

Beef Sessions

Moderators: R. Kevin Vance, Glenn Rogers

Guidelines for Ultrasound Fetal Sexing in a Cow/Calf Operation

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Abstract

Fetal sexing was first described in 1989. For the next decade only a small number of experienced ultrasonographers actually applied the technique on a commercial basis. In recent years, client pressure has increased the number of veterinarians offering the service, but the demand for the artisan skill continues to grow as new and emerging reproductive technologies become commercialized. However, the learning curve to accurately diagnose sex by ultrasound is steep. To have command of the procedure to the point of becoming 98% accurate takes time away from practice and a lot of bred cows with accurate breeding records to practice on. The purpose of this paper is to review fetal sexing and offer suggestions on how to minimize the learning curve so that practitioners won't be intimidated by it.

Résumé

La détermination du sexe chez les fœtus a été décrite pour la première fois en 1989. Dans la décennie qui suivit, la technique n'a été appliquée sur une base commerciale que par un petit groupe d'utilisateurs de l'échographie hautement qualifiés. Plus récemment, le nombre de vétérinaires offrant ce service a augmenté suite à la demande des clients. Néanmoins, la demande pour les compétences nécessaires continue de croître en raison du grand nombre de nouvelles technologies reproductives mises sur le marché. La courbe d'apprentissage est très prononcée pour bien pouvoir déterminer le sexe avec l'échographie. L'atteinte d'un taux de réussite de 98% nécessite de passer moins de temps à la pratique et d'avoir accès à beaucoup de vaches ensemencées avec des fiches de reproduction à jour pour pouvoir se pratiquer. Le but de cet article est de faire le tour d'horizon de la détermination du sexe chez les fœtus et d'offrir des suggestions afin de minimiser la difficulté

d'apprentissage et rendre la détermination du sexe moins intimidante pour les praticiens.

Introduction

Fetal sexing, first reported by Curran in 1989,^{1,2} is perhaps the most difficult ultrasound procedure to learn, and the most revered by ultrasonographers. Clients often judge an ultrasonographer by his or her ability to accurately diagnose sex of 60 to 90 day fetuses. Misdiagnoses are costly to the client and embarrassing to the performing veterinarian. The learning phase is intensive, but once mastered, the technique is extremely gratifying and valuable as a practice builder. The inability to diagnose sex by ultrasound puts the practitioner in a sub-professional level by his client base with regards to reproduction.

At approximately day 55 of gestation, male and female genital tubercles can be visualized on a high-resolution ultrasound monitor.³ The fetal sex organs are composed of dense, highly echogenic tissue similar to skeletal structures, and therefore are depicted as bright or white structures on the monitor. Male and female genital tubercles appear bilobed during an ultrasound exam; each lobe is in the shape of an oval, which aids in differentiation from surrounding structures. The male genital tubercle is found just caudal to the umbilicus (Figure 1), whereas the female genital tubercle is located under the tail (Figure 2).

Phase I and II of Learning Curve

There are two phases of the learning curve that are separate, yet vital for the student. The order that those phases are learned will largely determine how frustrating the technique is to the practitioner. Trying to learn fetal sexing without help, or without following the phase order, can be a humiliating experience (author's personal experience).

Phase 1 involves knowing what to look for and how to recognize the important anatomical structures on the ultrasound monitor so that a proper diagnosis of sex can be made. Phase II is learning how to produce a high quality diagnosable image with a transducer in the rectum of a cow. Phase I is relatively easy. There are training DVDs^{3,4} that adequately address Phase 1 learning. Jumping to Phase II without previously addressing Phase I is like playing baseball for the first time without having previously seen a game. Phase II can be learned at home or at wet labs where pre-selected cattle and trained professionals are there for assistance.

Technique

A systematic approach should be taken by the ultrasonographer when performing fetal sexing. However, a thorough knowledge of first trimester bovine fetal anatomy is necessary before looking at a fetus on an ultrasound monitor. The male genital tubercle (MGT) is very prominent and located just caudal to the umbilicus (Figure 3). The female genital tubercle (FGT) is located just under the tail (Figure 4). The visual imagery of the actual fetuses will help the student in his quest for diagnostic efficiency.

There are three very important anatomic references on a fetal ultrasonogram that are critical in achieving

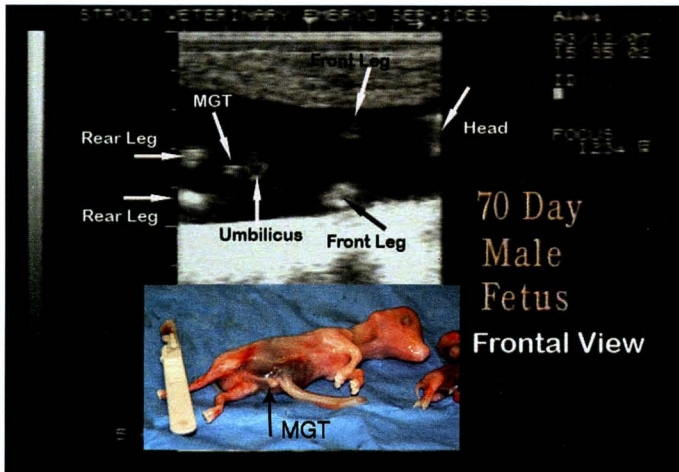


Figure 1. Frontal view still image ultrasonogram of 70 day male fetus. Anatomical structures are labeled. The actual fetus at the bottom of the picture is in the same position as the fetus in the ultrasound still image.

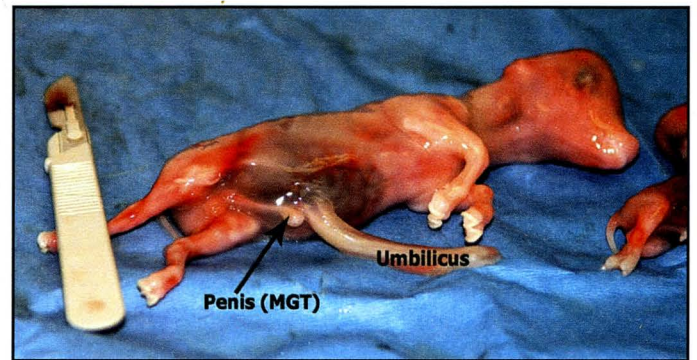


Figure 3. Actual male fetus 70 days into gestation. Notice the size of the umbilicus and the position of the male genital tubercle just caudal to where the umbilicus attaches to the abdomen.

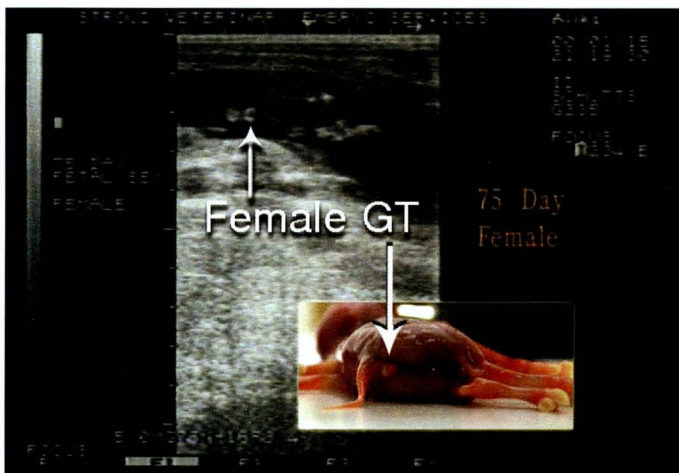


Figure 2. Still image ultrasonogram of 75 day female fetus. Ultrasound image is a cross sectional view of perineal area. Notice the bilobed female genital tubercle (top arrow). The actual 75 day old female fetus at the bottom of the ultrasound image is in the same relative position as the fetus in the ultrasound image.

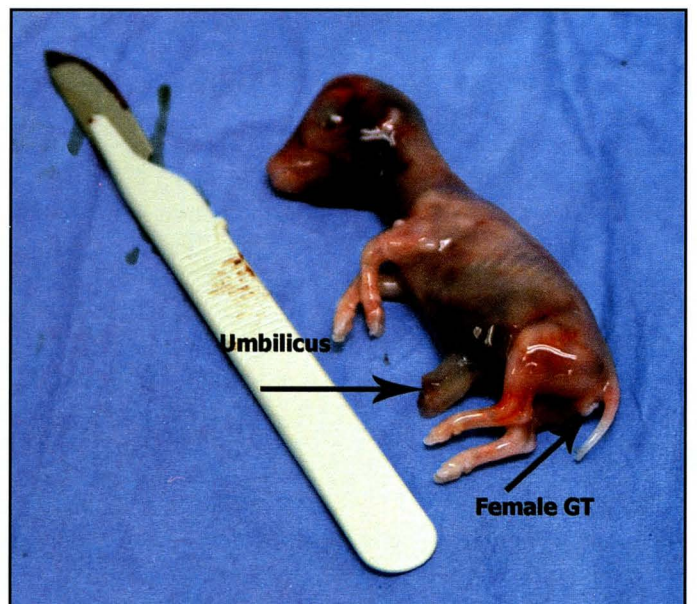


Figure 4. Actual 65 day old female fetus. Notice the absence of a MGT caudal to the umbilicus, and the presence of a FGT ventral to the tail.

proper orientation of the fetus: (1) the head, (2) the beating heart, and (3) the umbilicus. These structures are relatively easy to recognize on the monitor even for a beginning ultrasonographer. It is sometimes difficult to differentiate the front legs from the rear legs; therefore, these structures have been excluded from the list of anatomic references. Once the fetus has been located on the monitor, the three anatomic references should be systematically examined to ensure cranial-caudal orientation.

The following three views can be used to observe a fetus during an ultrasonographic examination: a lateral view (which is rarely seen), a frontal view (which is common and the easiest for orientation), and a cross-sectional view (which is most often presented). Angled or oblique variations of these views are generally encountered, but, for teaching purposes, all three views are discussed in principle.

During a cross-sectional examination of the fetus, the transducer is placed over the cranium and moved distally through the thorax to review the beating heart; no heartbeat indicates a dead fetus. The transducer is moved further distally to where the umbilicus attaches to the abdomen. At this time, the transducer should be moved slowly back and forth to diagnose the presence or absence of a male genital tubercle. In males, the genital tubercle is immediately caudal to the umbilicus, appears very bright or highly echogenic on the monitor, and is usually bilobed.

If a male genital tubercle is detected, the examination is complete. If a male genital tubercle is not observed, the transducer must be moved distally to the perineal area to detect the presence of a female genital tubercle. The perineal area is the most difficult region of the fetus to focus, therefore, patience is required. The ultrasonographer should move the transducer slowly and must establish the difference between a cross-sectional view of the tail and the female genital tubercle (Figure 2). The female genital tubercle is generally bilobed whereas the tail is a monolobed structure. Frequently, the tail and female genital tubercle are seen simultaneously and the ultrasonographer should definitively distinguish one structure from the other.

When the fetus is in a frontal position, the head, thorax, abdomen and inguinal area can be viewed. The transducer should be manipulated so that the umbilical attachment to the abdomen comes into focus. In males, immediately caudal to the umbilicus is the hyperechogenic male genital tubercle (Figure 1). The frontal view is excellent for diagnosing sex because the perineal area can also be viewed, however, some finesse by the technician is required. The female genital tubercle is sometimes superimposed over the tail. If the transducer is tilted either to the left or right, creating a slightly oblique angle, the two structures can be optically separated.

Lateral-view orientation is relatively difficult to achieve, and is not commonly used. The male genital tubercle at 60 to 100 days and often the entire penis at a 90-day pregnancy examination is easily seen on a lateral-view ultrasonogram.

It is often difficult for even an experienced ultrasonographer to create a particular view, i.e., a frontal view of the fetus, by rectal manipulation. The fetus lies in the uterus a certain way and access to the fetus with a linear transducer per rectum is somewhat limited. The best advice is to learn to diagnose sex from every view possible. Take what the cow gives you and don't spend a lot of time trying to manually get the presentation that you prefer. Severe or rough manipulation of the fetus can result in abortion (author's experience).

When a diagnosis of fetal sex is made, it is imperative that the respective male or female genital tubercle is seen clearly and distinctly. Diagnosing sex on the absence of the opposite genital tubercle is not advised. For example, it is usually faster to diagnose a male because the umbilicus is easy to find. By following the umbilicus to its site of attachment to the abdomen, the male genital tubercle can usually be seen very readily. To diagnose a fetus as female based on the absence of a male genital tubercle without observing the perineal area and clearly seeing the female genital tubercle can lead to a misdiagnosis. At certain angles, the male genital tubercle may not be focused properly and can be overlooked. Also, sound waves can be reflected by other tissues, thus preventing the MGT from being clearly resolved. Be sure and move the probe slowly back and forth across the umbilical attachment to the abdomen, and that a clear image of the GT is viewed before making a diagnosis.

A female fetus can be misdiagnosed as male when the tail is tucked between the hind legs³. The tip of the tail can actually approach the umbilicus and create a hyperechogenic structure similar to a male tubercle on a cross-sectional view. Ultrasonographers must be patient and decisive in order to avoid misdiagnosis. With experience, making an accurate diagnosis is not a problem.

At approximately 80 to 90 days of gestation, fetal sexing is enhanced by secondary anatomic structures. In males, the scrotum has developed and can easily be seen on a frontal view or a cranial-caudal cross-sectional view between the rear legs. In females, the teats are very distinct in the frontal and cranial-caudal views. Diagnosing sex based on the presence or absence of these structures is not advised; however, the scrotum and teats are helpful adjuncts to the genital tubercles when diagnosing sex.

Conclusion

Ultrasonographers must (1) have a thorough un-

derstanding of ultrasonographic fetal anatomy and (2) develop the skills necessary to produce fetal images that are positioned and focused well enough to diagnose the proper sex. As soon as these criteria are met, ultrasonographers will become proficient in determining fetal sex. A considerable amount of practice is needed in order to achieve a professional level of expertise in making a consistent and accurate diagnosis. Reaching that level can be quite frustrating, but, with patience and training aids, it can be done in a reasonable time frame.

References

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