the transverse cut can be made using the Krey hook to anchor the vertebral stump to the fetotome.

A second transverse division of the trunk is made though the mid-sternum and thoracic vertebrae just caudal to the scapulae. When the diameter of this fetal part is too large the rib cage can be collapsed as described for the anteriorly presented fetus. If a Krey hook attached to the severed vertebrae does not facilitate extraction, one or two further cuts can be made. The option is to either remove each forelimb separately, or to diagonally divide the remaining fetal part. The curved wire introducer is passed between the neck and forelimb and retrieved ventrally. Some blunt dissection may be necessary before the head of the fetotome is positioned between the thorax and scapula. If a diagonal cut is to be made the head of the fetotome should be placed on the lateral surface of the opposite scapula.

Fetal Monsters

The *shistosomus reflexus* anomaly almost inevitably requires either a fetotomy or cesarean section to facilitate extraction. Inappropriate cuts can leave sharp bone fragments and often surgical correction is the more appropriate approach. Typically a shistosomus fetus has dorsoretroflexion of the vertebral column such that the fetal head lies in close proximity to the sacrum, in combination with failure of closure of the ventral body wall such that abdominal and sometimes thoracic viscera are exposed. Obviously the possibility of uterine rupture with prolapse of maternal viscera should be considered. If the fetal viscera are present within the vaginal canal they should be removed to reveal the point of spinal angulation. This is the site of the fetotomy cut to bisect the fetal trunk. A curved wire introducer is used in a similar manner to amputation of a flexed carpus or tarsus. Occasionally extra cuts may be necessary to reduce the fetal parts sufficiently to permit atraumatic extraction. If the limbs are presented it is sometimes possible to introduce the threaded fetotome and then guide the wire loop up around all four limbs. When placed correctly the wire will encompass the head and parts of the thorax and pelvis. An obstetrical chain attached to one or two limbs is used to anchor the fetus to the notched plate in the fetotome. If the cut is successful the head, neck, forelimbs and part of the pelvis with hindlimbs can be extracted. A second cut through the point of spinal angulation may be necessary to permit removal of the remaining fetal trunk.

The *perosomus elumbis* anomaly is a fetus missing the vertebrae and spinal cord from thorax to tail. There is a small flattened pelvis and ankylosed, flexed hindlimbs. The anterior portion of these typically small fetuses is normal and enters the vaginal canal quite easily. The ankylosed, distorted hindlimbs cause the dystocia and attempts at forced extraction almost inevitably result in uterine rupture. Transverse division of the fetal trunk (see hip lock) is followed by longitudinal division of the pelvis.

Suggested further reading:

Bierschwal CJ, deBois CHW: The technique of fetotomy in large animals. Bonner Springs, KS; VM Publishing, 1972. Youngquist RS: Parturition and Dystocia. In Youngquist RS (ed): Current Therapy in Large Animal Theriogenology, p 309-324. WB Saunders Co, Philadelphia. 1997. Mortimer RG and Toombs RE: Abnormal bovine parturition - obstetrics and fetotomy. Vet Clin N Am - Food Animal Practice. 9:2:323-341 (1993).