C-SECTION, WHAT'S NEW?

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Introduction

Cesarean section is without a doubt, the most gratifying surgery a large animal veterinarian has to do. Extracting a 50 to 70 kg living animal from a conscious standing cow is a great accomplishment. In fact, the c-section is now a routine procedure in countries where large calves has to be delivered. In Belgium, the mastering of the surgical technique and the positive outcome has led the owner to forget the easiness of calving as an important genetic trait and put more emphasis on larger calves. The Belgian Blue, had been created with important zootechnical consequences. The owners have now great expectations from the veterinarians performing a c-section. No calves, no money. In dairy cattle, the expectations are quite different where the cow is often more important than the calf. The situation gets more complicated with high genetic value embryos.

Indications

The most common reason for c-section is certainly maternal/foetal disproportion. In Belgium, genetic selection of double-muscled calves increase the number of c-section performed by veterinarians. Michaux reported a study on 10696 Belgian Blue heifers which 72% of them had their calves delivered by c-section. A survey of general practitioners in UK showed that oversize foetus (39%) or undersize dam (26%) were the principle indications for c-section. In Ireland the same category of survey were conducted on 381 practitioners where 17% of the deliveries were performed by c-section. Foetal oversize was the most frequent indication for the operation (76%) followed by maternal undersize (22%). Even if c-section is performed extensively in Belgium does it still worth it? According to one study, the price of a c-section represents 10% of the cost of the calf. Also, there is a decrease mortality rate if c-section was performed (2.9%) compare to calves delivered naturally with the assistance of 4 persons (14.6%) or 2 persons (5.3%). Cesarean section becoming the standard procedure to deliver calves in certain breeds, welfare issues has to be taken into consideration.

There are numerous other reasons for performing c-section which were described exhaustively in the literature: uterine torsion, incomplete dilation of the cervix, vaginal or vulvar atresia, foetus abnormalities, uterine rupture, hydrops, foetal maceration or mummification. Recent advance in nuclear transfer or cloning brought promising avenue by enabling the multiplication of elite livestock and engineering of transgenic animals for various agricultural and biomedical purposes. The value of those animals are considerable demanding special attention at birth. Although value of the animal should be considered in your decision when you deliver clone calves or IVF, physiologic factors are certainly very important too. Birth weight of calves produces by cloning is 20% larger than calves produced by ET and AI. An important proportion of those calves are suffering of poor adjustment to their new world. Different diseases or conditions have been reported: immature lungs, pulmonary hypertension, compromise immunity, congenital abnormalities and finally death. Cesarean section provide rapid and planned intervention to the calf improving its chance of survival.
Surgical approach

Surgical approaches have been evolving over the years. The different surgical techniques have been described in the literature. Even if most of cows will end up with a left flank incision, in certain occasion choice of the approach should be made based on specific criteria.

**Foetus**
A living or dead foetus should influences the choice of the surgical approach. If the foetus is dead, exteriorization of the uterus is very important to avoid spilling of contaminated fluid in the abdomen and further infection and complication with a possible fatal outcome. A more ventral approach makes exteriorization easier. Bacteria are already present in the uterine fluids and the count is increasing if the foetal membrane are broken. In human, the same bacteria were found in the amniotic fluid and an aspiration from surgical wound infection after c-section. Foetotomy should be the method of choice if the calf is dead, the cow standing and if the cervix is open.

**Dam**
Certain cows will be unable to stand at the time of the cesarean because of a non responsive milk fever, a toxemias, a fracture etc. Therefore, the surgery has to be performed on the recumbent animal. If the animal is in poor systemic condition, dorsal recumbency should be avoided. The ventral midline or paramedian approach is difficult and risky if performed on a dairy cow with well developed mammary veins. A paramamary incision, between the milk vein and the fold of the flank should be favored. Transabdominal palpation of the fetus will help the surgeon to decide if the incision should be made on the left or right side. The behavior of the animal is taken into consideration especially if the surgical facilities are inadequate. It is quite difficult to perform a c-section on a moving target tight to a post in the field. In this situation, dorsal recumbency is certainly the approach of choice. If the animal has to be sold, a ventral incision is more cosmetic.

Whichever approach is used by the surgeon, exteriorization of the uterus should always be attempted but in certain situation this is impossible. Belgian blue cows have more than one c-section in their life time therefore adhesions prevent exteriorization of the uterus. Large calves are quite difficult to manipulate. In one study, 73 % of the practitioners were incising the uterus in the abdomen. If the calf is alive and obstetrical manipulation before the cesarean were short duration, there should be no consequences. Recently, it was proven that polyethylene polymer based obstetrical lubricant (J-Lube) was toxic in horses and cows if in contact with the peritoneal cavity. It was shown that 1 liter of the commercial concentration of this lubricant intraperitonally was deadly to cattle. Carboxymethylcelulose based lubricant should be used while performing obstetrical manipulation, especially if c-section might be an option.

If the uterus has to be incised in the abdomen, a scissor or a letter opener is used. Umbilical cord should not be cut with a sharp object. Stretching of the cord should be favored to stimulate contraction of the artery and avoid excessive loss of blood. In general, after a c-section, the umbilical cord ends up getting to short.

Parish described a variation of the left flank approach. The incision begins 10 cm cranial and 10 cm ventral to the tuber coxae and directed cranioventrally toward the ribs. This approach gives a better exteriorization of the uterine horn without the trouble of having a cow on lateral recumbency.

**Suturing the uterus**
Use of different suture techniques and materials has been incriminated in adhesions and subsequent infertility problems in cattle. Adhesions are found along the line of the incision. Mijten
investigated the differences between 2 techniques of sutures (Lembert and Utrecht), 2 suture materials (catgut and Vicryl®) and 5 surgeons (2 were doing the Utrecht and 3 the Lembert). 152 cows underwent a standing C-section. Five weeks later the same investigator palpated rectally the uterus for adhesions. Fertility was not investigated in this study. Sixty-two percent of the cows had adhesion after the surgery. No differences were seen between the suture materials groups as well as the suture patterns groups. A significant difference was seen between the 2 surgeons performing the Utrecht suture. One of the surgeons had 80% adhesions frequency compared to 50%.15

The Vicryl® or Dexon ® have a predictable absorption rate and decrease tensile strength. There is less inflammation response and a better knot security compared to gut. Its main disadvantage is the dragging effect through the tissues which may have tremendous consequences in an oedematous uterus after extracting a death calf or a uterine torsion. Catgut is no longer available in some countries because of the BSE.

Whichever suture or pattern is used some principals have to be respected to prevent adhesions:

- Follow good principle of surgery: homeostasis, minimal trauma and asepsis
- The suture should never go through the mucosa
- The knots should be hidden as well as the suture material
- We recommend to perform 2 layers of suture
- Catgut USP 2 or 3 or a braided absorbable USP 1 or 2 are used
- Lembert, Cushing or Utrecht should be used on the uterine wall
- Remove any blood clots on the uterine incision with a continuous flow of saline without swapping the incision with gauze.

Intraperitoneal sodium carboxymethylcellulose (SCMC) at a concentration of 1% has been reported to be effective in ewes and different species to prevent abdominal adhesions.16,17 The SCMC acts as a mechanical barrier between viscus, preventing adhesions. Large volume should be used to be effective. No studies have been performed in cattle therefore the volume used is empirical from 500 ml to 4 liters. SCMC should not be used if there is already a peritonitis.

Complications

In countries where cesarean section is an elective procedure, the complications are less frequent because the decision process is quicker and obstetrical manipulations are minimal. In the rest of the world, most veterinarians will first try manual extraction. After minutes or hours of obstetrical manipulations, a c-section will be performed. The animal is weak debilitated and frequent manipulation and passage through the vagina increase the chance of puerperal infection.1 Mijten showed that complications are more frequent in dairy cows than in double-muscled cows.2 Of the 412 cows included in this study, 70% recovered uneventfully. Dairy cows delivering a dairy calf, fully recovered in 58% of the time compared to 78% for double muscled cows. Twenty-one % of the animals had a wound infection. The dairy cows were more affected than beef cows. In a report from UK, 89,5% of the dam survived and only 4,5% died as a direct consequence of dystocia.6 According to one study, peritonitis is the commonest cause of mortality associated with caesarean sections followed by shock, metritis, concurrent diseases, and haemorrhage.7 A retrospective study from a teaching hospital established the risk of dying for the cows after a cesarean to be 24%. The calf status influenced this risk. Depending if the cow had an emphysematous, dead, or live calf; it was 63%, 21%, and 14%, respectively.18 Seven out of 10 veterinary legal procedure in France are related to an obstetrical procedure. Of the 400 records studied between 1992 and 1996, the results of autopsy
following a prosecution are: 40% were from a defect of the uterine suture, 20% from haemorrhage and 10% from peritonitis. According to this study, the surgeon is required to achieve a perfect uterine suture therefore there is an obligation of result. Otherwise he has to prove that something was wrong with the uterus. Based on those findings, by law in France, 2 layers of suture must be done to close a uterine incision.

References