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Fetotomy - A Tool to Resolve Dystocia and Salvage Reproductive Future of Dairy Animals

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Abstract

The handling of dystocia in farm animals is usually treated only as a task requiring application of forced traction on fetus. This injudicious handling usually leads to substantial economic loss in terms of decreased productivity, increased morbidity and mortality. However, proper treatment with fetotomy procedures can lessen the losses.

Keywords: Bovine; dystocia; fetotomy; malpresentation; obstetrics

Introduction

Parturitions that are prolonged and require assistance of farmer or a clinician for calf delivery are termed as dystocia and their occurrence in dairy animals is 02-23% (Mee, 2008). The important etiology involves failure of expulsive forces during parturition, birth canal inadequacy, fetal malposition, feto-pelvic disproportion and uterine torsion (Ghuman, 2010). When forced extraction is unsuccessful for fetal delivery, then options are fetotomy or caesarean section (Ghuman and Dhaliwal, 2011). However, these procedures especially caesarean operation is frequently associated with increased risk of maternal and fetal death, as well as drastic impact on milk yield and postpartum reproductive efficiency of surviving animals (Tenhagen *et al.,* 2007).

Fetotomy or embryotomy simply means cutting up of dead fetus, whether fetus is lying wholly or partially in uterus, into parts to reduce its size and hence facilitate per-vaginal delivery in considerably lesser intervention time (Ghuman, 2012). In addition, if delivery of a live calf is not possible, then partial fetotomy can dramatically reduce dystocia handling time. The aim of fetotomy is to minimize trauma or damage to dam.

Factors favouring Fetotomy

The strategy for resolving an obstetrical problem through fetotomy or cesarean section is usually influenced by factors namely economic value of animal expertise, equipment, facilities available and preference of owner (Momont, 2005). Although some dystocias are better resolved by cesarean section, the expenses incurred during caesarean and post-operative care usually exceed fetotomy (Bierschwal and de Bois, 1972). In a study, out of the cases not resolved by mutation alone, 66% were corrected by fetotomy and 34% by cesarean section (Frazer *et al*., 1997).

The vaginal examination is done to assess cervical dilation, fetal viability and fetal presentation, position and posture. Before starting fetotomy, the absence of fetal reflexes (limb withdrawal, ocular reflex, swallowing reflex and anal reflex) shall be observed (Frazer *et al.,* 1997). Usually clinician has to carry out fetotomy when the birth passage is already damaged by unsuccessful attempts aimed at delivery of fetus. However, fetotomy shall be avoided in cases of tear in birth passage, inadequate space in birth canal, faulty instruments, lack of lubricant, lack of obstetrician's experience especially strength, stamina, skill and patience (Ghuman, 2012). Therefore, if obstetrician is not familiar with correct fetotomy procedure the best option is caesarean (Frazer *et al*., 1997).

Fetotomy in delayed cases of dystocia especially emphysemated fetus will help to avoid risk of peritonitis following caesarean operation. Moreover, fetotomy shall be first choice in hip lock and breech presentation as these are not possible to be corrected by mutations (Ghuman, 2012). Also, cases of fetal-maternal disproportion

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(narrow pelvis, oversized fetus), pelvic abnormalities and fetal anomalies can be relieved only by fetotomy. The incidence of narrow pelvis is around 8-9% in bovines (Phogat *et al*., 1992).

Fetotomy Necessities

Intrauterine lubricant: Constant lubrication is essential for achieving success during fetotomy (Frazer *et al*., 1997). In cases of contracted uterus, infusion of lubricant can induce uterine relaxation and creates adequate working space between uterus and fetus, protects arms of clinician and prevents chances of tear in lubricated birth passage compared to dry passage.

Many lubricants like liquid paraffin and linseed oil have been used in past. To our experience, copious quantties of percent gel solution of Sodium Carboxy Methyl Cellulose (SCMC) in hot water produces lubrication that works like a miracle (Fig. 1). Moreover, SCMC is a readily available product from chemical houses.

Equipment: Besides technical knowledge and expertise, the obstetrician must have correct equipment (Fig. 1 and 2) to optimize chances for successful fetotomy. A good quality Thygesen's fetotome loaded with a strong and flexible fetotomy saw wire (27 interwoven steel wires in a group of 3x3x3 wires) to cut through soft and bony tissues of fetus. Various other important instruments required for fetotomy are wire saw handles, calving rope carrier (to pass wire saw over fetal parts otherwise inaccessible for slipping of wire saw loop, *e.g.* abdomen of fetus lying in transverse presentation, extreme deviation of fetal head, complete retention of fetal limbs), Moore' chain (to apply traction on amputated fetal parts), Krey Schottler hook (to apply traction after fixing on vertebral column when no other fetal extremity is available), eye hook, anal hook (can be used as eye hook) and a sterile stomach pump and stomach tube (to infuse the lubricant into the uterine lumen; Fig. 1-2).

Manpower: Adequate help in terms of at least two obstetricians and three-four assistants for applying traction should be available in case a complete fetotomy is to be carried out (Mee, 2008). It shall be kept in mind that carrying out complete fetotomy procedure is time-consuming and exhaustive for obstetrician.

Fig. 1: Fetotomy instruments (A-C). Uterine pump for intrauterine lubrication with 2% Sodium Carboxy Methyl Cellulose (SCMC) solution (D-F) Specially designed fetotomy wire with 3x3x3 intertwined wires (G) Thygeson's fetotome loaded with fetotomy wire.

Fig. 2: Fetotomy instruments (A) Anal hook (B) Calving rope carrier (C-G) Eye hooks (H) Obstetrical chain (I) Krey Schottler hook (J) Fetotomy wire handle.

Impact of Fetotomy

To shorten the intervention time and permit a less traumatic delivery of dead fetus, extreme care should be taken to complete fetotomy in minimum number of cuts. To perform complete fetotomy of fetus in anterior or posterior longitudinal presentation, generally cuts are given in a manner as described (Ghuman, 2012; Fig. 5-7).

A partial fetotomy (one, two, or exceptionally three cuts) allows repositioning of fetus for possible

Fig. 3: Position of fetotome head during commonly used fetotomy cuts. (A) Amputation of fetal head with position of fetotome head near posterior border of mandible with cut aimed at occipital joint, (B) Amputation of fore limb with position of fetotome head dorso-caudal to cartilaginous part of scapula with cut aimed at scapular joint, (C) Transverse division of fetal trunk at anterior portion of chest with position of fetotome head at point of scapular attachment, (D) Amputation of hind limb with position of fetotome head near trochanter major and on side of base of tail opposite to limb to be removed with cut aimed above pelvic joint.

Fig. 4: Crossing of fetotomy wire leads to breakage of wire.

(54.5% of total cases), hydrocephalus-dicephalicus (4.5%), breech presentation with deformity or ankylosis of hindlimbs (12.9%), partial transverse presentation (18.9%) and deformity, ankylosis, or reflection of forelimbs (9%; Vandeplassche, 1980). In another dystocia study, almost half of cases were resolved by fetotomy (Frazer *et al*., 1997). One or two fetotomy cuts

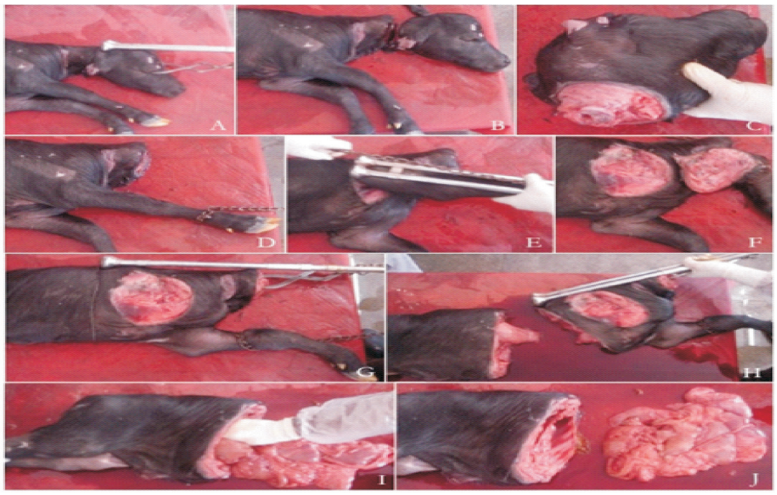

Fig. 5: Fetotomy cuts in normal anterior presentation of fetus. (A-C) Amputation of head (D-F) Amputation of a fore limb (G-H) Transverse division of fetal trunk at anterior portion of chest (I-J) Evisceration

vaginal delivery. In a report, partial fetotomy was the method of choice to rapidly and safely resolve over 80% of cases that were not possible by mutation (Vandeplassche, 1980). These cases included dystocias due to deviation of head were sufficient to correct 57% cases in which head and neck, or limbs were abnormally placed and remaining cases required three (21%) or four (22%) cuts (Frazer *et al*., 1997). In cases of gross fetal oversize or narrow pelvis, numbers of cuts

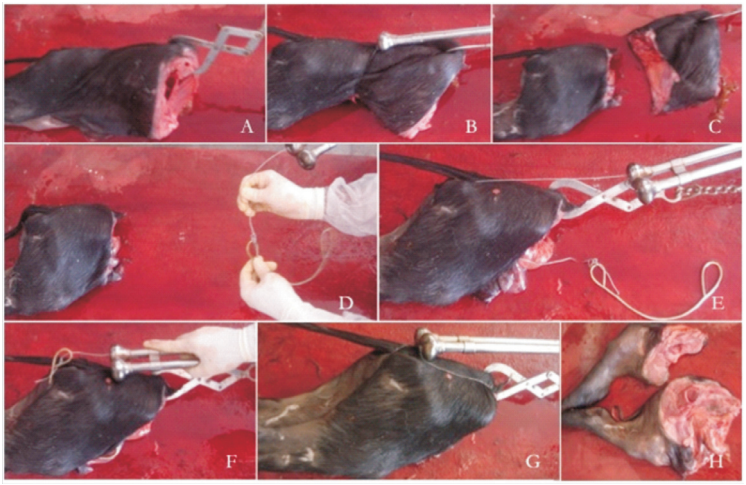

Fig. 6: Fetotomy cuts in normal anterior presentation of fetus (A-C) Transverse division of fetal trunk at posterior portion of chest (at lumbar region) (D-H) Longitudinal division of hind quarters (Pelvis bisection) using calving rope carrier.

Fig. 7: Fetotomy cuts in normal posterior presentation of fetus. (A-B) Amputation of a hind limb (C-D) Transverse division of fetal trunk (scapular region).

required were 3.33±0.71 and 3.22±0.55, respectively. The higher numbers of cuts were associated with a decrease in dam survival rate (Ghuman and Dhaliwal, 2011).

A partial fetotomy is beneficial for vaginal delivery of fetal monsters like muscular hypertrophy of neck, arthrogryposis-scoliosis buffalo fetus, conjoined discordant twins, steatosis, syncephalo-thoracopagus quadribrachius quadripus and hydrocephalic fetus (Ghuman *et al*., 2009, 2012; Singh *et al*., 2013b). However, on which part of monster fetotomy cut is to be given depends upon experience of obstetrician.

Care for Best Outcome of Fetotomy

During calving process in dairy animals, the time to give obstetric assistance should be around two hours after appearance of fetal hooves at vulva, also known as 'two feet-two hours' rule-of-thumb (Mee, 2008).

The time spent manipulating on fetotomy operation is critical (Frazer *et al*., 1997). Mostly, the unsatisfactory outcome following fetotomy is attributed to lack of experience and poor technique (Bierschwal and de Bois, 1972). An extensive experience facilitates acquisition of technical expertise necessary to manipulate fetotomy equipments and to perform fetotomy without traumatizing birth passage (Ghuman, 2012).

Once fetotomy wire is threaded around fetal part to be amputated, sufficient tension is applied to wire to check that wire is not crossed or kinked (Fig. 4). The obstetrician must ensure that head of fetotome is in correct position, and coverd with hand (Fig. 3). An assistant should start the cut by slow, short to-and-fro arm movements. Therafter, the length of arm movements (long stroke) and pressure applied can be increased to spread wear on wire and prevent it from overheating, hence reducing chances of wire break.

During the procedure, part of fetus to be amputated

should be removed as a whole. In case of amputation of fore limb, a correctly placed cut will remove entire forelimb by dissecting through muscular attachments between scapula and chest wall. If scapula is not cut in its entirety, then stump of remaining scapula should be covered with hand during fetal extraction. The failure to do so will result in lacerations of uterus, cervix, and vagina (Ghuman, 2012).

Avoid manipulating dry birth canal as this may lead to uterine rupture and ultimately unsuccessful fetotomy. If there is severe straining then use of epidural anesthesia is advised (Momont, 2005).

During fetotomy, a limited manipulation of birth passage and good cleanliness will reduce chance of subsequent endometritis (Mee, 2008). Nevertheless, a complete fetotomy is generally expected to result in severe trauma to genital tract, even if performed by a skillful and experienced obstetrician (Vandeplassche, 1992; Frazer, 1997). A poor prognosis can be expected if surgery is attempted after animal has been subjected to prolonged vaginal manipulations or attempts at fetotomy.

Stress Due to Fetotomy

The cases of dystocia requiring caesarean section following unsuccessful extraction or total fetotomy lead to enhanced postpartum adrenocortical function (Nakao and Grunert, 1990). Others also suggested that release of plasma cortisol in buffaloes subjected to caesarean was more and for longer duration than their counterparts subjected to fetotomy. Therefore, stress response was more and for longer duration following caesarean than fetotomy. This explains poor survival rate in buffaloes following delivery of calf through vagina or caesarean section which is 88-100% and 25-95%, respectively (Prabhakar *et al.,* 1995, 2002). The cattle subjected to caesarean operation with uterine torsion were associated with hepatic dysfunction. On the other hand, fetotomy has no effect on hepatic function **(**Hussein and Abd Ellah, 2008).

Attempts were made to tranquilize buffaloes before start of fetotomy operation and hence reduce degree of stress. However, relieving a dystocia in buffaloes through fetotomy, with or without Chlorpromazine tranquilization, lead to non-significant increase in cortisol till end of fetotomy followed by significant decline by end of next day (Prabhakar *et al.,* 1999). This suggested no added advantage of chlorpromazine tranquilization before start of fetotomy procedures, although, buffaloes suffering from dystocia appeared calm and tranquilized clinically (Prabhakar *et al.,* 1999). An increase in plasma cortisol during fetotomy followed by decline during post-fetotomy period suggests impact of fetotomy procedure on plasma cortisol (Nakao and Grunert, 1990). Moreover, a high survival rate following fetotomy as compared to following caesarean section (80 *versus* 25%) was observed irrespective of tranquilization with chlorpromazine (Prabhakar *et al.,* 1999). Decreased oxygen utilization following fetotomy and caesarean was evident which improved in fetotomy group on subsequent days. However, caesarean group showed tissue hypoxaemia continuously till third post-operative day (Prabhakar *et al*., 2000).

Considering that elevation in plasma cortisol was indicative of stress, it could be concluded that occurrence of dystocia and its removal through obstetrical maneuvers was highly stressful experience for cattle and buffaloes. An early expulsion of fetus may lead to early relief from stress and prolonged elevation in plasma cortisol was indicative of fatal prognosis. Various therapies aimed at alleviation of stress of dystocia and obstetrical maneuvering can be useful for increasing survival rate of dystocia-affected bovines (Ghuman and Dhaliwal, 2011).

Future fertility following Fetotomy

The whole aim of relieving a dystocia is avoiding stress on dam as well as calf (Tsousis *et al*., 2011). The dairy animals undergoing cesarean section usually have higher mortality rate, longer interval from first service to conception than those with mutation. In a study, the survival rate of dams following caesarean section and mutation with/without partial fetotomy was 34.9% and 80%, respectively. The animals subjected to caesarean had 45.1% lower survival rate as compared to those with/without partial fetotomy. Furthermore, conception rate in dams that had caesarean deliveries and mutations with/without partial fetotomy was 36 and 23%, respectively (Frazer *et al.,* 1997; Singh *et al*., 2013a).

A major advantage of cesarean is a definitive end point, however fetaotomy outcome varies tremendously due to level of expertise offered by obstetrician and facilities available (Vandeplassche, 1988; Momont, 2005). A common fault is to choose fetotomy when the birth canal is already traumatized by unproductive attempts at mutation (Bierschwal and de Bois, 1972).

In comparison to caesarean operation, fetotomy should be preferred due to higher dam survival rate, lesser post-operative complications and better future fertility.

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