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CAST FORMATION AND MAMMOGRAPHY STUDY OF THE INTRAGLANDULAR DUCT SYSTEM IN THE LACTATING UDDER OF ADULT INDIGENOUS COW (*Bos taurus)*

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ABSTRACT

The purpose of this study was to describe some characteristic features of the intraglandular duct system in the lactating udder of adult indigenous cow by cast forming and radiography study. Ten udders of local breed cows (5 for resin cast formation and 5 for radiological study), clinically appeared healthy and aged (2-5) years were obtained from Al- shoala slaughter-house in Baghdad city. Our study primed to describe and investigate of the intraglandular duct system of the local cow breed. The present finding was showed that the duct system was a network of unequal sizes tubules which was begins with the small intralobular ducts then interlobular duct empty into a collecting duct which drain the milk into the lactiferous sinus by a several of lactiferous duct, the lactiferous sinus forms a common cavity for each quarter of the udder which drain into the teat sinus and then teat canal.

INTRODUCTION

The cow was a one of the most important animals because it was the mains source of milk and meat production, the quantity of milk and its quality was directly dependent on the health of cow and in particular the health of the udder (1, 2, 3).

The study of intraglandular duct system was very important for evaluation of the morphological characteristics of the udder in the cow (4, 5). The duct system of the lactating udder was a tubules which drain the milk from the secretory units (alveoli) to the lactiferous sinus by a small intralobular duct and ended in the teat canal then the teat orifice (6, 7, 8).

The Iraqi cows consider as the primary dairy animals for many dairy products were including thick cream (gay mar), butter, and cheese (9).

Due to lack of anatomical and histological study on the udder of iraqi cow and specially the study of the intraglandular duct system which was consider the second important portion of udder beside the first portion which was the glandular part, so the aim of our study was to attentions to the possibility of using cast forming and radiological technique to investigate of the pattern of intraglandular duct system to summarize the data for better understanding the function of milk production.

MATERIALS AND METHODS

To investigate the duct system in the lactating udder of Iraqi cows, ten udders of apparently healthy of local Iraqi cows aged 2-5 years were clinically healthy and normally appearance which collected immediately after slaughter from Al-shoala slaughter-house in Baghdad city.The udders were located in the inguinal region which removed with it was skin covering and care was taken to avoid injury of udder tissue. The specimens were divided into two groups 5 udders for cast forming and 5 udders for radiological study.

The cast form of resin technique:

For producing three dimension cast of the intraglandular duct system, the five udders were injected with Cold Cure Acrylic resin (Fig.1) which was powder and liquid in mixed ratio of 2gm to 12ml liquid this ratio give about 17 minutes to setting which was enough time to complete injection.

The resin was injected by hand and using 50ml syringe and polyether catheter inserted in the teat orifice of each quarter and the resin was injected as a single dose in each gland. After complete the injection, the teat orifice was close by ligation it to prevent oozing the resin mixture from the teat orifice. Each gland gets a single dosage of resin which were (10, 20, 30, 40, 150) ml.

The injected udder was kept for 24 hours in a room temperature to complete setting of resin was occurs. After that the second step was the maceration which was done by 40% KOH solution for 4 days. The KOH solution was changed every day and in each change the cast gently rinse with tap water and cover with new solution of 40% KOH.

Each udder was kept in separation suitable plastic container full with a solution for 4 days.

The solution was changed every day, at the end of the fourth day complete maceration of soft tissue was occur, the cast thoroughly washed in tap water for three hours then the cast was dried by hot air. The cast was examined by the naked eye and magnified lens for study, greet care was taken to the all parts of cast (10).

Mammography study:

The mammography was a radiographic term used for description the distribution of intraglandular duct system imaging by using contrast media (11). The use of mammography as a useful tool for the evaluation of morphological characteristics of the udder and teats in dairy cattle, to summarize the data related to ultrasound examination in cows (12).

The radiological images were down by using contrast media on the fresh isolated udders to investigate pattern of the intraglandular duct system in lactating udders.

Two types of contrast media used in this study were Ultravist 370 (Iopromide 370 mg I/ml) which was an Iodine compound and Barex (Barium sulphate) (Fig.2).

The contrast media was injected manually by hand and using 50ml syringe and poly ethylene catheter of 20cm length and 3mm diameter inserted through the teat orifice. Four dosage (5-10-15-20) of contrast media were injected in each gland, and a single exposers (radiological image) was taken after each injected dosage to follow the contrast media passing in the duct system of each gland.

For donning x-ray image, the x-ray digital machine (Siemens Germany) was controlled on the following parameters were used: KV. (60), Time exposer (4.5) msec and focus film distance FFD (80) cm. (11).

RESULTS AND DISCUSSION

The cast form of resin: To make a complete gland cast forming, the resin must be have low viscosity to allow the resin for passes through small ducts to reach into the alveoli quickly as possible before the resin was set. The proper time (17) minutes which was prepare previously through the ratio mixture was (2 to 12) help to produce good cast, through given enough time to complete injection before setting of resin.

The manual injection of resin by syringe produce enough pressure to push the resin through the duct system without making damage of fine duct and alveoli, this result was agreement with the finding of (10), who reported the using of air compressor in the process of injection may be produce rapture in a fine duct.

The time of maceration usually depended on the concentration of the KOH solution and the size of specimen (13). The thourghly of the cast after maceration was much imparted the clean cast from the macerated debris and to remove the harmful effect of KOH on our hand during handling the cast to examined.

At a first observation, the cast produce by a half udder (fore and hind quarters), the cast shows each quarter produce a single gland and appear as heavy branched free-seem spongy mass from dense meshwork of resin (Fig.3) this was agreement with (14) in she-camel and (15) in goat.

The hind gland slightly larger than the fore one of the same half (Fig.3) this result was uncontract with the results of (14) in she-camel which found that each quarter possesses two gland completely separated from each other, with fore (large) and hind (small) gland of the same halve.

The ventral extremity of the cast of each gland, showing spindle rod-like projection (3.5 cm) from the cast which was the teat sinus with the teat canal, connected with the base of each gland (Fig.3, 4). Same results were found by (16, 17) which used epoxy resin in sheep mammary gland, also agreement with the results of (14) in she-camel. While was contrast from the result of (18) in the teat of mammary gland in carnivorous, horse, pig which contain multiple teat camel and sinus separately at the teat apex.

The lactiferous sinus was a base of the gland which large, round and various in size cavity (Fig.4, 5). The lactiferous sinus was connected ventrally with the teat sinus and dorsally with a several lactiferous ducts were relatively large and open dorsally on it (Fig.4, 5, 6) same result was observation in she-camel by (14).

Each lactiferous duct received several small diameter collecting ducts and the collecting duct formed from several interlobular duct which ended by many intralobular duct which was the fines branches and ended by the alveoli which appear as very small round sac-like structure (Fig.6, 7). This same as in she-camel by (14, 15) in the goat.

Radiological study:

Our results in radiological study showed at the begins of injection (5ml) of the contrast media via the teat orifice, the contrast media pass up through the teat canal, teat sinus and small amount distributed in the lactiferous sinus. The teat canal and sinus appears as long narrowed spindle in shape (Fig.8), that similar finding were recorded by (19) in small ruminants and (14, 20) in she-camel.

At second injection (10ml), the contrast media progressive move up in the lactiferous sinus. The contrast media when injected in the fore quarter was showing begging of lactiferous duct, while in the hind quarter the contrast media distributed horizontally (Fig.9).

This variable bet in the fore and hind quarters due to the fore quarter was smaller in size than hind quarter so the contrast media move more up, similar finding of (19) in ewe which has irregular lactiferous sinus and clearly diameter lactiferous sinus in she-goat. While (20) showed the lactiferous sinus appear as large round structure in she-camel.

At the third injection (15ml) of contrast media, the lactiferous sinus in fore quarter was felled and the origin of lactiferous duct were appeared, also the lactiferous sinus of hind quarter was felled with contrast media (Fig.10).

As contras media more injected (20ml) it pass more up reaching the alveoli by passing through the lactiferous duct, collecting duct, interlobular and intralobular duct (Fig.11, 12) similar finding was found by (20) in she-camel, (21) in goats and (8) in cow.

Fig1: Injectable materials: shows three types of Cold Cure Acrylic Resin which were used in cast formation.

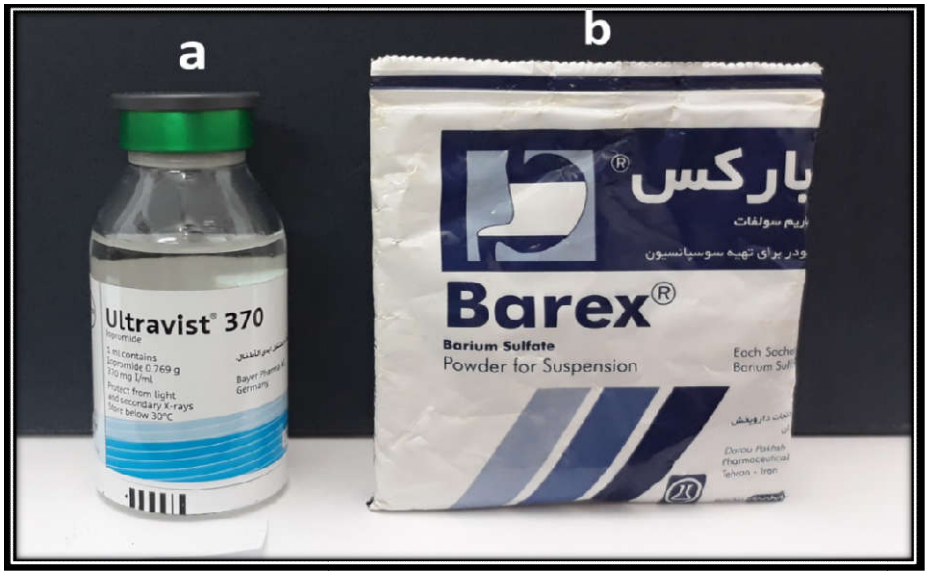

Fig.2: Contrast media, shows two types of the contrast media which were used: a. Iopromide b. Barium sulphate

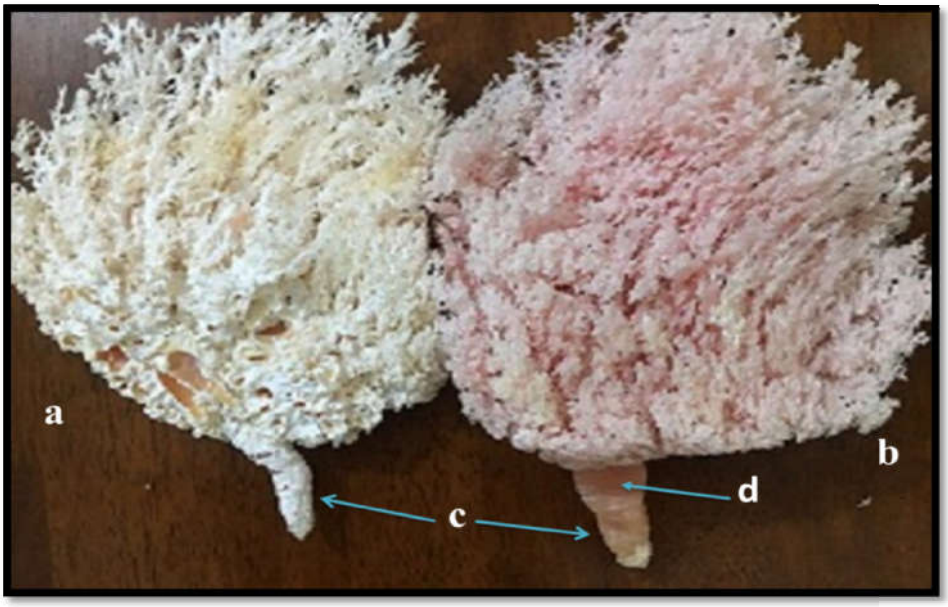

Fig.3: Cast form of the right halve of the lactating udder in local Iraqi cow shows: a.Fore quarter b.Hind quarter c.Teat canal d.Teat sinus.

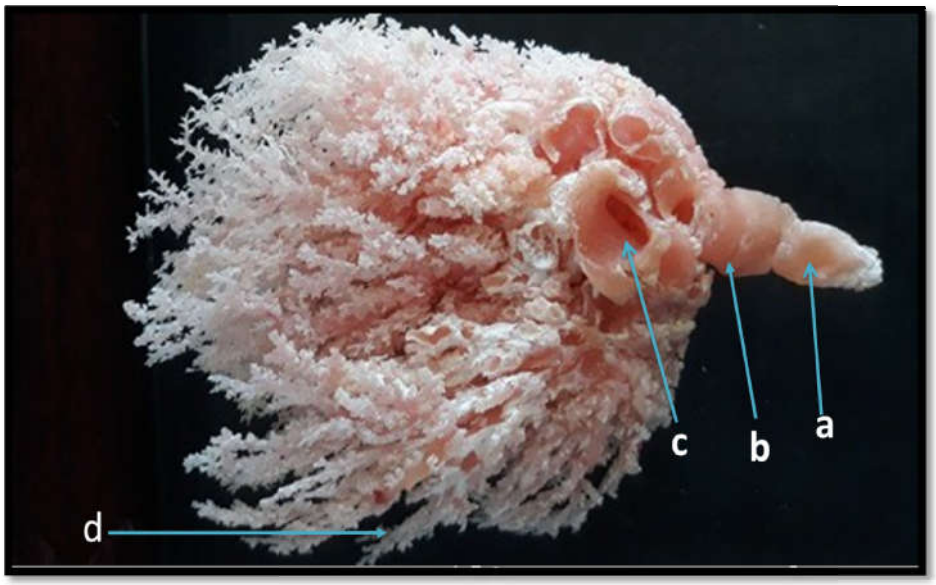

Fig.4: Cast form of the hind quarter in the lactating udder in local Iraqi cow shows: a.Teat canal b.Lactiferous sinus c.Lactiferous sinus d.Lactiferous duct.

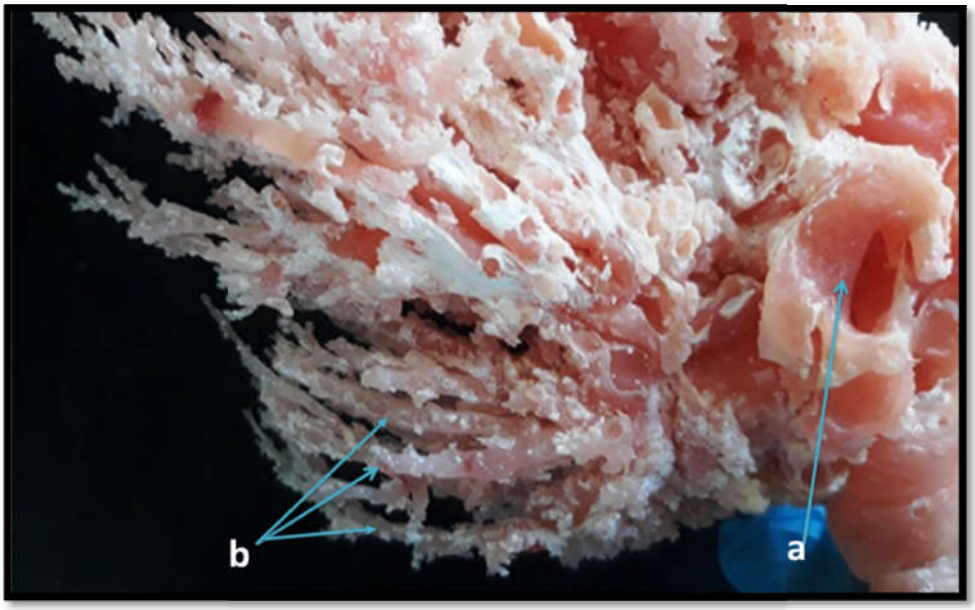

Fig.5: Cast form of the lactating udder in local Iraqi cow shows:
a.Lactiferous sinus b.Lactiferous duct.

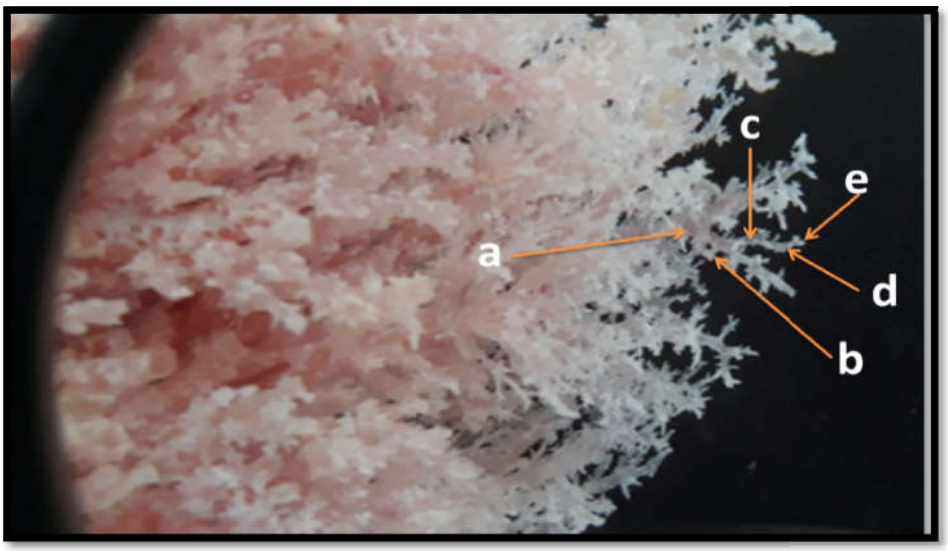

Fig.6: Cast form of the lactating udder in local Iraqi cow shows:a.Lactiferous duct b.Collecting duct c.Interlobular duct.d.Intralobular duct e.Alveoli.

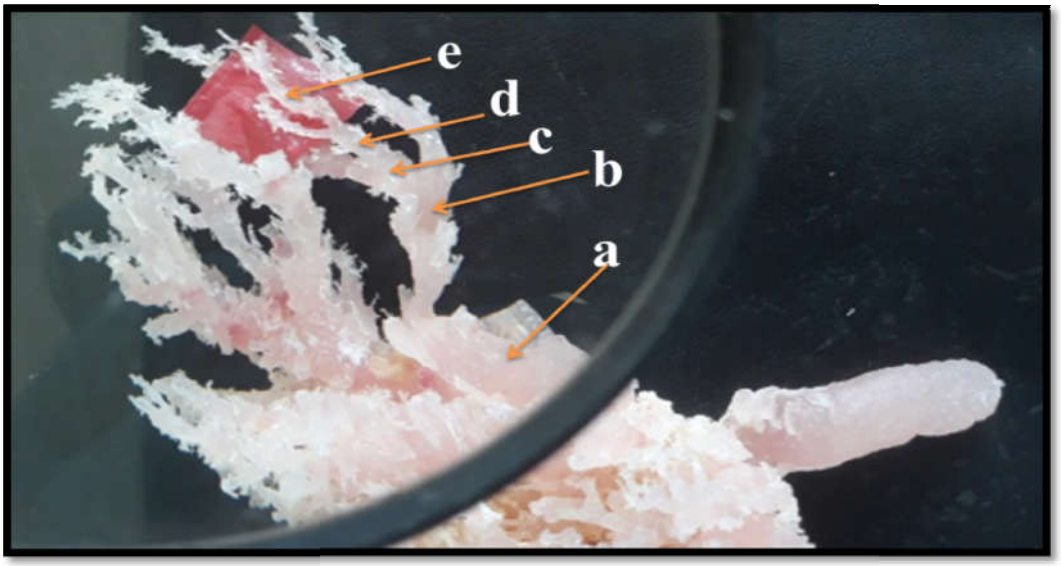

Fig.7: Cast form of the lactating udder in local Iraqi cow photed with magnifying glass shows: a.Lactiferous sinus b.Lactiferous duct c.Collecting duct d.Interlobular duct e.Intralobular duct.

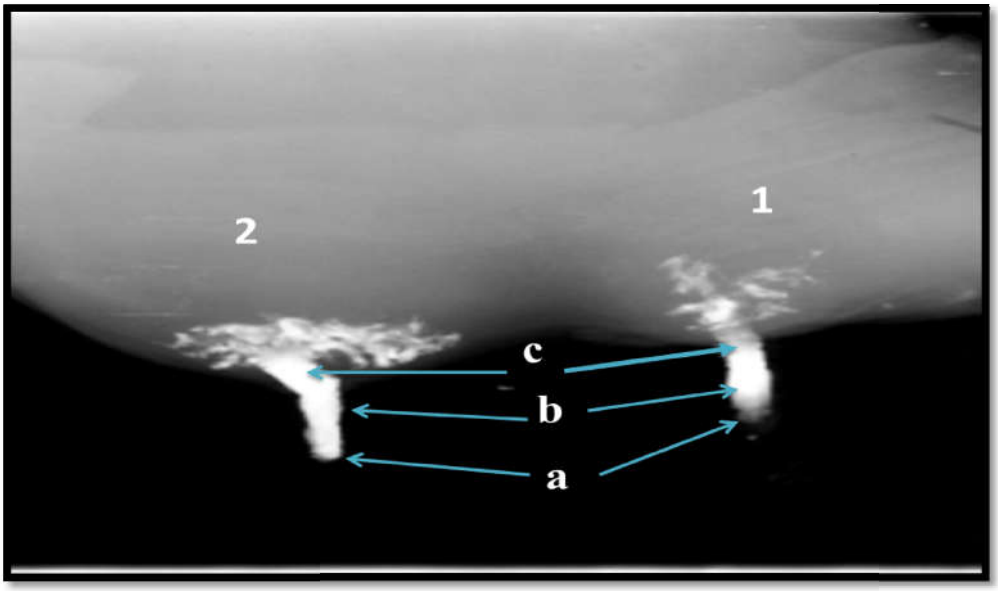

Fig.8: Radiographic picture of the right halve in lactating udder shows: a.The teat orifice b.The teat canal c.Teat sinus 1. Fore quarter 2. Hind quarter(5ml of Barium sulfate contrast media).

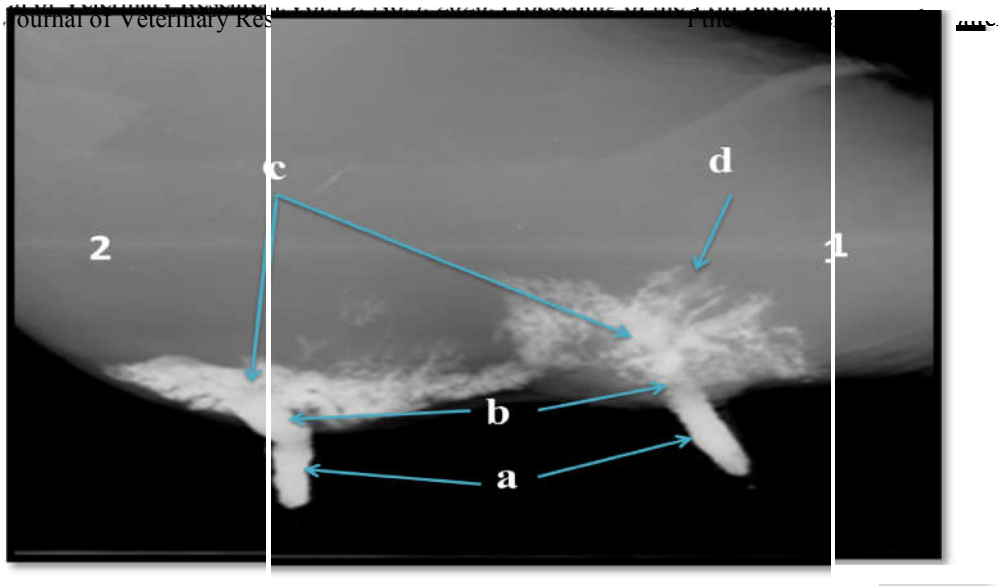

Fig.9: Radiographic picture of the right halve in lactating udder shows:
a.Teat canal b.Teat sinus c.Lactiferous sinus d.Lactiferous duct
1.Fore quarter 2.Hind quarter (10ml of Iopromide contrast media**).**

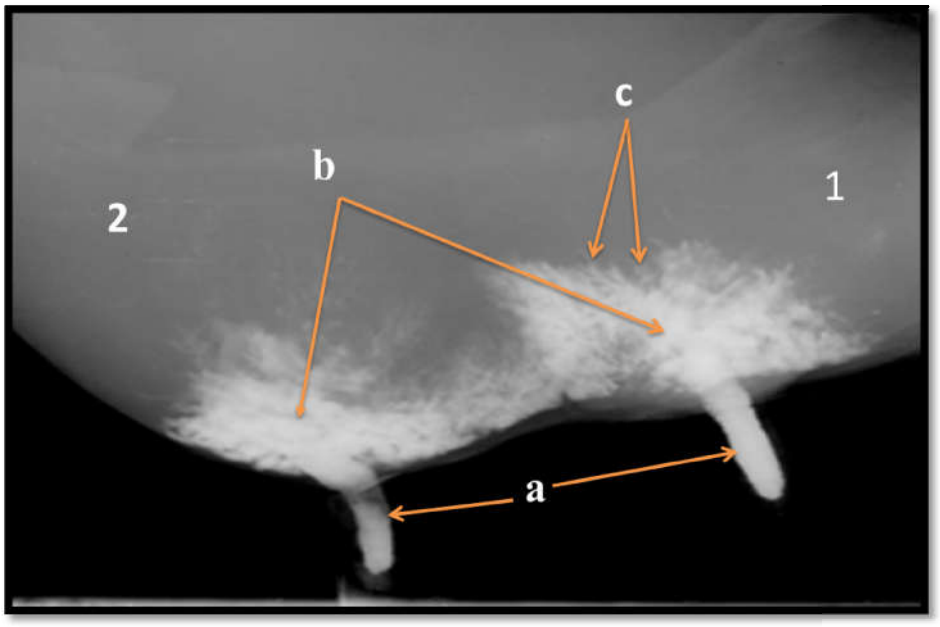

Fig.10: Radiographic picture of the left halve in lactating udder shows:
a.Teat canal b.Lactiferous sinus c.Lactiferous ducts 1.Fore quarter 2.Hind quarter(15ml of barium sulfate contrast media).

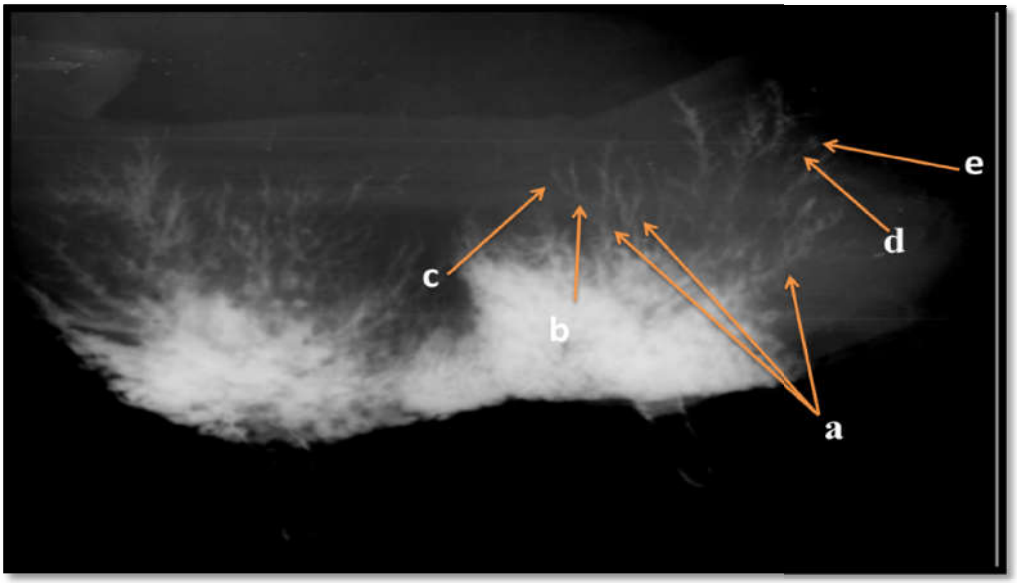

Fig.11: Radiographic picture of the right halve in lactating udder shows: a.lactiferous ducts b.Collecting duct c.Interlobular duct d.Intralobular duct e.Alveoli (20ml of Iopromide contrast media).

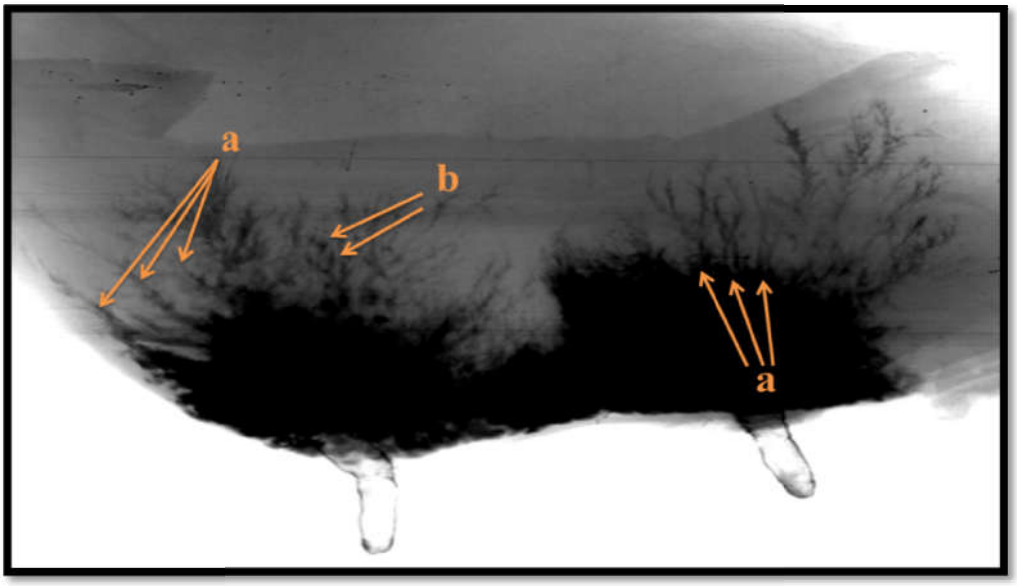

Fig.12: Negative radiographic picture of the right halve in lactating udder shows: a.lactiferous ducts b.Alveoli (20ml of Iopromide contrast media).

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