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Dr. Pramod Kumar

Assistant Professor, Department of Veterinary Gynecology and Obstetrics, College of Veterinary and Animal Science, RAJUVAS, Bikaner, Rajasthan, India

Dr. Dharmveer Singh

Teaching associate, Livestock Research Station (LRS), Nohar, Hanuman Garh, Rajasthan, India

Dr. Sivendra Kumar Bhalothia

Bhalothia Department of Veterinary Gynecology and Obstetrics, College of Veterinary and Animal Science, RAJUVAS, Bikaner, Rajasthan, India

Dr. Tapendra Kumar

Department of Veterinary Gynecology and Obstetrics, College of Veterinary and Animal Science, RAJUVAS, Bikaner, Rajasthan, India

Dr. KS Nehra

Officer Incharge, Livestock Research Station (LRS), Nohar, HanumanGarh, Rajasthan, India

Dr. Ashok Kumar

Scientist, ICAR-Central Sheep and Wool Research Institute (CSWRI), Arid Region Campus (ARC), Bikaner, Rajasthan, India

Dr. Talluri T Rao

Senior Scientist, National Research Center on Equine (NRCC), Equine Production Center (EPC), ICAR, Bikaner, Rajasthan, India

Corresponding Author:

Dr. Pramod Kumar

Assistant Professor, Department of Veterinary Gynecology and Obstetrics, College of Veterinary and Animal Science, RAJUVAS, Bikaner, Rajasthan, India

Fetotomy: An obstetrical operation to resolve the dystocia in the domestic animals: A review

Pramod Kumar, Dharmveer Singh, Sivendra Kumar Bhalothia, Tapendra Kumar, KS Nehra, Ashok Kumar and Talluri T Rao

Abstract

The principle purpose of obstetrical operations is to deliver a viable fetus as far as possible without injury to the dam. In most cases of dystocia, one or more combinations of the different obstetrical operations are performed. The obstetrical operations have been divided into four major groups viz. mutation, forced extraction, fetotomy and caesarean section. The plan of the choice of the procedures to be used for a safe delivery depends not only on the condition of the case but also on the time since dystocia and assistance available. The present paper detailed about the indications, procedure, merits and demerits of fetotomy in domestic animals.

Keywords: Dystocia, fetotomy, percutaneous fetotomy, subcutaneous fetotomy

Introduction

Fetotomy operations performed on the dead fetus for the purpose of reducing its size by either its division or the removal of certain parts of dead fetus (Kebede *et al.*, 2017) [1]. In most cases these operations are performed within the uterus of the dam in order to remove the fetus per vaginum (Benesch and Wright, 2001) [2]. If the fetus is dead and accessible fetotomy should be the first choice of relieving dystocia when mutation fails to correct it (Bierschwal and deBois, 1972; Harvey and Vailancourt, 1989; Rusch and Berchtold, 1978; Mortimer *et al.*, 1984) [3-6]. A fetotomy can be performed under the following conditions to save the life of the dam:

1. The fetus is lifeless.
2. If the fetus is emphysematous, this decreases the survival rate of the dam after a C-section.
3. The fetus is big to be delivered or the dam's pelvis is narrow (i.e., fetomaternal disproportion/size mismatch). Fetopelvic discrepancy includes
 - (a) Fetal oversize due to prolonged gestation or fetal muscular hypertrophy
 - (b) Narrow pelvic cavity due to pelvic fractures/ exocytoses
 - (c) Emphysematous fetus
 - (d) Fetal monsters like hydrocephalus, schistosoma reflexus (Herr, 1979) [7], perosomus elumbis, fetal anasarca or fetal duplication.
4. The fetus has an abnormality that will not allow it to be delivered (such as schistosomus reflexus, perosomus horridus or perosomus elumbis).
5. Uncorrectable fetal malpresentation
6. The fetus and the dam are in a hip-lock (breech presentation) that cannot be corrected by fetal rotation.

General consideration for fetotomy

1. The general condition of the patient (Temperature, pulse and respiratory rate) must be assessed and appropriate therapy (Fluid therapy and life saving drugs) must be instituted before any handling efforts. The condition should be assessed early to decide on the type and extent of fetotomy.
2. Fetus must to be dead and accessibility of the fetus examines per vaginally.
3. Fetotomy should never be delayed too long. The mare is more sensitive to excessive fetotomy and hence manipulative attempts should first be done.
4. The animal should be restraining preferably in a standing position. If the patient is recumbent it must be restrain in lateral recumbency (Benesch and Wright, 2001) [2].
5. For removal of a limb by subcutaneous fetotomy in a recently died fetus, artificial

emphysema can be induced by subcutaneous injection of air.

6. Manipulations in a dry birth canal predispose it to injuries. Sufficient lubrication of the birth canal should be done if it is not well lubricated than infuse liquid paraffin with hot water or non-irritant sweet oil or obstetric cream or jelly.
7. Good clean and sterile instruments should be used in the fetotomy operation.
8. Epidural anaesthesia is indicated in most of cases but not all cases by injecting 5-10 ml of 2% lignocaine or xylocaine.
9. The cervix is only partially (two or three finger) dilated—introduction of fetotomes are difficult than put the animal for C-section (Thangamani *et al.*, 2018)^[8].
10. To perform Fetotomy veterinarian should also make sure if there is adequate space in the birth canal for introduction and alignment of the fetotome, the patient can be restrained in an area that allows adequate space for operating the wire saw, adequate help is available (Schultz *et al.*, 2008)^[9].

Equipment

Apart from having the technical knowledge and proficiency, a veterinarian must have the correct equipment to optimize the chances for a successful fetotomy (Bierschwal and de Bois, 1972)^[10]. Following equipment's and accessories are listed as below:

1. Thygesons embryotome: this is a double-barrelled instrument with a hand grip and notched oval plate.
2. Fetotomy (palm) knife: this is used to seat the wire for some cuts. It is beneficial for removing bone fragments prior to fetal extraction.
3. Krey hook: expandable, two-armed hook
4. Fetotome saw wire
5. Wire saw handles
6. Wire introducer: this is a curved instrument for passing the wire over or around a fetal part.
7. Fetotomy wire and disinfected wire cutters are required.
8. Lubricants, cotton ropes, obstetrical sleeves or gloves etc.

Procedure of Fetotomy

Subcutaneous fetotomy

Subcutaneous fetotomy is cutting of fetal parts usually the limbs without removal of the skin. It is usually done in emphysematous fetuses, employing different types of knives. Epidural anesthesia using 5-8 mL of 2% xylocaine may be given in some cases (Hall, 1971; Bhokre and Deshpande, 1979)^[11, 12]. Tocolytic drugs are also helpful as they relax the birth canal (De Nooij, 1984; Balla and Tschiru, 1985)^[13, 14] especially in mares. After proper lubrication the knife is introduced in the birth canal and the skin is incised from the scapular point to metacarpal bone in anterior presentation and from hip joint to metatarsal bone in posterior presentation. The skin is detached from the muscles and other attachments by the operator's fingers and/or blunt instruments. The pectoral muscles and the muscles nearby the scapula or hip are broken. Traction is then applied on the limb under the skin using ropes or chains. The limb breaks off from the scapular or hip joint and is taken out. The other limb is removed similarly when required. To avoid injury both to the operator and the birth canal care should be taken. At many locations where the obstetrician has limited access to instruments or technical help and the fetus is emphysematous, subcutaneous

fetotomy can be attempted using small surgical blades or simple knives or even shaving blades. Subcutaneous fetotomy can also be done for removal of one or both limbs in the dairy goat and ewes using a surgical blade and the fingers of the operators (Kumar *et al.*, 2014; Ruhel *et al.*, 2018)^[15, 16].

Percutaneous fetotomy

The animal is restrained either in standing condition in a travis or in a sternal recumbency in sitting position. The hind portion of the animal is washed with soap and water and then with a mild antiseptic. Epidural anaesthesia is administered when required. Percutaneous fetotomy is done using different types of commercially available fetotomes (Dadarwal, 2004)^[17]. Fetotomes are double barrel stainless steel equipment through which a wire saw is passed to make a loop of wire at one end. The other end of wire saw is tied to a wire saw holder. The wire saw is threaded in advance when a fetal limb is to be cut while, the wire is first passed through one barrel of the fetotome and after passing through the fetal part the wire is passed through the other barrel of the fetotome and tied up in the wire saw holder. The birth canal should be well lubricated before inserting the fetotome. The fetotome is inserted in the birth canal. The free end of the wire saw is tied to the wire saw holder and by sawing action the part intended to be removed is cut. This part is taken out and the fetotome is introduced to another part if that also has to be cut or the fetotome is removed and following mutation the fetus is removed by traction. Sufficient care must be exercised to avoid any part of the birth canal to be imposed between the fetus and the wire saw. In lateral deviation of the head, amputation of the limb opposite to the side of flexion or the amputation of the entire head may create sufficient space for correction of fetal maldisposition and/or delivery of the fetus. Uncorrectable carpal flexion or hock flexion posture warrants the amputation of one or both limbs below the knee or hock joint to preserve some traction point. Likewise, in shoulder flexion posture amputation of the head or one or both limbs creates plenty of workable space to correct the maldisposition. In hip flexion posture which is considered to be one of the toughest malpresentation, amputation of one of the hind limbs or pelvic bisection is necessary to create space in the birth canal (Sharma *et al.*, 1992a)^[18].

Using complete percutaneous fetotomy, the fetus can be cut into pieces and delivered. The maximum number of cuts that are suggested are six (Dadarwal, 2004)^[17], however, many times only partial fetotomy would be sufficient to deliver a maldisposed fetus per vaginum. A low incidence of post-operative complications (vulvo vaginal laceration or edema) and a high dam survival are seen in cows and buffaloes with the use of percutaneous fetotomy. In general, it is considered by many clinicians that the dam survival and future fertility of the dam are high when fetotomy is used as a means of fetal delivery in dystocia affected animals (Franz and Kramer, 1970; Mortimer *et al.*, 1984; Purohit and Mehta, 2006; Purohit, 2006)^[19-22]. However, it much depends on the hygienic conditions, time since dystocia onset and the post handling care. The detailed procedures of fetotomy for different fetal maldispositions in the mare have been described (Frazer, 1997; Frazer *et al.*, 1997)^[23, 24].

Merits of fetotomy

1. It reduces the size of the fetus which create more space for manipulation in birth canal.
2. It avoids traumatic surgical procedures and prevents

trauma to the birth canal by use of excessive traction. In subcutaneous fetotomy, skin loop of legs provides more option for traction.

3. Avoids the major abdominal surgery of caesarean section, less assistance required than caesarean section, shorter recovery time/less aftercare and less cost (Newman and Anderson, 2005) [25].
4. It maintains future fertility of the animal when carefully performed (Franz and Kramer, 1970; Purohit and Mehta, 2006) [19, 21].

Demerits of fetotomy

1. It may be dangerous, causing injuries or lacerations to the uterus or birth canal by instruments or sharp edges of bone when performed roughly; and also it may take a long time causing exhausting of both the dam and the operator (Elits, 2007) [26].
2. It prompts the obstetrician to infections of the arm when the fetus is emphysematous.
3. Cervical adhesions are almost inevitable in the mare after prolonged intervention.

Fetotomy in cattle and buffalo

Fetotomy is commonly used to correct dystocia due to fetomaternal disproportionation in cattle and buffalo (Noakes *et al.*, 2009) [27] and must be given first concern if the fetus is dead, especially when it is emphysematous (Wehrend *et al.*, 2002; Noakes *et al.*, 2009; Purohit *et al.*, 2012; Gupta *et al.*, 2017) [28-30]. Fetotomy may be unsafe causing injuries or lacerations to birth canal by instruments or sharp edges of bone. It may take long time, fatiguing both the dam and operator and possibly cause pressure necrosis of the birth canal and if fetus is emphysematous there is a possibility of infection to operator's arm (Roberts, 1986) [31]. After fetotomy following precaution should be kept in mind:

- Make sure you remove every piece of the fetus
- Examine the uterus for any tears, cuts, or the presence of another calf

If the calf does not present any anomaly like schistosomus reflexus or perosomus elumbis to be delivered vaginally, and if the calf is in a caudal presentation and is just too large to be delivered vaginally, a fetotomy should be escaped because after cutting one or both hindmost limbs the thorax will be too large to be delivered and usually the calf cannot be rotated. A C-section would be indicated for these cases (Schultz *et al.*, 2008) [9].

Fetotomy in sheep & goat

Fetal maldisposition is major contributing factor of causing dystocia in sheep and goat (Thomas, 1990; Ismail, 2017) [32, 33]. The most common maldispositions are lateral deviation of head and neck, flexion of carpus and shoulder (Purohit *et al.*, 2012) [29]. The incidence of postural abnormalities has been reported between 65 to 70% in sheep and goat. Deviation of fetal head in sheep and goat may vary in degree. It is most commonly deviated slightly but sometimes it may be deviated laterally to the fetal body (Purohit, 2006, Kumar *et al.*, 2014; Ruhil *et al.*, 2018) [22, 15, 16]. There are a few obstetrical procedures can be done to remove the fetus (Majeed *et al.*, 1995) [34]. These obstetrical procedures includes following processes-

1. Mutation- correction of abnormal presentation, position and posture of fetus by manipulation.
2. Forceful traction- application of outside force used to

assist dam to expel fetus.

3. Fetotomy to reduce the size of dead fetus inside the uterus, the main indication of fetotomy in sheep and goat is postmortal fetal edema and emphysema (Sobiraj, 1994) [35].
4. Caesarean section by delivering fetus through laparohysterotomy preferred in relative fetal oversize or narrow and small pelvis of the dam (Hussain and Zaid, 2010) [36].

Fetotomy in mare

The incidence of dystocia in mare has been much less documented than bovines (Frazer, 2007 and Singh *et al.*, 2019) [37, 38]. Dystocia in mare is perhaps one of the most challenging conditions faced by equine practitioners (Purohit, 2011) [39]. The obvious goal is not only to deliver a live foal whenever possible, but also to preserve life and fertility of mare (Carluccio *et al.*, 2007) [40]. Therefore duration of vaginal intervention should be kept to a minimum even if fetus is dead. Procedure of fetotomy isn't easy as in cow than to longer equine birth passage and therefore the impediment posed by rapidly detaching foetal membranes (Fraser, 1997) [23]. In the mare maldisposed dead fetuses can be safely resolute for vaginal delivery through fetotomy performed by skilled persons; otherwise, it is potentially dangerous (Frazer, 1997; Higgins and Wright, 1999; Frazer, 2001; Al-Dahash *et al.*, 2013 and Singh *et al.*, 2019) [23, 41-43, 38]. One or two well placed fetotomy cuts can radically shorten intervention time and permit the atraumatic delivery of non-viable fetus (Frazer, 1997, Nimmo *et al.*, 2007 and Sutaria *et al.*, 2014) [23, 44, 45].

Fetotomy in camel

The common causes of dystocia in the camelids are the extremely long neck and fetal extremities predispose to flexion (Tibary and Anouassi, 1997) [46]. Fetotomy using ordinary bovine techniques can be used in camel dystocia cases where the fetus is known to be dead and the uterus is readily accessible (Jackson, 1995) [47]. Partial fetotomy of the head or limbs is possible in camels using a Thygesons or other fetotomes used in cattle. Fetotomy reduces the size of fetus and creates space for manipulation and correction of the abnormality. Dead foetuses can deliver by Fetotomies (Kumar *et al.*, 2012; Tejpal *et al.*, 2015; Dudi *et al.*, 2016) [48-50] and forced extraction, but, may sometimes lead to a fatal uterine hemorrhage due to injury to the birth canal and hence cesarean section must be performed (Van Starten, 2000 and Purohit *et al.*, 2000; Purohit *et al.*, 2011, purohit, 2012) [51-54].

Conclusions

1. A dead fetus either oversized/monster or abnormalities in presentation, position, or posture or a combination of these which cannot be corrected by mutation is considering an indication of fetotomy.
2. Results from fetotomy can vary, reliant on a level of expertise offered by the veterinarian and the facilities available.
3. A mutual fault to choose fetotomy only after the birth passage has already been traumatized by unproductive attempts at manual correction.
4. The great veterinarian should be skilled within the former, but have recourse to the latter and will use both techniques at appropriate time.
5. In general fetotomy shouldn't be attempted unless: proper fetotomy instruments and adequate space within the birth

passage for manipulation.

- In field condition if there is lack of instrument than subcutaneous fetotomy is preferred while long unapproachable extremities of fetus indicated percutaneous fetotomy.

Conflict of interest

The authors declared that they have no potential conflict of interest with respect to the authorship and/or publication of this article.

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