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## Dystocia in the Bitch

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Some of the more challenging but also most rewarding cases in the busy general practice are the bitches presenting with suspected, or confirmed dystocia, or where the owners ask for an elective Cesarean section. Often both the welfare of the mother and the chances for survival of the pups are dependent on the accurate assessments and informed decisions made by the veterinarians and the staff at the clinic. To diagnose dystocia, a thorough appreciation of the various stages of the normal parturition – eutocia - in the bitch is vital.

### Physiologic Changes During Pregnancy Start

Metabolic demands are increased during pregnancy. Blood volume increases by 40%, primarily composed of plasma, resulting in a hemodilution and a hematocrit of around 30% at term. This is thought to facilitate placental perfusion. Cardiac output is increased owing to enhanced heart rate and stroke volume. Oxygen consumption during pregnancy increases by 20%, while the functional residual capacity of the lungs is decreased owing to anterior displacement of the diaphragm by the enlarged uterus. Pregnant animals also may have delayed gastric emptying owing to decreased gastric motility and displacement of the stomach.

### Gestation Length

Gestation length in the bitch averages 63 days, but can vary from 56 to 72 days if calculated from the first mating.<sup>1</sup> This large variation is mainly owing to the long and variable period of behavioral estrus of the bitch. Gestation length is highly predictable when calculated either from the pre-ovulatory surge of luteinizing hormone (LH), when it is  $65 \geq 1$  days; from the day of ovulation, when it is  $63 \geq 1$  days [2]; or from the time of fertilization of the oocytes, when it is  $60 \geq 1$  days [1,3].

The ability to determine gestational age and to predict the day of parturition in the bitch is of considerable clinical importance especially in case of suspected prolonged gestation, as well as in a bitch that is scheduled for elective Caesarean section. Some of the methods discussed here are applicable only in the bitch that has been examined in advance in anticipation of dystocia, whereas others are useful also in acute cases of dystocia.

### B-mode Ultrasonography

B-mode ultrasound can be used throughout pregnancy to assess the diameter of pregnancy structures and to estimate fetal size [4-6]. Inner chorionic cavity diameter on days 18 to 37 from ovulation and fetal head diameter on day 38 to parturition show the best correlation to gestational age and to predicting parturition day. Other fetal structures used to time pregnancies are fetal limb buds, first detectable at days 33 to 35; eyes, kidney, and liver at days 39 to 47; and intestines at days 57 to 63.

### Radiography

Using radiography, the fetal skeleton is visible rarely before day 42; the skull on days 45 to 49; pelvic bones on days 53 to 57; and teeth on days 58 to 63.

### Serum Progesterone

Serum progesterone concentration can be a useful predictor of the day of parturition. It is becoming increasingly more common that breeders determine the optimal day of mating of the bitch by checking the serum progesterone during proestrus and estrus. Progesterone rises sharply from near basal levels to  $>4.5$  nmol/l ( $>1.5$  ng/ml) at the time of the LH peak, and parturition can be expected to occur  $65 \geq 1$  days later. The accuracy of prediction of parturition day within a  $\geq 1$ ,

≥ 2, and ≥ 3 day interval using pre-breeding serum progesterone concentrations was 67%, 90%, and 100% [7], and was not seen to be influenced by either body weight or litter size. The serum progesterone level is also useful in predicting the parturition day in the bitch at term, as it decreases sharply from 12 to 15 nmol/l (4-5 ng/ml) to below 6 nmol/l (2 ng/ml) starting 24 hours before the onset of whelping.

### **Other Clinical Signs**

**Relaxation of the pelvic and abdominal musculature** is a consistent but subtle indicator of impending parturition. It is, therefore, usually best observed by the owner of the bitch.

**The drop in rectal temperature** in most bitches is a good predictor of the day of parturition. During the final week of pregnancy the rectal temperature of the bitch fluctuates, as a consequence of the fluctuations in the (thermoregulatory) progesterone level, but it then drops sharply 8 to 24 hours before parturition, which is 10 to 14 hours after the concentration of progesterone in peripheral plasma has declined to less than 6 nmol/l (2 ng/ml). To properly assess the prepartum drop in body temperature, however, measurements should be made every 1 to 2 hours as long as the temperature decreases, but can be done less frequently when the temperature is seen to increase again. The degree of the drop in rectal temperature varies between 1°C (33.8°F) and 3.5°C (38.3°F), probably as an effect of surface area/body volume ratio. Thus, in short-haired miniature breed bitches it can fall to 35°C (95°F), in medium-sized bitches to around 36°C (96.8°F), whereas it seldom falls below 37°C (98.6°F) in bitches of the giant breeds or bitches with a thick hair coat. In bitches with uterine inertia, a distinct drop in body temperature may not be seen to occur.

**Behavioral changes** may be manifested. Several days before parturition the bitch may become restless, seek seclusion, or be excessively attentive, and may refuse food. She may exhibit nesting behavior 12 to 24 hours before parturition concomitant with increasing frequency and force of uterine contractions. Shivering is a response to the drop in body temperature.

In primiparous bitches, lactation may be established less than 24 hours before parturition, whereas, after several pregnancies, colostrum can be detected as early as 1 week pre-partum.

### **Normal Parturition**

Stress produced by the reduction of the nutritional supply by the placenta to the fetus stimulates the fetal hypothalamic-pituitary-adrenal axis, resulting in release of adrenocorticosteroid hormone, and is thought to be the trigger for parturition. An increase in fetal and maternal cortisol is believed to stimulate the release of prostaglandin F<sub>2a</sub>, which is luteolytic, from the fetoplacental tissue, resulting in a decline in plasma progesterone concentration. Withdrawal of the progesterone blockade of pregnancy is a prerequisite for the normal course of canine parturition; bitches given long-acting progesterone during pregnancy fail to deliver [2]. Concurrent with the gradual decrease in plasma progesterone concentration during the last 7 days before whelping is a progressive qualitative change in uterine electrical activity. A significant increase in uterine activity occurs during the last 24 hours before parturition, with the final fall in plasma progesterone concentration to below 6 nmol/l (2 ng/ml) [2,8,9]. In the dog, estrogens have not been unambiguously shown to increase before parturition as they do in many other species. Sensory receptors within the cervix and vagina are stimulated by the distention created by the fetus and the fluid-filled fetal membranes. This afferent stimulation is conveyed to the hypothalamus and results in release of oxytocin during second stage labor. Afferents also participate in a spinal reflex arch with efferent stimulation of the abdominal musculature to produce abdominal straining. Relaxin causes the pelvic soft tissues and genital tract to relax, which facilitates fetal passage. In the pregnant bitch, this hormone is produced by the ovary and possibly also by the placenta and uterus and rises gradually over the last two thirds of pregnancy [10].

### **First Stage**

The duration of the first stage usually is between 6 and 12 hours. It may last 36 hours, especially in a nervous primiparous animal, but for this to be considered normal the rectal temperature must remain low. Vaginal relaxation and dilation of the cervix occur during this stage. Intermittent uterine contractions, with no signs of abdominal straining, are present. The bitch may appear uncomfortable, and the restless behavior may become more intense. Panting, tearing up and rearranging of bedding, shivering, and occasional vomiting may be seen. Some bitches show no behavioral evidence of first-stage labor. The inapparent uterine contractions increase both in frequency, duration, and intensity toward the end of the first stage. Inexperienced breeders may not fully understand the function of this preparatory stage of parturition during which the recurrence of uterine tones, the softening of the birth canal, and the opening of the cervix take place.

During pregnancy, the orientation of the fetuses within the uterus is 50% heading caudally and 50% cranially, but this changes during first-stage labor as the fetus may rotate on its long axis and extend its head, neck, and limbs. This results in 60% to 70% of pups being born in anterior and 30% to 40% in posterior presentation [11,12]. The fluid-filled fetal

membranes are pushed ahead of the fetus by the uterine propulsive efforts and dilate the cervix.

### Second Stage

It is crucial that the veterinarian is able to determine whether the bitch is in the second stage or still in the first stage of labor. If one or more of the following signs have been observed the bitch is in second-stage labor:

- The rectal temperature has been down and is returning to normal level
- Visible abdominal straining is observed
- Fetal fluids are passed

The duration of the second stage is usually between 3 and 12 hours; in rare cases, it has lasted 24 hours. At the onset of second-stage labor the rectal temperature rises to normal or slightly above normal. The first fetus engages in the pelvic inlet, and the subsequent intense, expulsive uterine contractions are accompanied by abdominal straining. On entering the birth canal the allantochorionic membrane may rupture and a discharge of some clear fluid may be noted. Covered by the amniotic membrane, the first fetus is usually delivered within 4 hours after onset of second-stage labor [13]. Normally, the bitch will break the membrane, lick the neonate intensively, and sever the umbilical cord. At times, the bitch will need some assistance to open the fetal membranes to allow the newborn to breathe, and sometimes the airways will have to be emptied of fetal fluids. The umbilicus can be clamped with a pair of hemostats and cut with a blunt scissors to minimize hemorrhage from the fetal vessels, leaving about 1 cm of the umbilicus. In case of continuing hemorrhage, the umbilicus should be ligated.

In normal labor the bitch may show infrequent and/or weak straining for up to 2, and at the most, 4 hours before giving birth to the first fetus. If the bitch is having strong, frequent but nonproductive straining, this indicates the presence of some obstruction. Veterinary advice should be sought after no more than 20 to 30 minutes.

Expulsion of the first fetus usually takes the longest. The interval between births in normal uncomplicated parturition is from 5 to 120 minutes [11,12]. As long as pups remain in both uterine horns the fetuses are mostly delivered alternately from each side. When giving birth to a large litter a bitch may accumulate lactic acid in the myometrium and stop straining. Such a rest between the deliveries of two consecutive fetuses may last for more than 2 hours. The second-stage straining will then resume, until all the fetuses are born. A normal parturition stimulates fetal circulation, empties airways of fetal fluids, and thereby, facilitates breathing.

Parturition is usually completed within 6 hours after the onset of second stage labor, but it may last up to 12 hours. It should not be allowed to last for more than 24 hours considering the risks involved both for the bitch and the fetuses.

### Third Stage

Expulsion of the placenta and shortening of the uterine horns usually follows within 15 minutes of the delivery of each fetus. Two or three fetuses may, however, be born before the passage of their placentas occurs. Should the bitch ingest more than one or two of the placentas, she may develop diarrhea. The greenish postpartum discharge of fetal fluids and placental remains (lochia) will be seen for up to 3 weeks or more. They are most profuse during the first week. Uterine involution is normally completed after 12 to 15 weeks.

### Dystocia

Dystocia, defined as difficult birth or the inability to expel all fetuses through the birth canal without assistance, is a frequent problem in the dog. The overall incidence is probably below 5%, but in some breeds may amount to almost 100%, especially those of the achondroplastic type and those selected for large heads [11,14,15]. Dystocia in the bitch in around 75% of cases is of maternal origin, and in 25% of fetal origin (Table 75-1) [14].

	<b>Frequency (percent)</b>
<b>Maternal causes</b>	75.3
Primary complete inertia	48.9
Primary partial inertia	23.1
Narrow birth canal	1.1
Uterine torsion	1.1

<b>Table 75-1. Causes of Dystocia in Bitches (182 cases) (Darvelid and Linde-Forsberg, 1994)</b>	
	<b>Frequency (percent)</b>
Uterine prolapse	–
Uterine strangulation	–
Hydrallantois	0.5
Vaginal septum formation	0.5
<b>Fetal causes</b>	<b>24.7</b>
Malpresentations	15.4
Malformations	1.6
Fetal oversize	6.6
Fetal death	1.1

### **Clinical Assessment**

When a bitch with dystocia is presented, taking an accurate history and performing a thorough physical examination are important prerequisites for proper management. In the absence of an obvious cause for the dystocia, such as an obstructed fetus visible in the vagina, the three criteria for being in second-stage labor, namely body temperature returned to normal, visible abdominal straining, and passage of fetal fluids, should be assessed. An evaluation of the bitch's general health status should be made and signs of any adverse effects of parturition noted. Observation should be made of the bitch's behavior and the character and frequency of straining. The vulva and perineum should be examined, noting color and amount of vaginal discharge. Mammary gland development including congestion, distention, size, and presence of milk should be evaluated. Palpation of the abdomen and estimating the degree of distention and the uterine tone should be carried out. Digital examination of the vagina using aseptic technique should be undertaken to detect obstructions and determine the presence and presentation of any fetus in the pelvic canal. In most bitches, it is not possible to reach the cervix during first stage, but an assessment of the degree of dilation and tone of the vagina may give some indication of the status of the cervix and the tone of the uterus. Pronounced tone of the anterior vagina may indicate satisfactory muscular activity in the uterus, whereas flaccidity may indicate uterine inertia [16]. The character of the vaginal fluids also indicate whether the cervix is closed, with the production of a fluid that is scant and sticky, creating a certain resistance to the introduction of a finger, or open, when fetal fluids lubricate the vagina, making exploration easy. When the cervix is closed, the vaginal walls also fit tightly around the exploring finger, whereas with an open cervix the cranial vagina appears more open.

Radiographic examination is valuable to assess gross abnormalities of the maternal pelvis and the number and location of fetuses, to estimate fetal size, and to detect signs of fetal death. Intrafetal gas will appear 6 hours after fetal death and can be detected radiographically, whereas overlapping of cranial bones and collapse of the spinal column will be seen after 48 hours. Ultrasound examination will determine fetal viability or distress, with normal heart rate being 180 to 240 beats per minute, decelerating in the compromised fetus.

### **Diagnosis**

The range of normal variations observed in dogs at parturition makes recognition of dystocia difficult. Although strict time limits are not applicable in all cases, and the intensity, duration, and frequency of the uterine contractions are also crucial factors, the following criteria may serve as rules of thumb, both in the discussions with the dog owners and to assist in the diagnosis:

- The rectal temperature has been down by 1 to 3°C and has returned to normal with no signs of labor.
- Fetal fluids were observed 2 to 3 hours ago but there are no signs of labor.
- Labor is absent for more than 2 hours or has been weak and infrequent for more than 2 to 4 hours.
- Labor has been normal but is becoming increasingly more infrequent and weak.
- Strong and persistent non-productive labor has been occurring for more than 20 to 30 minutes.
- A green vulvar discharge is present but no fetuses have been delivered. (This discharge emanates from the marginal hematoma of the placentas and indicates that at least one placenta is becoming separated from the maternal blood supply. It is normal once birth is underway).
- An obvious cause of dystocia is evident such as pelvic fracture or a fetus stuck in the birth canal and partially visible.

- The bitch has been in second-stage labor for more than 12 hours.

Signs of toxemia (disturbed general condition, edema, shock) are noted when parturition should be occurring.

## **Causes of Maternal Dystocia**

### **Uterine Inertia**

Uterine inertia is by far the most common cause of dystocia in dogs. In primary inertia, a normal uterus may fail to respond to the fetal signals because there are only one or two pups and, thus, insufficient stimulation to initiate labor (the single pup syndrome) or because of overstretching of the myometrium by a large litter, excessive fetal fluids, or oversized fetuses. Other causes of primary inertia may be an inherited predisposition, dehydration, or a nutritional imbalance, fatty infiltration of the myometrium, age-related changes, deficiency in neuro-endocrine regulation, or systemic disease in the bitch. Primary complete uterine inertia is the failure of the uterus to begin labor at full term. Primary partial uterine inertia is said to occur when uterine activity is enough to initiate parturition but is insufficient to complete a normal birth of all fetuses in the absence of an obstruction. Secondary uterine inertia implies exhaustion of the normal uterine myometrium caused by obstruction of the birth canal. The pathogenesis of secondary inertia is thus different and medical treatment is seldom effective. Therefore, secondary inertia should be clearly distinguished from primary inertia.

### Management of Uterine Inertia

It is not unusual that pups are born in the car on the way to the veterinarian. Most of these pups would probably have been delivered in the calm and quiet of home had the owners tried to induce straining in the bitch themselves, thereby giving the pup a better start in life and possibly also resulting in the whole litter being born without further intervention. In cases of primary uterine inertia with a bright and alert bitch, therefore, the owners should initially be instructed to try to induce straining by actively exercising the bitch for 10 to 15 minutes, for instance by running around the house or up and down the stairs. Another means to induce straining in the bitch with insufficient labor is by inserting two fingers into the vagina and pushing or "walking" with them against the dorsal vaginal wall, thus inducing an episode of straining (the Ferguson reflex). This method can also be effective in initiating labor after successful correction of the position or posture of an obstructed fetus. Gentle massaging of the mammary glands will induce oxytocin release and may enhance labor progress. Owners should also be advised to provide the bitch with sufficient fluids and energy, e.g., glucose, to avoid dehydration and hypoglycemia during labor.

Psychological stress may lead to nervous voluntary inhibition of labor, mainly in a nervous primiparous animal. Reassurance by the owner or administration of a low dose tranquilizer may remove the inhibition [17]. Once the first fetus is born, parturition will usually proceed normally.

The bitch with complete primary uterine inertia is usually bright and alert, has a normal rectal temperature, and has no evidence of labor. The cervix is often dilated, and vaginal exploration is easy to perform owing to the presence of fetal fluids, but the fetus may be out of reach because of the flaccid uterus. Before initiation of medical treatment of uterine inertia, obstruction of the birth canal must be excluded. Per oral or intravenous fluids and glucose should be administered.

Calcium solutions and oxytocin are the drugs of choice in cases of primary uterine inertia. Oxytocin has a direct action on the rate of calcium influx into the myometrial cell, which is essential for myometrial contraction. Some 10 minutes before the administration of oxytocin, 10% calcium borogluconate, 0.5 to 1.5 ml/kg bodyweight, should be given by slow intravenous infusion (1 ml/min) with careful monitoring of the heart rate. The calcium can also be administered subcutaneously, which eliminates the risk for arrhythmia but presents a small risk for granuloma formation at the injection site. Hypoglycemia may occur, particularly after prolonged straining. In such cases, a dilute (10 to 20%) glucose solution can be added to the infusion or given intravenously in doses of 5 to 20 ml. The recommended dose of oxytocin for the bitch is 1 to 5 IU given IV or 2.5 to 10 IU IM, and it can be repeated at 30-minute intervals. The response to treatment will, however, be reduced with each repeated administration. Higher doses than recommended or too frequent administration may result in prolonged contracture of the myometrium, preventing fetal expulsion and impeding uteroplacental blood flow, causing hypoxia in the fetuses. The disadvantages of oxytocin administration also include a tendency to cause premature induction of placental separation and cervical closure. If there is no response to treatment after a second administration of oxytocin, the pups should be delivered without further delay, either with the aid of obstetrical forceps, if only one or two pups remain and are within easy reach in the uterine corpus, or by cesarean section. The long-acting ergotamines should never be used in connection with parturition.

The treatment regimen includes:

- A 10% solution of calcium gluconate is given slowly intravenously while carefully checking the bitch's heart rate.
- The bitch is given 30 minutes to respond to treatment. If straining begins, the treatment can be repeated if necessary or continued with oxytocin.

- If the calcium infusion has no effect within 30 minutes, oxytocin is given intravenously or intramuscularly.
- The bitch is again given 30 minutes to respond to treatment. If straining begins, the treatment can be repeated if necessary, although each additional administration will elicit a weaker response.
- If no response occurs within 30 minutes, further treatment is not likely to be successful. The fetuses should be delivered, either by forceps, if only one or two fetuses remain and are within easy reach, or by cesarean section.

### **Obstruction of the Birth Canal**

Some maternal causes for obstruction are listed below:

#### Uterine Torsion and Uterine Rupture

These are acute, life-threatening conditions occurring either during late pregnancy or at the time of parturition. The condition of the bitch may quickly deteriorate. Surgery is always required and a quick diagnosis is essential for survival of the bitch.

#### Uterine Inguinal Herniation

Uterine inguinal herniation is often detected during the fourth week of pregnancy when the fetal uterine enlargements are 2 to 2.5 cm in size. The early stages may be mistaken for mastitis of the rear mammary glands. The condition is corrected by surgery, repositioning the uterine horns, and suturing the herniation. In case of circulatory disturbance and substantial tissue damage, the uterus may have to be removed.

#### Soft Tissue Abnormalities

Soft tissue abnormalities such as vaginal septa and neoplasms or fibrosis of the birth canal may cause obstructive dystocia. Vaginal septa usually are remnants of the fetal Müllerian duct system, but may also occur secondary to vaginal trauma or infection. If extensive, both septa and neoplasms may prevent the passage of the fetuses. Often, however, prepartum the vagina is relaxed enough to allow the fetuses to pass. Cervical or vaginal fibrosis is seen in rare cases and is usually secondary to trauma or inflammatory processes and may in severe cases cause dystocia. Tumors and septa formations may be surgically removed, preferably during anestrus and before mating; but in cases of fibrosis, surgery is seldom successful because of new scar tissue formation during the healing process.

#### Narrow Pelvic Canal

Narrow pelvic canal causing obstructive dystocia may result from immaturity, congenital malformation of the pelvis, or pelvic fractures. The normal canine pelvis usually has a vertical diameter greater than the horizontal. Congenitally narrow birth canals exist in some terrier and brachycephalic breeds, e.g., Boston terriers and Scottish terriers. In addition, fetuses of those breeds have comparatively large heads and wide shoulders. In the achondroplastic Scottish terrier, dorsoventral flattening of the pelvis modifies the normal pelvic inlet, and creates an obstruction to the engagement of the fetuses. Significant differences were found in Scottish terrier bitches whelping normally compared with those with dystocia owing to a too-narrow birth canal caused by a dorsoflattening and a shortening of the pelvis [15]. In Boston terrier bitches a significantly greater inner pelvic height was found in normally whelping bitches. In this breed also, the size of the pups, and especially of their heads, was important because the weight of the pup was related to the size of its head. The English bulldog has a large, deep chest and pronounced waist. The fetuses, therefore, are presented at a relatively acute angle to the pelvic inlet. Bulldogs also may have slack abdominal musculature, leading to insufficient uterine contractions and abdominal straining to lift the fetus up into the pelvic cavity. In cases of pelvic obstructions, usually a cesarean section is necessary. Genetic counseling to breeders is also important in these cases [15].

### **Causes of Fetal Dystocia**

Fetal causes of dystocia include malpresentations/malorientations and oversized fetuses or monstrosities, e.g., those with hydrocephalus, edema, or duplications. Fetal death may result in dystocia owing to malpositioning or inadequate stimulation for parturition to begin. A healthy fetus is active during expulsion, extending its head and limbs, twisting, and rotating to get through. In most breeds, the greatest bulk of the fetus lies in its abdominal cavity, whereas the bony parts, the head and the hips, are comparatively small. The limbs are short and flexible and rarely cause serious obstruction to delivery in the normally sized fetus.

### **Posterior Presentation**

Posterior presentation is considered normal in dogs, occurring in 30% to 40% of fetal deliveries [11,12]. Posterior presentations have, however, been related both to higher pup mortality [11] and to a predisposition for dystocia, particularly where this involves the first fetus to be delivered, because mechanical dilation of the cervix may be inadequate. In addition, expulsion is rendered more difficult because the fetal chest instead of being compressed becomes distended by the pressure from the abdominal organs through the diaphragm and because the fetus is being delivered against the direction of its hair coat. Occasionally, the fetus may have the elbows hooked around the pelvic brim, preventing further expulsion. When a

fetus becomes lodged in the pelvic canal, pressure on the umbilical vessels trapped between the fetal chest and the maternal pelvic floor may cause hypoxia and reflex inhalation of fetal fluids.

### **Breech Presentation**

Breech presentation (i.e., posterior presentation with hindlegs flexed forward) can be a serious complication, especially in medium- and small-sized breeds. Vaginal exploration will reveal a tail tip and maybe the anus and the bony structure of the pelvis of the fetus.

### **Lateral or Downward Deviation of the Head**

These are two of the most common malpositionings in the dog. Downward deviation is seen in brachycephalic breeds and long-headed breeds such as Sealyham and Scottish terriers whereas lateral deviation is most common with long-necked breeds such as rough collies. In downward deviation of the head, either both front legs and sometimes the nape of the neck of the fetus can be palpated, or both front legs may be flexed backwards and only the skull of the fetus be reached. In lateral deviation, vaginal exploration will demonstrate just one front leg, the one contralateral to the direction of the deviation of the head (i.e., when the head is deviated to the left, the right front paw will be found and vice versa).

### **Backward Flexion of Front Legs**

This condition is especially common when the fetus is weak or dead and is sometimes seen in combination with deviation of the head, especially downward. For bitches of the larger or even medium-sized breeds, it may be possible to deliver a puppy with one or both front legs flexed.

### **Bicornual or Transverse Presentation**

A fetus, instead of progressing from the uterine horn through the cervix to the vagina, may sometimes proceed into the contralateral uterine horn. This may be owing to some obstruction, or the fetus may have been implanted close to the body of the uterus. These cases always require surgery, because no room exists for manual correction.

### **Two Fetuses Presented Simultaneously**

Sometimes one fetus from each horn is presented at the same time, jamming the birth canal. If one is coming backwards this one should when possible be removed first, because it occupies more space.

### **Oversized Fetuses**

A pup weight of 4% to 5% of the weight of the bitch is considered the upper limit for an uncomplicated birth. Oversized fetuses are often associated with small litter size. In brachycephalic breeds such as the Boston terrier and the Scottish terrier, dystocia occurs from the combination of a flattened pelvic inlet and puppies having a large or a long head. Obstructive dystocia was found to occur at pup weights of 2.5% to 3.1% of the adult weight in these breeds [15].

### **Management of Fetal Malpresentations**

If a fetus is present in the birth canal, manipulation by hand or by obstetrical forceps may be attempted before a decision is made to proceed with a cesarean section. This is relevant in cases where it is assumed that, by removing the obstructed pup, the birth of the remaining pups may proceed without problems.

Fetal position must be assessed. If the fetus has advanced partly through the pelvic canal, it will create a characteristic bulge of the perineal region. Easing the vulvar lips upward may reveal the amniotic sac and the position of the fetus. Vaginal exploration and radiographic examination will aid in making a diagnosis in the cases when the fetus has not advanced as far. Having an assistant holding the bitch so that it is standing upright on the hind legs or with the bitch sitting on his lap facing forward takes advantage of the force of gravity to get the fetus within reach for palpation. In bitches of the giant breeds it may even be possible to insert one hand through the vagina into the uterus to extract the pup.

During natural birth the pup will almost make a full somersault, emerging from the loop of the uterine horn, progressing upward to pass through the pelvic canal, and then down through the long vagina and vestibulum of the bitch, to reach the vulva placed some 5 to 15 cm below the level of the pelvic floor. Thus, after the fetus is seized, traction should be gently applied in posteroventral direction.

If external manipulation is to be attempted, generous application of obstetrical lubricant (liquid paraffin, petroleum jelly, or a sterile water-soluble lubricant) is helpful, especially if the bitch has been in second-stage labor for some time. The narrowest part of the birth canal is within the rigid pelvic girdle. The fetus that cannot be easily pulled out may have to be pushed cranially in front of the pelvic girdle, where corrections of its position or posture are easier to perform. This should be done between periods of straining of the bitch, never working against the uterine contractions. The widest part of the pelvic girdle usually is on the diagonal; thus, rotating the fetus 45 degrees may create sufficient room for passage.

Depending on the position and posture of the fetus, its head and neck should be grasped, from above or below whichever is most convenient, or its pelvis, or legs. Care should be taken because the neck and limbs of the fetus are easily torn when pulled. Correction of posture may be more easily accomplished by manipulation of the fetus through the abdominal wall with one hand and concurrent transvaginal manipulation with the other. A finger may be introduced into the mouth of the fetus to help in correcting a downward deviation of the head. Should it be necessary to change the postures of the limbs, a finger should be inserted past the elbow or knee and the limb moved medially under the fetus and corrected.

A gently applied alternating right-to-left traction of the puppy, gently rocking it back and forth or from side to side and possibly twisting it to a diagonal position within the pelvis, will help free the shoulders or the hips one at a time. By applying a slight pressure over the perineal bulge the fetus may be prevented from sliding back in again between strainings.

Obstetrical forceps should only be used for assisted traction of a relatively oversized fetus when the rest of the pups in the litter are likely smaller or when just one or two fetuses remain. The forceps is guided with a finger and never introduced further than to the uterine body because of the risk of getting part of the uterine wall within the grip, and thus causing serious damage. If the head of the fetus can be reached, the grip should be applied around the neck (Pålssons forceps) or across the cheeks. In posterior presentation the grip should be around the fetal pelvis. If the legs can be reached, the grip should be around those, not around the feet.

### **Outcome of Obstetrical Treatment**

Digital manipulation including forceps delivery and/or medical treatment for dystocia is successful in only 27.6% of the cases [14]. Around 65% of bitches with dystocia, thus, end up having a cesarean section. Early diagnosis and prompt treatment are crucial to reduce pup death rate in cases of dystocia.

### **Criteria for Cesarean Section**

The indications for Cesarean section include the following:

- Abnormalities of the maternal pelvis or soft tissues of the birth canal
- Primary, complete or partial, uterine inertia that does not respond to medical treatment
- Secondary uterine inertia with inadequate resumption of labor after removal of the obstruction
- Fetal absolute or relative oversize, or fetal monstrosity
- Excess or deficiency of fetal fluids
- Fetal malposition unamendable to manipulation
- Fetal death with putrefaction
- Pregnancy toxemia
- Neglected dystocia
- Prophylactic/elective (history of previous dystocia).

Once a decision has been made to deliver the litter by cesarean section, surgery should be carried out without delay. The bitch has often endured hours of more or less intensive labor and may be suffering from physical exhaustion, dehydration, acid-base disorders, hypotension, hypocalcaemia, and often, hypoglycemia. The prognosis for both bitch and offspring is good if surgery is performed within 12 hours after the onset of second-stage labor; it continues to be fairly good for the bitch after 12 hours but guarded for the fetuses. If more than 24 hours have passed after the onset of second-stage labor the entire litter is usually dead and further delay compromises the life of the bitch.

The decision to perform an elective Cesarean section should be made by the veterinarian based on a well-founded presumption that if surgical intervention was not provided the bitch would experience dystocia. The veterinarian may, however, also have to take into consideration that it may be better for practical purposes and for the safety of the bitch to do an elective cesarean section on a Friday afternoon rather than during the week-end when the clinic may not be fully staffed. Performing elective cesarean sections in a line of dogs that cannot reproduce successfully without intervention, or for the convenience of the breeder, may be questioned on ethical grounds.

The bitch submitted for an elective cesarean section should be at term, and preferably have entered first stage of parturition, so that the fetuses are mature and have enough surfactant for normal lung function. Pre-surgery treatment with methylprednisolone 0.5, 1 or 2 mg/kg bw or dexamethasone preferably 24 to 48 hours and at least 1 hour pre-surgery to advance fetal lung maturation (especially of the brachycephalic breeds) and for maternal preparation is advocated by some, although not scientifically documented in the dog.

If peripheral plasma progesterone was determined at the time of mating, this is a good help in making the decision when to perform the elective cesarean section. C-section on a bitch before day 62 past the LH surge (defined as the initial raise in serum progesterone concentrations two times that of basal, i.e., in the range of 4.5 to 7.5 nmol/l [1.5 – 2.5 ng/ml]) is likely



to result in a high percentage of neonatal losses owing to fetal immaturity. Elective cesarean sections, therefore, should be made at the earliest 62 to 64 days after the LH-surge (i.e., 58-60 days post fertilization). Progesterone at this time is usually less than or about 6 nmol/l (2 ng/ml).

### **Postpartum**

The postpartum bitch should be examined if:

- Severe genital hemorrhage is continuous.
- All placentas have not been expelled within 4 to 6 hours after the birth of the last pup.
- The lochia are putrid and/or foul smelling.
- The rectal temperature is higher than 39.5°C (103°F).
- The general condition of the bitch is affected.
- The general condition of the pups is affected.

### **Postpartum Hemorrhage**

True hemorrhage should be distinguished from normal vaginal post-parturient discharge and from cases of subinvolution of the placental sites (SIPS). SIPS occurs predominantly in the young, primiparous bitch and is observed as a scant vaginal hemorrhage over many weeks or even months. This is no cause for alarm, as long as the bitch does not become anemic or develop a uterine infection. No effective treatment exists and the condition in the vast majority of cases heals spontaneously, and it usually does not recur at subsequent parturitions.

Excessive hemorrhage after parturition may, in contrast, indicate uterine or vaginal tearing or vessel rupture or may be evidence of a coagulation defect. The hematocrit should be checked, remembering that 30% is normal for the bitch at term. Inspection of the vulva and vagina should be performed in an attempt to locate the source of the bleeding. Oxytocin can be administered to promote uterine involution and contraction of the uterine wall. In more severe cases of uterine hemorrhage, an exploratory laparotomy may be necessary. The bitch should be monitored closely for signs of impending shock, and blood transfusion may be required while attempting to determine the cause of hemorrhage.

### **Retained Placentas/Fetuses**

Retained placentas in the bitch may cause severe problems, especially when accompanied by retained fetuses or infection. Clinical signs of retained placenta include a thick dark vaginal discharge. Retained fetuses can be identified by palpation or ultrasonographic or radiographic examination. The examination should also encompass the corpus uteri and the vagina for the presence of partly expelled fetuses or fetal membranes. A retained placenta is often palpable in the uterus, depending on the size of the bitch and the degree of uterine involution. Extraction of retained tissue, by careful "milking" of the uterine horn or by using forceps, is sometimes possible. Treatment with 1 to 5 IU oxytocin per dog SC or IM 2 to 4 times daily for up to 3 days can help expulsion of retained placentas. The long-acting ergot alkaloids should not be used because they may cause closure of the cervix. Antibiotic treatment is advisable if the bitch is showing signs of illness.

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