

## ORIGINAL ARTICLE

# Morphological study of Dulaa in Iranian one Humped Camel Embryos

E. Salehi\*, M.Morovati Sharifabad\*

\* Department of Veterinary Science, Ardakan University, Ardakan, Yazd, Iran

### ABSTRACT

The soft palates of 50 camel embryos were collected from 2 till 13 month age for developmental study. Camel uteruses were gathered from slaughter house in Yazd province. After dissecting the uteruses, the age of fetuses was measured by CRL formula. Then head of embryos were separated and after dissection maxilla and mandible, length, thickness and width of dulaa were measured also existence the orifice in dulaa were evaluated. The present study revealed that, morphogenesis of soft palate was a complicated developmental process that required two main events; elevation and then fusion of the palatal shelves. The palatal development began at 2.5 cm CRL camel embryo, and was completed at 6 cm CRL camel fetus. The two secondary palatine shelves were hanged vertically on both sides of the primitive tongue at 2.8 cm CRL camel embryo. It began to be elevated from a vertical to horizontal position, above the dorsum of the primitive tongue at 3 cm CRL camel embryo, with the appearance of the primitive palatine ridge at the same age. The primitive ridge appeared as an epithelial thickening at the junction between the lateral surface of the palatine shelves (future oral surface) and the maxillary process, with an apparent condensation in the subjacent mesenchyme. The close contact of medial epithelial edge (MEE) could be detected at 5.7cm CRL camel embryo. For fusion of the palatal shelves to be occurred, there was a breakdown of the MEE, followed by the fusion of the mesenchyme of the two secondary palatine shelves. This fusion took place rostro-caudally in its direction. The result of macroscopic evaluation shown that formation of dulaa is occurred in 4rd embryonic month and continue up to 7 month of gestation. Also, development of soft palate and dulaa in male and female embryo was similar.

**Keywords:** development, dulaa, camel, embryo, morphology

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## INTRODUCTION

The dulaa is a unique diverticulum on the ventro-rostral part of the soft palate of the dromedary camel [15]. It is extruded from the buccal cavity during the rut or under excitation [1]. A small minority of camels do not protrude the dulaa throughout their life time. The presence of dulaa outside the buccal cavity makes it vulnerable to trauma [6]. Several reports describe the affections of the dulaa in Arabian camel [2, 11, 12, and 26]. These reports have shown that minor ulcerations with subsequent camels [3, 4, 24, 25, 28, flaccidity of the dulaa may lead to its impaction with feed [25, 4]. Furthermore, neglected injuries may lead to gangrene of the organ with subsequent dysphasia and dyspnoea [10]. Despite the importance of the dulaa the developmental findings, is rarely documented [23, 24]. The aim of the present study was conducted to give detailed description about the morphogenesis of the dulaa in one-humped camel (*Camellus dromedaries*), an important breed of camel in Iran, which may be helpful in the field of biological science.

## MATERIALS AND METHODS

Fifty camel embryos and fetuses of both sexes, ranging from 2 till 13 month age were used for developmental study in this research. These specimens were collected from abattoirs in Yazd province. After dissecting the uteruses, the suggested ages were estimated according to the CRL previously cited formula (7). The whole embryos and fetuses were fixed immediately using 10% neutral buffered formalin, solution. Then head of embryos were separated and after dissection maxilla and mandible,

length, thickness and width of dulaa were measured by ruller and caliper. The topographic location, shape of dulaa was recorded. Then the data were analyses by Student T. Test.

**RESULT**

Dulaa is part of soft palate which composed of two parts: left and right segment which is exposed laterally near the palatoglossal arch. Each segment consists of two fold, lateral and medial, and small diverticulum. Left and right fold of dulaa has the same morphological feature in both sides. In 2<sup>nd</sup> month of embryonic period dulaa have not been observed macroscopically. formation of dulaa began between 3 to 13 month of gestation at the end of hard palate (fig1 & fig2). At the beginning time of formation small right and left diverticulum have been formed and depth of this diverticulum is more. At the last months (12 till 13 months) of gestation, transverse folds at the bottom of dulaa begin to form. Length of Dulaa than the length of the soft palate is on the rise (fig 3). The distance between inner and outer folds in both right and left side IS HIGH AT FIRST but Over time, with increased age of the fetus as well as, the thickness of these folds raised, and closer to each other. (fig3&4). but the average thickness of internal fold than external is more (chart1). Compare the length and width of Dulaa in the same age of male and female embryos show that at the level of (p < . / .5) difference between two sexes is not statistically significant (figures 1 and 2).



Fig .1.formation of soft and hard palate (2 month of gestation)  
1- Soft palate 2-hard palate



Fig .2.dulaa and soft palate) 4 month of gestation)  
1- Interpharyngeal orifice 2-soft palate 4-external fold 3-internal fold 5-hard palate

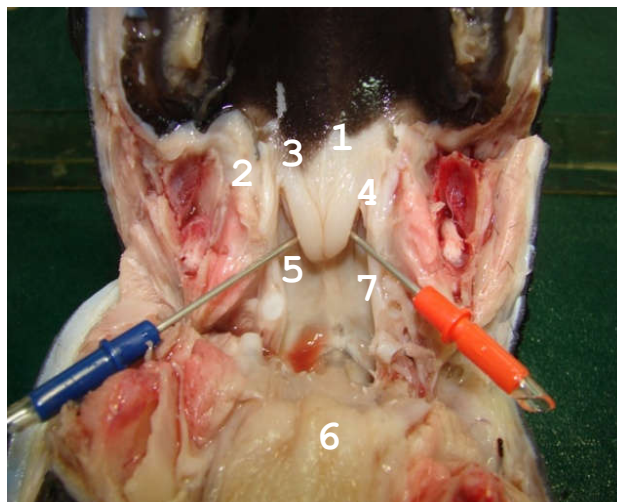


Fig.3. Dulaa folds formation (6 month of gestation)  
 1- hard palate 2-external fold 3-internal fold 4-soft palate 5-palatopharyngeal fold  
 6-Thoung 7-palatoglossal arch

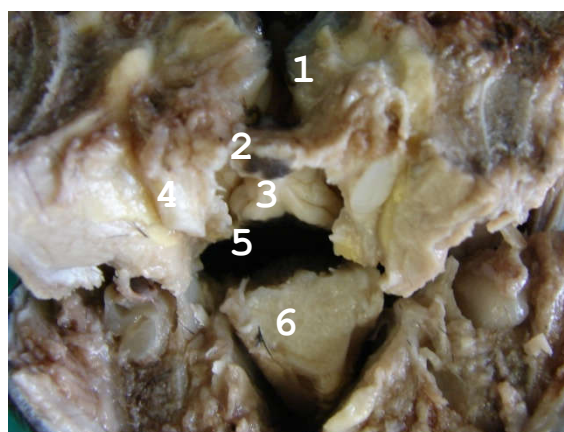


Fig.4. Transverse section of head (7 month of gestation)  
 1- choana orifice 2-palatolinguine  
 3-internal fold 4-external fold 5-oropharynx region 6-tongue

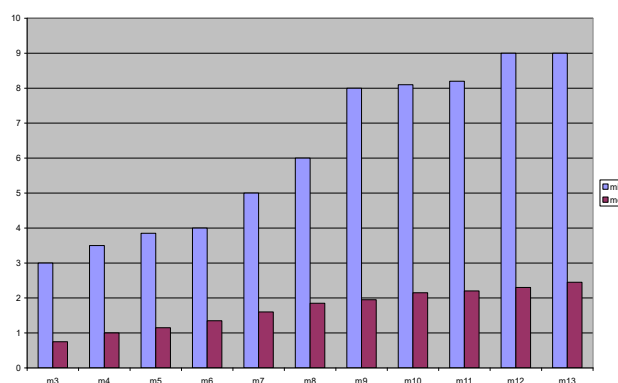


Chart.1. Average thickness of internal fold (Mi) against external fold (Me)

### DISCUSSION

The current study attempted to increase the information about the normal palatogenesis in camel. The present study revealed that, the palate development was detected at 2.5 cm CRL, and was completed at 6 cm CRL camel embryo. On the same line, in human, it begins at the end of 5<sup>th</sup> week of intrauterine life and completed at 12<sup>th</sup> week [19]. In rat, it begins at 12.5 day mouse fetus [20] and in ferret, at 27 days of gestation [14]. The formation of the secondary palate could be traced in human at 9<sup>th</sup> week, in rat at 16<sup>th</sup>

day, in cat at 32nd day, in dog and pig at 33th day, in horse at the 4th week and in cow at 8th week. These findings are due to species variations, and were tabulated in previous record [22]. The present context revealed that, there were two distinct secondary palatine shelves, hanged vertically on either side of the primitive tongue at 2.8 cm CRL camel embryo. It is unknown why the shelves attain this vertical orientation. It has been proposed that, the direction of shelves growth is related to the amount of space available in the oronasal cavity during the period of palatogenesis [8, 9]. The evolution of the large muscular mammalian tongue constrains the shelves to grow vertically, until sufficient space can be created in the oronasal cavity [9]. The present investigation demonstrated that, the palatine shelves began to be elevated from a vertical to horizontal position, above the dorsum of the tongue at 3 cm CVRL camel embryo. This elevation is completed within a day as previously mentioned [22]. These findings correlated with that reported in human [19], as this event occurs rapidly, possibly in a matter of hours. Several mechanisms have been proposed to account for rapid movement of palatal shelves, from the vertical to the horizontal position, and the source of forces responsible for this reorientation. Two categories of explanation have been provided; either the forces are extrinsic to the shelves (movement of the tongue), or they are generated intrinsically by the shelves mesenchyme, due to the hydration of extracellular matrix component of the mesenchyme [5]. The downward movement of the tongue due to the mandibular growth spurt clearing a path for palatal shelves elevation [16, 17]. Concerning the close contact of the medial edge epithelium (MEE) at 5.7.0 cm CRL camel fetuses. There have been several theories on the mechanisms of MEE degeneration. The first theory [27] suggested that, it occurred as a result of programmed cell death. The second theory disputed this degeneration on the grounds, that there was no evidence of any cell debris or phagocytic activity at any time during this process.[13].In the present study, the primitive palatine ridge firstly observed at 3.5 cm CRL camel fetus as an epithelial thickening, at the junction between the lateral surface of the vertical palatine shelves and the maxillary process. This is come in parallel to that found in rat embryo at 12th day [29]. The consequence of fusion of the two secondary palatine shelves in the present work took its place rostro-caudally in its direction. This result is consistent with that happened in human [21]. In contrast, it occurs in the middle region of the shelves, then followed posterior, whereas the final part to close in the region of the incisive canals, in hamster and in mouse [18].

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