

CLINICAL RADIOGRAPHIC REVIEW

Maternal-Fetal Evaluation in Suspected Canine Dystocia: A Radiographic Prospective

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Introduction

Dystocia is broadly defined as a disordered birth process which may jeopardize the lives of both dam and unborn alike. Although comparatively rare when considered against the number of uncomplicated births in a given population, it nevertheless constitutes a commonly encountered problem in both large and small animal practice.

Canine dystocia may be associated with physiological or morphological derangements which can directly or indirectly involve the fetus and/or the dam. Physiological dystocia may be primary and as such is associated with a malfunction of the parturient trigger mechanism. A secondary form of physiological dystocia is invariably met in cases of longstanding fetal inertia of whatever cause. Morphological (mechanical) dystocia is most often of the primary form and is usually the result of an exceptionally sized fetus. It is most often associated with the toy and miniature breeds, as well as with primagravidas (initial pregnancy). Secondary morphological dystocia stems from an abnormal influence within, or upon the birth canal sufficient to preclude fetal transect. Pelvic fractures with subsequent malunion account for the majority of cases.

Technique

Obvious first order concerns in cases of suspected dystocia include: 1) the number, size, location and viability of the individual fetal structures, 2) the maternal pelvic morphology and 3) the general abdominal status. This information is best obtained with paired radiographic projections made at right angles to one another and constitutes the data base for Phase I of the radiographic analysis. Phase II input requires a fetal compression study, preferably in the sagittal plane relative to existing fetal posture and position.

Phase I abdominal radiographs must include

the *entire* abdomen in order that no potentially diagnostic information be omitted. It is equally critical that the entire pelvis be included. If a single film in either projection fails to include the necessary fields, then a second film should be made to complete the examination. Every effort should be made to achieve standard patient positions especially in the ventrodorsal view as this is the projection from which pelvic measurements are to be made.

The fetal compression maneuver constitutes Phase II of the radiographic examination, and is accomplished in the following manner. First a target fetus is selected based on its relationship to other fetal structures (if present) and the regional maternal anatomy. The objective is to isolate the fetal skull, preferably in the sagittal plane, in order to carry out a transcranial measurement. Moreover, compression of the target fetus toward the table surface reduces the relative difference in magnification factor between the fetus and the pelvic canal. This in turn increases the accuracy of the measurement process.

Analysis

Upon completion of the radiographic data base the obtained information is analyzed with the dual intent of establishing the status of the maternal abdomen and the associated fetal elements. The examination should be conducted in a triphasic fashion so as to preclude the omission of certain critical data. A radio-diagnostic guide is provided (Table I).

TABLE I
MATERNAL-FETAL EVALUATION IN SUSPECTED CANINE DYSTOCIA: A RADIOGRAPHIC GUIDE

Phase I	Analysis of Abdominal Survey Radiographs 1. General abdominal appearances 2. Number, size and location of fetal structures 3. Internal diameter of maternal pelvic canal (Figure 3)
Phase II	Analysis of Fetal Compression Radiographs 1. General fetal appearance 2. Transcranial diameter of fetal skull (Figure 4a)
Phase III	Determination of Fetal-Pelvic Ratio The fetal-pelvic ratio is determined by dividing the internal pelvic diameter by the transcranial dimension of the fetal skull. If the obtained ratio is equal to or greater than one, the prospect of a normal birth process is reduced. Above 1.25 a normal parturition should be considered highly unlikely

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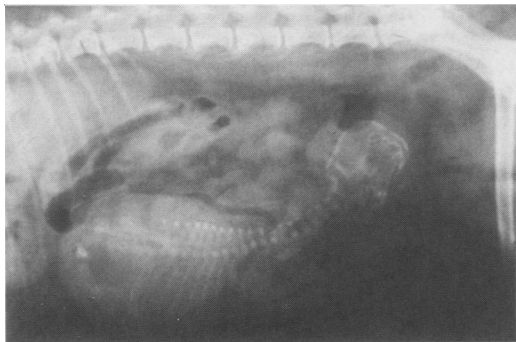


FIGURE 1. A right lateral abdominal projection in which a single, very large fetus is noted. This radiograph in conjunction with the associated ventrodorsal projection constitutes the data base for Phase I analysis of maternal-fetal status in suspected dystocia.

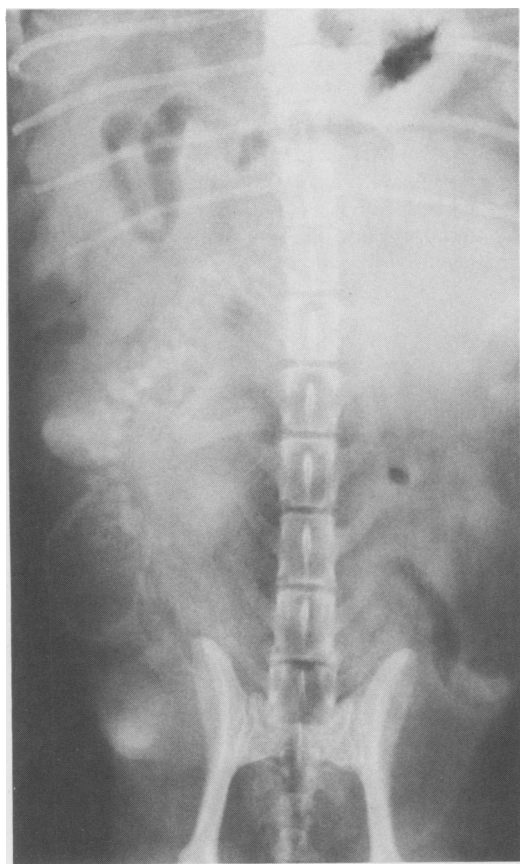


FIGURE 2. A ventrodorsal abdominal projection which provides additional information relative to the fetal status. Lacking, however, is full information regarding the morphology of the maternal pelvis. This field deficiency is remedied by including an additional pelvic projection in the abdominal film series (see Figure 3).

Comment

Additional considerations attendant to maternal-fetal evaluation in suspected dystocia include: 1) assessment of fetal viability, 2) the effect of magnification on image geometry and 3) fetal dosimetry (radiation received).

Early fetal death during final stages of intra-uterine development is indicated by the presence of one or more of the following radiographic signs: intravascular fetal gas, overlap of cranial bones, and abnormal fetal posture (1). As the postmortem period increases, the signs of fetal death become more obvious and include decomposition and extra fetal-intrauterine gas formation.

The abdominal radiograph represents an image composite composed of the various abdominal organs and associated supporting structures. Organ stratification results in varying object-film distances between individual tissues so as to produce a relative difference in organ magnification. These differences are of little importance in the majority of abdominal studies. Measurement of the fetal-pelvic ratio however constitutes an important exception as previously indicated. Al-

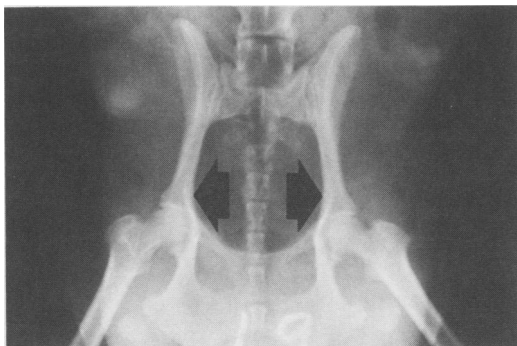


FIGURE 3. A ventrodorsal pelvic projection which is suitable for the evaluation of overall morphology especially with regard to the pelvic inlet, and for the measurement of the internal diameter of the birth canal (arrows).

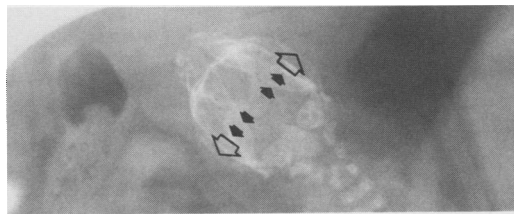


FIGURE 4a. A ventrodorsal compression examination of the fetus appearing in Figures 1 and 2. The skull has been selectively compressed in order to measure its transcranial dimension (arrows). The compression maneuver further assists in reducing the magnification differences between the fetal skull and the maternal pelvis.



FIGURE 4b. A lateral compression examination of the fetal skull noted in Figure 4a. This projection is most helpful in evaluating fetal viability. The prime benefit of such a maneuver is in the relative isolation of the fetal skull from the surrounding and oftentimes superimposed soft tissue structures, as well as from other fetal elements.

though magnification cannot be completely eliminated, it may be reduced significantly with the use of abdominal compression in the ventrodorsal position. This maneuver places the desired fetus in closer proximity to the portion of the pelvis which is to be measured.

There are no immediate or long term clinical consequences associated with late term fetal diagnostic irradiation. A clinical consequence is defined as any alteration in form or function not normally encountered in a nonirradiated population during a normal lifespan. This does not presume that no biochemical or subsequent histological injury occurs; very probably it does. Current opinion holds that there is no totally safe (threshold) dose no matter what the radiation level (2).

As with so many diagnostic alternatives, the use of diagnostic radiation is predicated on a benefit-risk consideration. In this instance there is little doubt the radiobiological risks associated with fetal irradiation are vastly outweighed by the diagnostic-prognostic benefits to be gained.

References

1. FARROW, C. S., J. P. MORGAN and E. C. STORY. Late term fetal death in the dog: early radiographic diagnosis. *J. Am. vet. rad. Ass.* 17: 11-17. 1976.
2. HALL, E. J. *Radiobiology for the Radiologist*. Maryland: Harper & Row. 1973.

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The Award will consist of a gold medallion and a \$500 cash award, and will be presented at an appropriate time during the Annual Convention.

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