

Revisiting subcutaneous fetotomy for removal of forelimb

Glennon Mays, Steven Brinsko
Department of Large Animal Clinical Sciences
College of Veterinary Medicine and Biomedical Sciences
Texas A&M University, College Station, TX

Abstract

Removal of a forelimb is often all that is necessary to allow vaginal delivery of an oversized fetus. Although the percutaneous Utrecht method is efficient, it requires expensive equipment, as well as adequate training and experience to be safely employed. This manuscript describes using a modified chisel, an older, simpler and less expensive method of subcutaneous fetotomy for forelimb removal.

Keywords: Fetotomy, subcutaneous, forelimb, chisel

Introduction

Fetal-maternal oversize is the most common cause of dystocia in cattle and may also occur, albeit much less commonly, in mares. When a fetus is no longer viable, oftentimes, removal of 1 forelimb in its entirety will reduce fetal size sufficiently to allow safe and efficient removal by forced extraction. Use of a fetatome and employment of percutaneous Utrecht method is the procedure most practitioners are currently familiar with to accomplish this task. However, many practitioners, even those who frequently provide obstetrical assistance, do not possess a fetatome. A quality fetatome, complete with all necessary ancillary equipment, can cost in excess of \$500.00, which can be a substantial financial outlay, especially for new practitioners. In addition, proper training and proficiency in the use of fetatome is imperative for a successful outcome. A much simpler and inexpensive method for removing fetal forelimbs (applicable but more difficult for hindlimbs) is the subcutaneous method using an obstetric chisel (Figure 1).

According to Professor Dr. C.H.W deBois,¹ development of subcutaneous method of fetotomy occurred early in the 18th century and by the 19th century, several books were written in The Netherlands describing this technique, with improvements continuously described until the 1930s, after which it was gradually replaced by percutaneous fetotomy. Early veterinary text books describe advantages of subcutaneous fetotomy in calves and foals. Unfortunately, many US veterinary schools either no longer teach fetotomy or provide only token instruction. Described below is the subcutaneous method preferred and used for many years by the first author, which is a modification of the technique described by Williams² and Keller-Benesch's modification of de Bruin's technique.³

Method

As with any obstetrical procedure, adequate restraint of dam and employing basic principles of cleanliness and lubrication are paramount. When a fetotomy is undertaken, an epidural should be administered and pelvic girdle should be devoid of competing fetal body parts as much as possible, to facilitate manipulation and dissection of the limb. Removal of head or placing the head and/or the opposite limb anterior to cervix, followed by repulsion of fetus out of birth canal and into the uterine body, will greatly enhance available space for further mutation and fetotomy (Figure 2). Ideally, fetotomy should be done with dam standing. However, if dam is laterally recumbent, removal of the uppermost limb is the most advantageous approach.

After mutating the fetus to provide adequate space, initial traction applied to the limb of focus is essential, but the limb should be minimally exteriorized before proceeding. Further exteriorization places more shoulder into the narrow space of birth canal. Ideally, one must be able to advance one's hand (with knife) proximal to the calf's scapulohumeral joint, to make the initial incision. Without mild to moderate traction on the limb, advancing the operator's hand/arm simply repels the calf's limb away from the clinician. Moreover, tension on the limb facilitates incisional direction and depth. Traction is maintained throughout the entire process.

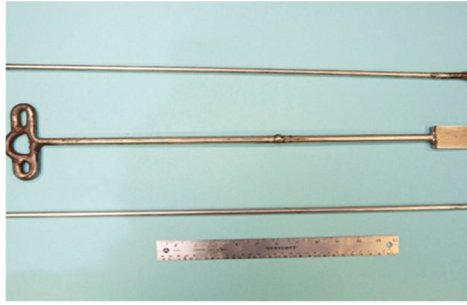


Figure 1. Three fabricated fetotomy chisels. Note that points extending on either side of the blade should be blunt to avoid penetrating skin. Instrument at the bottom was designed for use in small ruminants.



Figure 2. Fetus with head and opposite limb reflected to provide more room for removal of extended limb.



Figure 3. Encircling cut made at mid metacarpal region. Care is taken not to sever flexor or extensor tendons.



Figure 4. Type of pocket knife and blade preferred by Dr. Mays for incising the fetal skin in preparation for subcutaneous fetotomy.



Figure 5. Linear incision made from scapulothoracic joint to the level of circular cut at mid-metacarpal region.



Figure 6. Sharp and digital dissection is performed on the skin proximal to circular cut.



Figure 7. Finger holes made by stab incisions near each skin corners where longitudinal and encircling cuts join.



Figure 8. Application of traction to a finger hole as the fetal chisel is inserted under reflected skin to initiate skinning process.



Figure 9. After skin is circumferentially reflected at the level of forearm, chisel is inserted to facilitate separation of skin from underlying tissues.



Figure 10. Freeing skin above scapulohumeral joint using blunt digital dissection, note: traction applied to skin distally, facilitates dissection.



Figure 11a. After disruption of the pectoral muscles, leg can now be removed by applying traction, note: entire leg should slide out of birth canal, leaving skin attached to torso.



Figure 11b. Entire forelimb, from hoof to scapula, removed via subcutaneous fetotomy.



Figure 12. After removal of one forelimb, extraction of the fetus is accomplished by applying traction to the finger hole in the skin of the removed forelimb, the fetal head and the remaining forelimb.

A circular cut is made (through the skin) at the distal aspect of the initial incision in the mid-metacarpal region (Figure 3). Carefully avoid severing extensor or flexor tendons; they must be intact to facilitate final limb removal by traction. Once the circular cut is completed, the two ‘corners’ of skin at the union of the longitudinal and encircling cuts are lifted away from the subcutis by sharp dissection. It is helpful to exteriorize (if possible) this portion of the limb at this point for visualization and improved working space. Although further exteriorization of the limb is advantageous at this point, in some cases, disparity in fetal and birth canal sizes precludes this luxury. First author prefers a sharp pocket knife (Figure 4) with a rounded or blunted point, a blade many stockmen use when castrating calves. Scalpel blades are too short, too thin for adequate control and commonly break during the procedure. Moreover, introducing a scalpel into the deeper recesses of birth canal between fetus and vaginal wall has a very high probability of creating maternal damage.

Knife is then positioned proximally over the anterior (cranial) surface of the shoulder joint; a linear incision is made, progressing distally on the limb to the level of the circular cut made at mid metacarpal region (Figure 5). It is imperative that the incision extends through the thickness of skin. Depending on degree of sharpness of the cutting instrument and one’s ability to apply consistent and substantial pressure while making the cut, repeated passes are often required (at least for certain locations) before complete skin thickness is incised. If inadvertent cutting into muscle occurs with this first incision, it presents no additional challenge. Typically, difficulty is encountered in positioning one’s hand within the birth canal to apply sufficient pressure with the cutting edge to incise the skin full thickness. Hence, there is often necessity for swift repeated passes (2 or 3) to completely cut through the skin the entire length of the incision.

Continuing with sharp and digital dissection, skin proximal to the circular cut is reflected circumferentially and proximally to the carpal joint (Figure 6). At this point, a ‘finger hole’ is made by stab incision near each of the two skin corners where the longitudinal and encircling cuts join (Figure 7). Applying mild traction via these holes facilitates separation of the skin during dissection to reflect skin from carpus. Moreover, finger holes allow application of traction as the fetal chisel is inserted under the reflected skin to initiate the undermining process (Figure 8). Finger hole(s) may rip during the dissection process with chisel use. Therefore, subsequent stab incisions may be required when selecting sites for the original locations.

A combination of sharp and blunt dissection is preferable for skinning the carpus. Use of chisel at this point is neither productive nor necessary. Manipulating fingers and thumbs to produce separation of skin is generally sufficient. A sharp knife also can be used as necessary to complete the separation. Remember, the idea is to skin the leg; therefore, avoid cutting through the skin once the initial incisions are made, except when making the stab incisions for finger holds.

Once skin is circumferentially reflected at the level of the forearm, insertion of the chisel facilitates separation of skin from underlying tissues, as the proximal skinning process continues (Figure 9). Ultimately, the chisel advances to ‘unsleeve’ the shoulder with each successive guided thrust of the instrument. The intention is to direct the advance of chisel along the subcutaneous plane of the entire length of leg to effectively skin the leg within the birth canal/uterine body. Careful understanding of the chisel location at all times prevents chisel from inadvertently slipping from beneath the skin along the longitudinal cut. Separation of the skin is better accomplished along this line by digital dissection until enough distance from the margin is gained to safely begin chisel insertion under the skin. In the live cow, freeing skin above the scapulohumeral joint with the chisel may not be possible due to anatomical constraints; therefore, this is better accomplished using blunt digital dissection (Figure 10).

When separation of skin and subcutis is complete, reassess to locate any isolated areas of attachment that may have been missed. Most tightly connected areas can easily be separated with digital exploration and dissection, or the chisel can be reinserted for more difficult attachments. Pectoral muscles will offer greatest impediment to limb removal. These can be separated digitally or with the use of either a Linde’s or Guenther’s embryotomy [sic] knife. Leg removal can be accomplished by applying traction.

Note that forelimb removal can also be accomplished using a traction device, such as a hand-operated winch or fetal extractor, obviating the need for dissection of the pectoral muscles. With successful preparation, the entire leg should slide out of birth canal, leaving skin attached to the torso (Figure 11 a, b). After the limb has been removed, remainder of the fetus is extracted via traction on the remaining limb, fetal head and skin of the amputated limb (Figure 12).

This technique is more difficult to perform with recent intrauterine fetal death, whereas necrosis and early fetal decomposition ease skin separation. This procedure was implemented numerous times during many careers in a multi-doctor mixed animal practice. Although this fetotomy process enabled vaginal removal of decomposing fetal remains countless times, the authors have never experienced chisel penetration through fetal skin, resulting in damaged maternal tissues. If the fetus has been dead for more than 16 - 18 hours, subcutaneous emphysema may be present. In these cases, after the encircling cut is made and a short longitudinal incision is extended proximally from this circumferential incision, removal of the limb can sometimes be accomplished with traction and minimal dissection.

This simple technique provides limb removal including the shoulder thereby creating substantial reduction in size of remaining fetus to allow vaginal delivery and avoiding Caesarian section.

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(Editor's note: Online edition of the manuscript has color photographs)

