ULTRASONOGRAPHY OF THE UDDER AND TEAT IN BUFFALOES: A COMPARISON OF FOUR METHODS

K.Rambabu, Makkena Sreenu, R.V.Suresh Kumar and T.S.C.Rao

ABSTRACT

Ultrasonography of udder and teat in buffaloes was conducted by direct contact, the gel application, water bath and stand off methods. Out of the four methods, the gel application and water bath methods gave satisfactory ultrasonographic images of udder and teat. The merits and demerits of each method are discussed.

Keywords: ultrasonography, udder and teats, buffaloes

INTRODUCTION

Diseases of the udder and teat are common in buffaloes, and any disease condition involving udder or teat ultimately affects the farmer’s economy. The present study was undertaken to compare four methods of B Mode ultrasonography to evaluate the udder and teat anatomy of buffaloes since different methods of diagnosing the pathological conditions of udder and teats are in vogue. Not all the methods may provide complete information, and some methods are invasive, thus having inherent demerits.

MATERIALS AND METHODS

The present study was carried on buffaloes randomly selected from those presented to the clinics following thorough clinical examination by inspection, palpation, probing, and checking the milk flow from the teat. Ultrasonography of udder and teat was conducted with Logiq 100 V4 model machine and 7.5 MHz linear transducer both in sagittal and transverse planes and the images were recorded on Polaroid paper with a thermal printer. Four different methods, namely, direct contact, gel application, water bath, and standoff, were compared for their merits and demerits. Before scanning, the udder and teats were cleaned thoroughly with warm potassium permanganate solution. In the direct contact method, the surface of linear transducer was placed directly on the skin surface of the udder and teats. While, in the gel application method, the transducer was placed longitudinally/sagittally at the udder or teat after applying an acoustic coupling gel (Ultrasound Gel, jaay vee meditech international, Pondicherry, India). In the water bath method, the udder and teats were dipped in a polyethylene bag/condom filled with water and the transducer was applied in vertical-horizontal planes of the outer wall of the polyethylene bag/teat dipped in the water filled condom. A gel filled latex condom was used as a standoff and the transducer was directly applied in a vertical-horizontal planes on the outer wall of the gel filled latex condom and images of the udder and teats were recorded.

RESULTS AND DISCUSSION

Ultrasonographic comparison of different methods were carried out and the results were documented (Table 1).
Table 1. Comparative evaluation of different methods for ultrasonography of udder and teats in buffaloes.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameter</th>
<th>Direct contact</th>
<th>Gel application</th>
<th>Water bath method</th>
<th>Standoff method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glandular parenchyma</td>
<td>+++</td>
<td>++++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>2</td>
<td>Gland sinus/cistern</td>
<td>+++</td>
<td>++++</td>
<td>++++</td>
<td>+++</td>
</tr>
<tr>
<td>3</td>
<td>Teat wall</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>4</td>
<td>Teat sinus/Sinus papillaris/teat cistern</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>5</td>
<td>Papillary duct (teat canal/ductus papillaris)</td>
<td>−</td>
<td>++</td>
<td>++</td>
<td>−</td>
</tr>
<tr>
<td>6</td>
<td>Rossete of frusternburg</td>
<td>−</td>
<td>++</td>
<td>++</td>
<td>−</td>
</tr>
</tbody>
</table>

+++ : Excellent, ++ : Good, + : Moderate, : Fair, − : Poor

In the direct contact method, the application of the transducer on to teat or udder surface was easy but the shape of the teat could not be maintained. Visualization of udder parenchyma and gland sinus on ultra sonogram showed good clarity with presence of surface artifacts. The teat canal and sinus showed irregular contour while the three layers of the teat wall could not be clearly demarcated. The papillary duct and resette of furstenberg showed overlapped picture. Ultrasonography of udder and teat in cattle was conducted by direct contact method by Dinc et al., 2000; Santos et al., 2004; Flock et al., 2004 and Gungor et al., 2005. Santos et al., 2004 evaluated direct contact as a useful method in clinical cases.

In the gel application method, the application of the transducer on to the teat or udder surface was easy but the shape of the teat could not be maintained in a fixed position during sonography. Ultrasonographic image of udder parenchyma and gland sinus showed excellent images while the three layers of teat wall could be clearly demarcated. The papillary duct and resette of furstenberg showed an overlapped pattern with clarity (Figure 1). Bruckmaier and Blum (1992) suggested that the presence of air between the probe and the tissue examined must be avoided during ultrasound examination; the problem was usually solved by using contact gel and applying the probe directly to the animal’s body. Pressing the ultrasound probe to the tissue leads to teat image deformities. As the connection between the teat and gland is angular, the application of the probe should simultaneously exclude air and prevent teat image deformations as reported by Franz et al., 2001; Twardon et al., 2001; Ayadi et al., 2003; Santos et al., 2004 and Flock and Winter, 2006.

In the water bath method, the application of the transducer to the teat or udder surface was easy. Ultrasonographic image of udder parenchyma and gland sinus showed excellent clarity with minor surface artifacts. The teat canal and sinus showed regular contour and the three layers of teat wall could be clearly demarcated. The papillary duct and resette of furstenberg showed on overlapped pattern with clarity (Figure 2 and 3). Cartee et al. (1986) reported that the use of the water bath in scans of the mammary glands was to increase the acoustic impedance difference between the teat wall and the surrounding medium. The presence of milk in the teat sinus acted similarly as a window of acoustic impedance for imaging the deeper structures and far wall of the teat. The findings were in accordance with the observations of Catree et al. (1986); Worstroff (1986); Jenninger (1989); Bruckmaier and Blum (1992); Saratis and Grunert (1993); Dinc et al. (2000); Franz et al. (2001); Hoque et al. (2004); Santos et al. (2004) and Gungor et al. (2005).

In the standoff method, the application of the transducer to the teat or udder surface via a stand off was easy but the shape of the teat was
altered and the teat was not in a fixed position during sonography. The ultrasonographic image of udder parenchyma and gland sinus showed moderate clarity with minor surface artifacts. The teat canal and sinus showed irregular contour while the three layers of teat wall could be clearly demarcated. The papillary duct and resette of furstenberg showed overlapped pattern as reported Flock et al. (2004). Twardon et al. (2001) and Santos et al. (2004) performed ultrasonography of teats by dipping in liquid and using liquid pressure, respectively. Hoque et al. (2004) mentioned that the scanning of superficial structures poses a problem by obscuring the image due to near field reverberations and suggested the use of a commercially available standoff pad or home-made fluid filled plastic bag/condom to evaluate superficial structures (less than 3.5 cm depth). A gel filled condom was used in the present study as a standoff, which provided satisfactory results.

In the present study, the glandular parenchyma of the udder appeared as homogenous and hyperechoic with anechoic alveoli which could better be visualized in the water bath and gel application methods, whereas the direct and standoff techniques exhibited some artifacts. These observations were in accordance with Ayadi et al. (2003) in cows and Gungor et al. (2005) in mares. The gland sinus appeared as a homogenous anechoic area which could be better visualized in all the techniques without much difference, whereas Cartee et al. (1986) observed the gland sinus as an anechoic area continuous with the teat sinus. The lining of the wall of the gland sinus appeared as mixed hypoechoic folds. The lactiferous ducts were anechoic areas with in the hypoechoic matrix of the fold. Gungor et al. (2005) mentioned the lactiferous duct as elongated anechoic branches in hyper echoic mammary parenchyma and some of the anechoic areas with in the glandular parenchyma may have been blood vessels but others certainly were lactiferous ducts, because they could be seen entering the gland sinus.

Out of four-methods gel application and water bath methods gave satisfactory ultrasonographic images of the udder and teat. Both direct contact and direct contact with standoff techniques were more useful in clinical cases. The water bath technique was more ideal for identifying the teat anatomy.

Figure 1. Ultrasonographic appearance of teat in a buffalo with the gel technique. Note teat canal and teat cistern.
Figure 2. Ultrasonographic appearance of teat in a buffalo with the water bath technique. Note the teat as hypoechoic structures with anechoic lumens. The teat wall has three distinct layers: the hyperechoic outer layer, hypoechoic thicker middle layer, and another more hyperechoic inner layer. The papillary duct (PD) appeared as a thin anechoic area.

Figure 3. Ultrasonographic appearance of teat in a buffaloes with the water bath technique.
Figure 4. Ultrasonographic appearance of the udder in a buffalo with gel technique. Note the glandular parenchyma (GP) of the udder appears as homogenous and hyperechoic with anechoic alveoli. The gland sinus (GS) appeared as an anechoic area continuous with teat sinus (TS). Note continuation of gland sinus with teat sinus.

REFERENCES


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