International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2023; 8(2): 73-75

www.veterinarypaper.com
Received: 01-12-2022
Accepted: 12-01-2023

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Different surgical approaches for caesarean section in Bovines: A review

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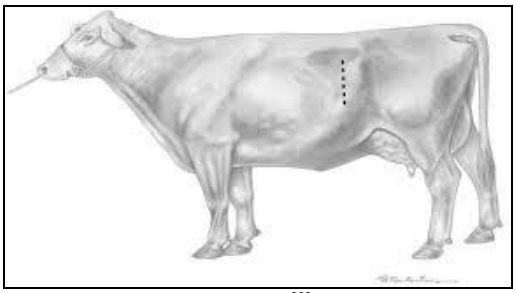
DOI: https://doi.org/10.22271/veterinary.2023.v8.i2b.492

Abstract
In large animal practice, animals presented with dystocia, torsion, prolonged pregnancies who are unable to deliver fetus normally requires surgical approach. Many veterinary practitioners use a common approach they have practiced and are familiar with and also depending upon the condition of animal whether animal is recumbent or in standing position. This article shows various possible approaches for caesarean section along with merits and demerits of each.

Keywords: Caesarean section, dystocia, surgical approaches

Introduction
Caesarean sections are now regarded as routine obstetrical technique because it is one of the commonest surgical operation which is performed by veterinarians in large and small animal practice. As compared to fetotomy it has higher maternal and fetal survivability (Vermont, 2008) [9]. The indication for performing caesarean procedure include maternal and fetal causes, in which the maternal causes are like incomplete cervical dilatations or cervix fails to dilate, immature or young animal, pelvic deformity, unrelieved uterine torsion, prolonged dystocia, hydramnios and hydroallantois, exhausted and recumbent cows, debilitating disease. The fetal causes include normal fetal conditions such feto-pelvic disproportionation, malpositions. Pathological fetal conditions include foetal anasarca, fetal monster, hydrocephalus, fetal emphysema, mummified fetus, and prolonged gestation (Campbell and Fubini, 1990) [2].
There are various approaches for caesarean section in cattle and selection of a particular approach depends upon the condition of animal-whether standing or recumbant, availability of restraining facility in case procedure performed on standing animal, familiarization of veterinarian with the particular approach, availability of assistants. Selection of approach also varies from region to region, in India the caesarean section on cow is usually done by restraining animal on right lateral recumbancy, detail of which will be discussed further in the article.

Approaches for caesarean section
1. Standing left paralumbar fossa approach
This approach is similar to what used for rumenotomy, and most practitioners are very familiar with this approach. A vertical midline incision is given on paralumbar fossa, starting5 to 10 cm ventral to transverse lumbar process and extending upto 30-40 cm (Noakes *et al.*, 2019) [5]. In this approach evisceration of the small intestine is prevented by rumen, but occasionally ruminal prolapse can occur if straining is higher during surgery (Newman and Anderson, 2005) [4]. However, large fetus may make it difficult to lift and practically impossible for some surgeons and also full rumen makes exteriorization of uterus difficult, in case of dead fetus and infected uterus abdominal contamination from uterine contents is nearly unavoidable. As the procedure is done in standing position, animal should be able to stand throughout the entire procedure (Roberts, 2004) [7].



Source: (Schultz *et al.*, 2008) [8]

Fig 1: Standing left paralumbar fossa approach.

2. Standing right paralumbar fossa approach

This approach is very similar to left paralumbar fossa approach, the incision is given on right paralumbar fossa extending from 5 to 10 cm ventral to transverse process of lumbar vertebrae. This approach is also used in surgical affections of intestines, abomasopexy, omentopexy, exploratory laparotomy. The striking difference between the left and right paralumbar approachs is the difficulty in keeping intestines in the peritoneal cavity with the right paralumbar approach (Newman and Anderson, 2005) [4]. Right paralumbar fossa approach is also indicated in case of severely distended rumen and large fetus in right uterine horn. While approaching uterus from right side, the incision to the other abdominal organs such as intestines, should be avoided (Vermont, 2008) [9]. However, right paralumbar approach is uncommon and is not routinely used for caesarean section in cow by practitioners in India.

3. Standing left lateral oblique approach

This is an alternative to left paralumbar fossa approach in which the incision is oblique at about 45 degrees angle to the vertical incision starting from about 10 cm cranial and 10 cm ventral to cranial aspect of tuber coxae and incision extended cranioventrally to end about 3 cm caudal to last rib (Vermont, 2008) [9]. The apex of uterine horn is comparatively more easily accessible than vertical flank incision and facilitate manipulation and exteriorization of uterus more easily. As the left oblique incision is longer as compared to vertical flank incision, it may be of value to remove large fetus (Ajeel *et al.*, 2019) [1]. For surgeons with either smaller stature or less physical strength, this approach is advantageous for them (Schultz, 2008) [8]. Another advantage is that the internal abdominal oblique and the transverse abdominis musles can be split in same direction of the muscle fibres making it easy to access genital tract and also suture comparatively easy (Cox, 1987) [3]. Howeverthe incision should not be extended farcaudodorsally near tuber coxae to avoid incision to circumflex iliac artery (Noakes *et al.*, 2019) [5].

Fig 2: Standing left lateral oblique approach. (Courtesy of Dr. Matt Miesner, The Ohio State University, Columbus, OH.)

4. Recumbant ventral midline approach

In ventral midline the cow is positioned in dorsal recumbancy at a 45-degree angle towards surgeon, with both front and hind legs tied and incision is given at 5 to 7 cm caudal to umbilicus over linea alba and can be extended as caudal as per requirement (Schultz *et al.*, 2008) [8]. This approach is not-commonly used in the field, as animal is restrained on dorsal recumbency, the respiratory function of is compromised and there is requirement of general anaesthesia or heavy sedation. However, it gives excellent access to the uterus (Vermont, 2008) [9]. This approach should not be used in older cows with large udder which prohibits the extension of incision caudally and in dairy cows due to increased ventral vasculature (Newman and Anderson, 2005) [4]. The difficulty arises in closure of abdominal wall due to increase in tension on site of incision, and reliability is of particular concern and can cause dehiscence and can result into hernia or evisceration due to opening of suture line (Noakes *et al.*, 2019) [5].

5. Recumbant ventral paramedian approach

This approach is very much similar to the ventral midline approach, also shares advantages and limitations as of ventral midline (Campbell and Fubini, 1990) [2]. Theincision is made 5 cm lateral and parallel to the linea alba and medial to the milk vein. The closure of abdominal wall in paramedian approach is more secure than that of ventral midline approach. As ventral midline, the paramedian method also offers good access to uterus, but there are also disadvantages such as requirement of heavy sedation, manpower to keep cow in dorsal recumbancy, risk of herniation and evisceration in poor abdominal wall closure. There are high chances of wound infection due to its location on ventral abdomen (Schultz *et al.*, 2008) [8].

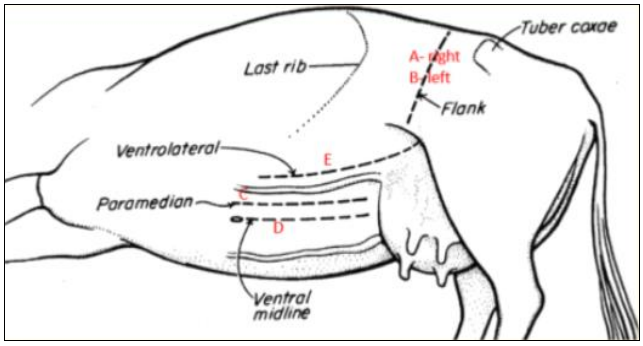


Fig 3: Diagrammatic representation of different approaches.

6. Recumbant ventrolateral oblique approach/ Paramammary approach

In India, this is most routinely used approach for caesarean sections in cow and buffalo. In this approach the cow is restrained in right lateral recumbancy with hind limbs extended caudally for best exposure of incision site (Schultz *et al.*, 2008) [8]. This approach is considered to be a better operative site by few surgeons because of lesser post-operative complications and has less chances of contamination of the operative site (Purohit *et al.*, 2011) [6]. An oblique incision is made starting from fold of stifle, dorsal to the attachment of udder, and is continued cranio-ventrally parallel and ventral to border of last rib (Fig.3). This site allows easy exteriorization of uterus, and is very suitable for removal of large emphysematous fetus (Roberts, 2004) [7]. This approach offers useful application in older cows and dairy cows as incision can be extended caudally, and proves advantageous over ventral midline and paramedian

approaches, however while extending incision cranially, precaution should be taken to prevent incision of milk vein (Noakes *et al.*, 2019) [5].

Conclusion

There are various approaches for caesarean section in cow with each approach having its advantages and disadvantages. Fornow the best suitable and most used approach by practitioners in India is Recumbant Ventrolateral obliques approach, but the choice of a particular approach depends on various factors as discussed in the article.

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