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## Ultrasonographic alteration in subclinical mastitis in cows

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### Abstract

Ultrasonography is one of the modern, accurate, relatively quick, noninvasive techniques for the diagnostic method for the udder illness. The study was plane to find the alteration in subclinical mastitis in cow by ultrasonography. Udders and teats of 55 lactating cattle of livestock farm, adhartal were screened using USG, MCMT, pH and SCC. All cows were screened by contact gel and water bath technique, in which 23 cows were positive for SCM. Normal udder parenchyma revealed homogenous hypoechogenic parenchyma with interspersed anechoic blood vessel. Teat wall of cow appeared in USG screening as three fold layer structure. The gland cisterns appeared as a large homogenous anechoic area with few hypoechoic dots corresponding to the milk. The rosette of furstenberg normally appears as short hyperechoic line extending from the teat cistern into the papillary duct. Udder parenchyma of cows found positive for subclinical mastitis by MCMT and somatic cell count appeared homogenous hypoechoic with lack of clarity of visualization of milk alveoli and lactiferous duct, irregular outline of the teat canal and cistern, homogenous hypoechogenic contents and loss of three layered appearance of the affected teat wall.

**Keywords:** Subclinical mastitis, udder, teat, ultrasonography, MCMT

### Introduction

Ultrasonography is a modern, safe, noninvasive and effective imaging tool, used for diagnosis and clinical guide procedures. USG of udder and teat can identify the Congenital and acquired obstructions of the teat and udder cistern are common causes for alterations in milk flow in bovines. Ultrasound unit contains the electronics, controls and a screen upon which the ultrasound image is visualized by the operator and a probe (transducer), which emits and receives high-frequency ultrasound waves. Linear-array transducers consist of a series of piezo-electric crystals arranged in a row. These crystals emit high frequency sound waves upon being energized. The configuration of a linear-array transducer results in a rectangular image on the field of scan (as opposed to a pie shaped image produced by a sector transducer). Ultrasound imaging uses high frequency pulses of sound waves (typically 2.5 – 10 MHz for general use) (Fricke, 2002) [5]. It is used to diagnose the udder illness and pathological alteration in the udder as inflammation, mucosal lesion, foreign bodies, the tissue proliferation, milk stone, congenital changes, haematoma and abscess (Fasulkov, 2012) [2]. So, the present study was conducted to find the changes in udder and teat in subclinical positive cows.

### Materials and Methods

Ultrasonographic examination of udder and teat of the higher somatic count and MCMT grade above +2 was performed using two dimensional, grey scales, B-mode ECM EXAGO machine (5.0-10.0 MHz) (Plate 01). Prior to USG physical restraining of cows in a Travis and hind leg secured with a rope. Then animals were screened without any sedation in standing position.

Scanning of the affected teat was carried by contact gel and water bath techniques using 5 to 7MHz linear array transducer and udder by contact gel technique both in sagittal and transverse planes (Plate 02). Before scanning, the udder and teats preliminary hair shaving, washing with potassium permanganate solution and degreasing of the skin with alcohol were performed. Then sterile ultrasound coupling gel was used to ensure proper skin and transducer contact (Rambabu *et al.*, 2008) [10].

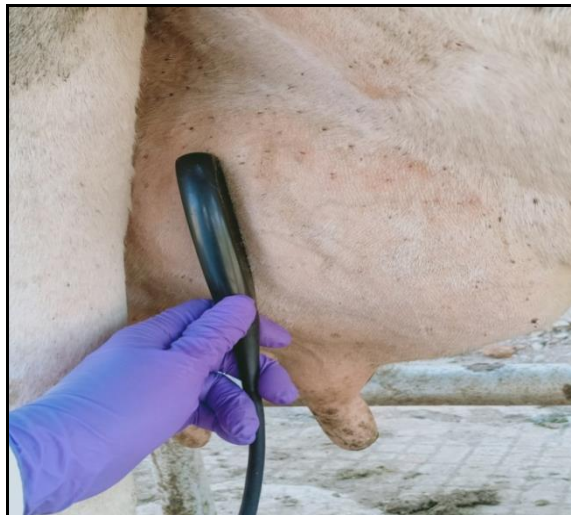
Ultrasound examination of the mammary gland parenchyma in animal was done primarily

through the contact gel application with a 5 or 7.5 MHz frequency linear probe by direct contact on the udder skin. Scanning of the entire udder was carried out by placing the probe on the caudal surface of each half along its longitudinal axis and moved upward and downward. For the examination of gland cistern the probe was placed cranially just above the teat insertion. In contact gel technique, the surface of the

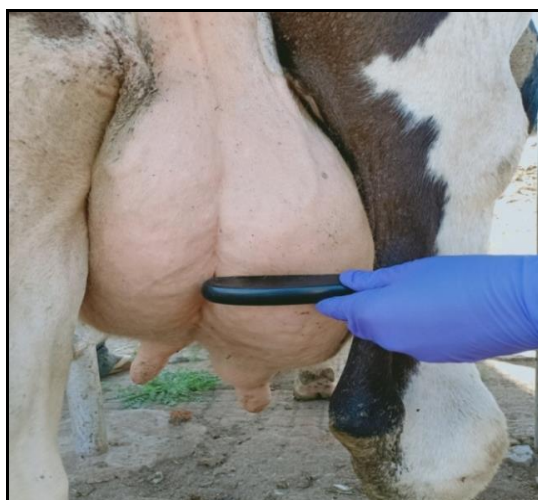
linear transducer with coupling gel was placed directly on the skin surface of the teat and udder (Plate 03). However, in water bath technique, the teat was immersed in small plastic container (empty plastic bottle of spirit and hydrogen peroxide) containing water (Plate 04) and the probe with the gel was applied on the external surface of the container (Flock and Winter, 2006) [3].



Scanning of udder (Sagittal plane)



Scanning of udder (Vertical plane)

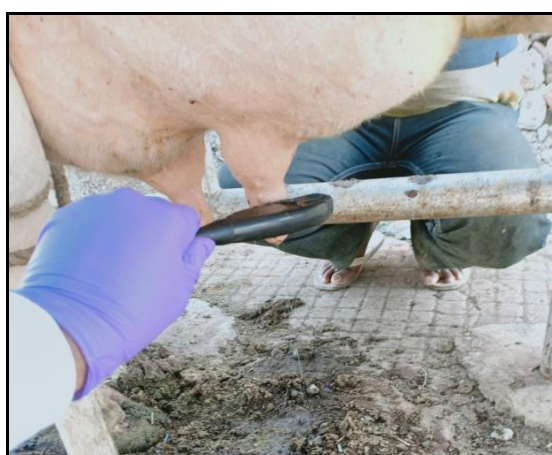


Scanning of udder (Sagittal Plane)



Scanning of udder (Vertical Plane)

**Plate 1:** Probe positioning for udder scanning

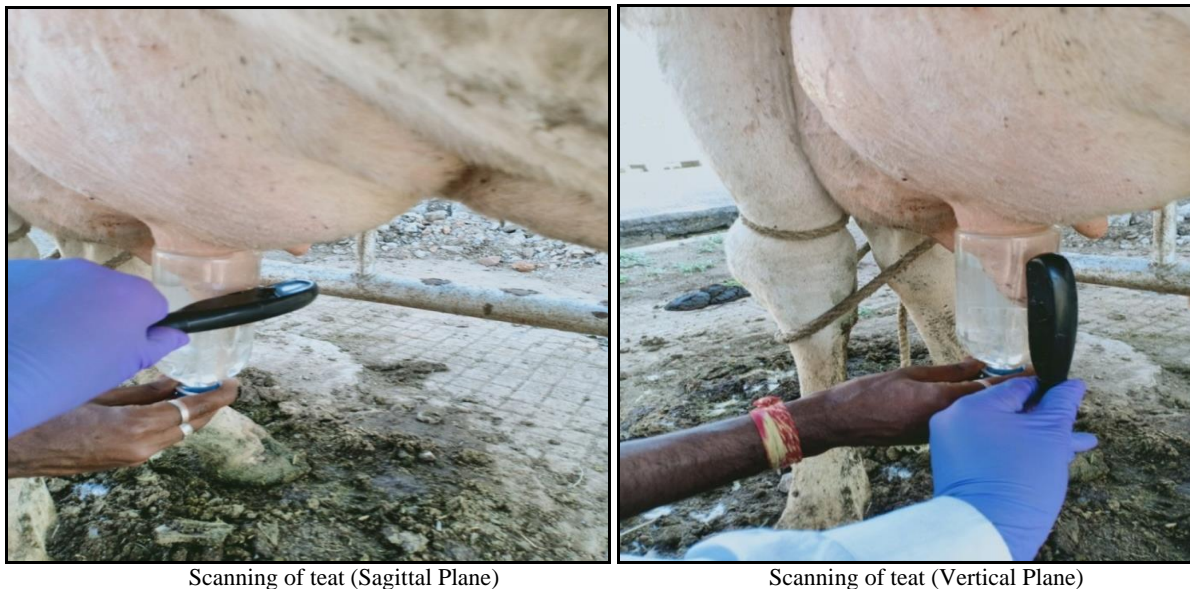


Scanning of Teat (Sagittal Plane)



Scanning of Teat (Vertical Plane)

**Plate 2:** Probe positioning for teat scanning by direct contact gel method

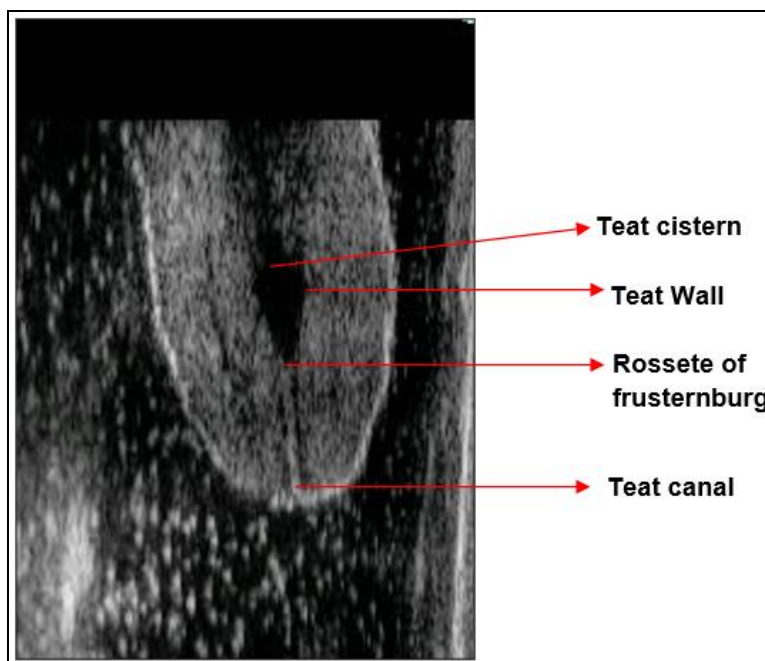


**Plate 3:** Probe positioning for teat scanning by water bath method

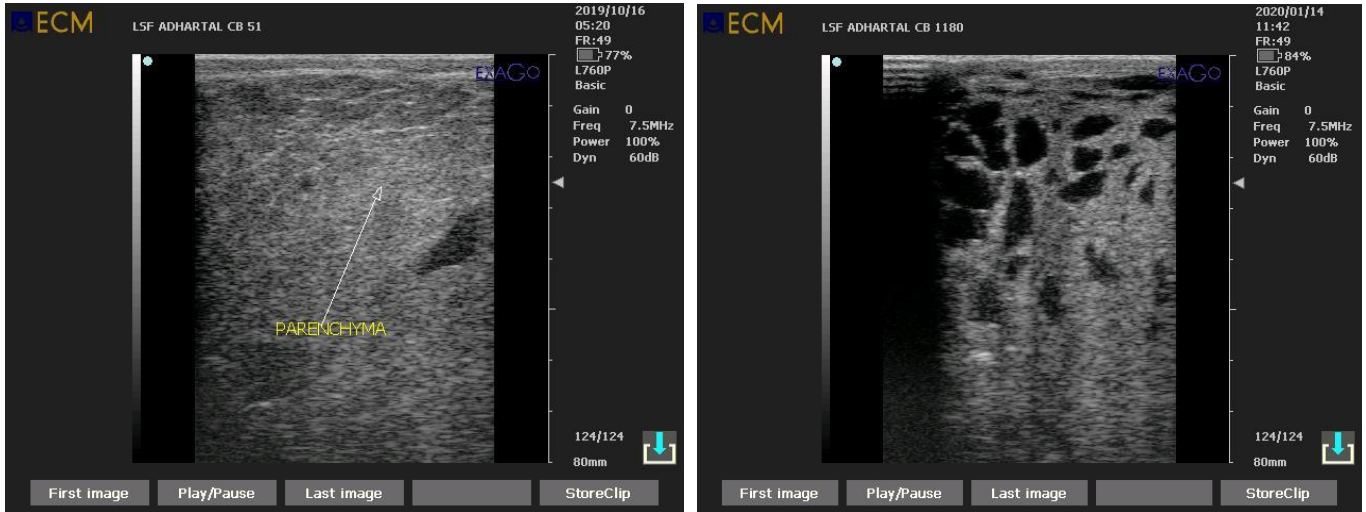
**Results and Discussion**

Subclinical mastitis (SCM) is a common problem in lactating cows worldwide. USG is quick and accurate diagnostic asset to get additional information about udder and teat in cattle positive for SCM. Udders and teats of 55 lactating cattle of

livestock farm, adhartal were screened using Ultrasonography (USG), Modified California test (MCMT), pH and Somatic cell count (SCC). All cows were screened by contact gel and water bath technique, in which 23 cows were positive for SCM (Plate 04-09).



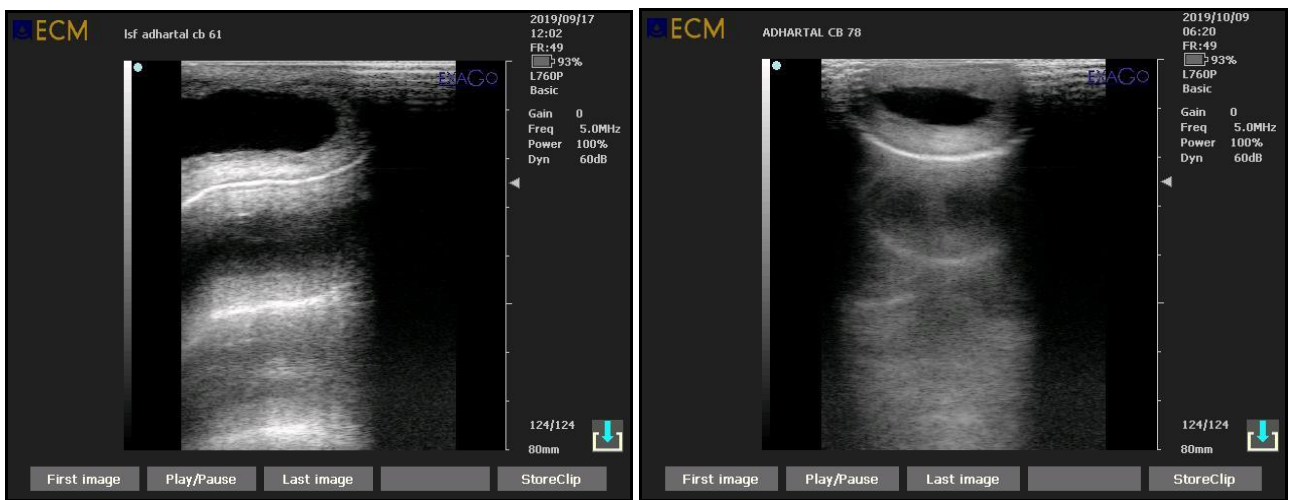
**Plate 4:** USG appearance of teat



(a) Udder parenchyma

(b) Parenchyma and collecting ducts

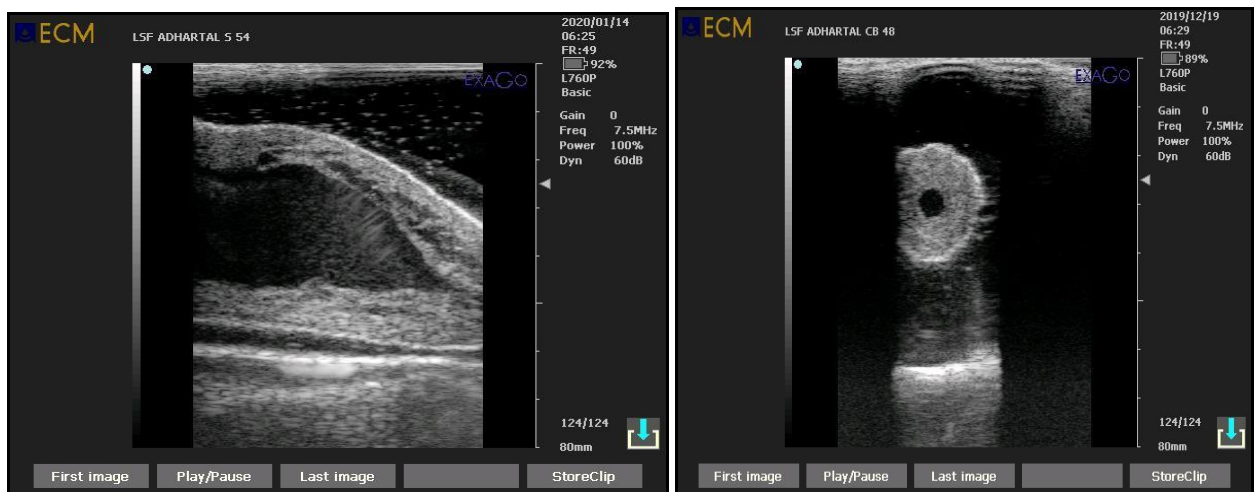
**Plate 5:** USG showing udder parenchyma and collecting ducts



(a) Vertical plane

(b) Sagittal plane

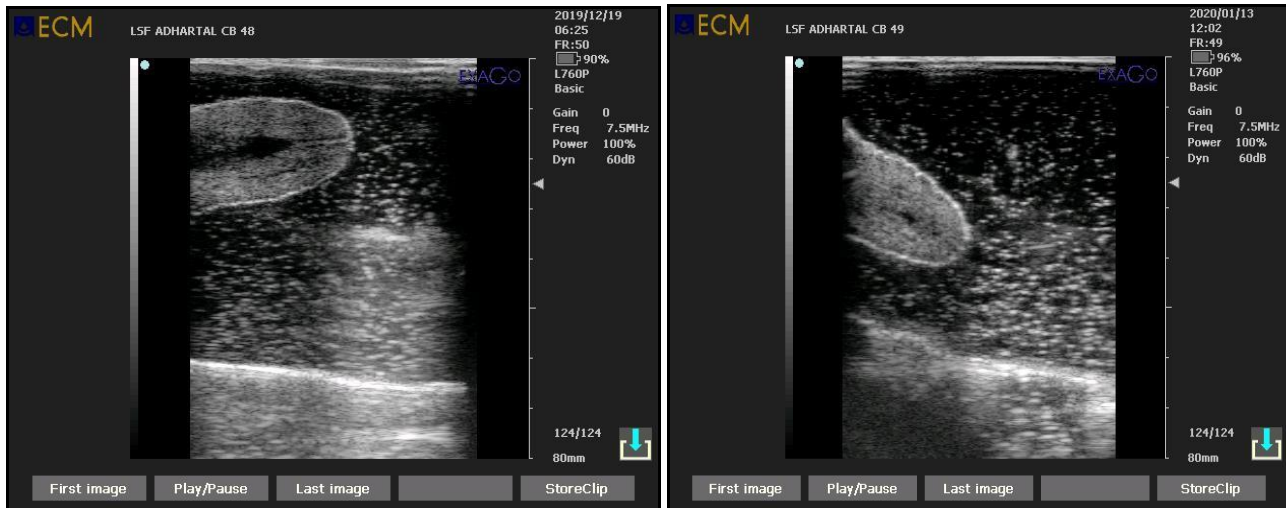
**Plate 6:** USG appearance of teat direct contact gel technique



(a) Vertical plane

(b) Sagittal plane

**Plate 7:** USG appearance of Teat by water bath technique



(a) USG of healthy teat

(b) USG of SCM positive teat

**Plate 8:** USG appearance of Healthy and SCM teat

Ultrasonography of the normal udder parenchyma revealed homogenous hypoechogenic parenchyma with interspersed anechoic blood vessel, milk alveoli and lactiferous duct. The gland cisterns appeared as a large homogenous anechoic area with few hypoechoic dots corresponding to the milk. These results were in accordance to Nak *et al.* (2005) [9], Rambabu *et al.* (2008) [10], Fasulkov (2012) [2], Kotb *et al.* (2012) [8] and Abd Al-Galil and Khalil (2016) [1]. Udder parenchyma of cows found positive for subclinical mastitis by MCMT appeared homogenous hypoechoic with lack of clarity of visualization of milk alveoli and lactiferous duct. There is loss of anechogenicity of gland cisterns and appeared as mixed hypoechogenic content. Similar findings have also been reported by Kotb *et al.* (2014) [8], Hussein *et al.* (2015) [6] and Abd Al-Galil and Khalil (2016) [1].

Teat wall of cow appeared in USG screening as three fold layer structure. The teat skin appears as outermost 1-2 mm thin, hyperechoic line, followed by the muscular/connective tissue layer containing blood vessels showing a thicker, homogenous, hypoechoic layer and the innermost mucous membrane appear as hyperechoic layer. The teat cistern appeared as an anechoic area with few hypoechogenic dots according to the presence of milk content. In subclinical mastitis, irregular outline of the teat canal and cistern, homogenous hypoechogenic contents and loss of three layered appearance of the affected teat wall (Plate 16). Similar findings were reported by Szenziova and Strapak (2012) [11] and Abd Al-Galil and Khalil (2016) [1].

The rosette of furstenberg appear normally as short hyperechoic line extending from the teat cistern into the papillary duct which could be defined as a thin, bright white line at the end of the teat. The similar findings were recorded by Khol *et al.* (2006) [7] while Nak *et al.* (2005) [9] reported it as a homogenous hyperechoic structure located directly above the teat canal. In subclinical mastitis, there were overlapping of papillary duct, papillary orifice and rosette of furstenberg and its differentiation was difficult. These observations are in good agreement with the findings of Szenziova and Strapak (2012) [11], Kotb *et al.* (2014) [8] and Abd Al-Galil and Khalil (2016) [1].

### Conclusion

SCM is a common problem in lactating cows worldwide USG is quick and accurate diagnostic asset to get additional

information about udder and teat in cattle positive for SCM. Ultrasonography of udder and teat of subclinical cow revealed the homogenous hypoechoic udder parenchyma with lack of clarity of visualization of milk alveoli and lactiferous duct. Loss of anechogenicity of gland cisterns and appeared as mixed hypoechogenic content and outline of the teat canal irregular, cistern, homogenous hypoechogenic contents, loss of three layered appearance of the affected teat wall. There was overlapping of papillary duct, papillary orifice and rosette of furstenberg and difficult to differentiate.

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