

EFFECT OF GENDER AND AGE OF DROMEDARY CAMEL ON THE NATURE OF DERMOID CYST

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ABSTRACT

Dermoid cyst is more common than other cutaneous cysts in camels. This study recorded the effects of camel's gender and age on the nature of dermoid cysts. A total of 1745 camels (*Camelus dromedarius*) were examined clinically for the presence of dermoid cyst, depending upon its characteristic location and clinical signs as well as paracentesis. A complete case history was taken whenever possible. The affected animal was subjected to thorough clinical examination. Gross examination of the cysts was also performed. The data were statistically analysed. Out of 1745 examined camels, 35 camels (2.01%) had 39 dermoid cysts. All of the recorded cysts were congenital and located at the anterolateral aspect of the cranial third of the neck, just over or near the jugular vein. The affected camels were 21 males and 14 females. The age of diseased camels ranged between one and 16 years. The recorded dermoid cysts located at the right side of neck in 18 camels and at the left one in 13 camels. However, four camels had bilateral dermoid cysts. The cyst appeared as fluctuating, round or oval, painless and movable swelling covered with normal haired skin. Gross examination of the cyst revealed a well-defined, encapsulated sac. The interior of cyst was lined with haired uneven skin and had multiple hair tufts, squamous debris, keratinous material, masses of greasy scales and coffee-coloured fluid. The cysts were either unilocular or multilocular and volume of the cystic contents ranged between 4 and 250 mL. There were no statistically significant associations between the camel's gender and the nature of the dermoid cysts ($P > 0.05$). However, there were statistically significant associations between the camel's age and the nature of the dermoid cysts in terms of volume of the cystic contents and presence of septa ($P < 0.05$). Each one-year increase in the affected camel's age increased the volume of cystic contents by 17.01 mL ($R^2 = 0.96$, $P < 0.0001$). In conclusion, dermoid cyst is a common congenital cutaneous cyst in camels and has an identical location as well as characteristic features. The camel's age has an effect on the nature of dermoid cyst in terms of volume of the cystic contents and presence of septa.

Key words: Camel, cutaneous cyst, dermoid cyst, dromedaries, neck swelling, paracentesis

Dermoid cysts are an uncommon developmental aberration that causes focal reduplication of the whole skin structure, including the epidermis and adnexa. They are often congenital, although not always hereditary. Moreover, dermoid cysts appear to affect camels more than other cutaneous cyst (Purohit *et al*, 1989; Ramadan, 1994). Dermoid cysts have been recorded in different animal species and at different locations, mainly in the head and neck regions as shown in Table (1). Dermoid cyst can be single or many, monolocular or multilocular and unilateral or bilateral (Purohit *et al*, 1989; Ramadan, 1994; Abu-Seida and Ahmed, 2007).

Clinically, the cyst appears as a soft, fluctuating, painless, well defined and easily moveable circumscribed swelling of various diameters. The skin above the cyst appears normal (Purohit *et al*,

1989). Aseptic exploratory puncture produces dark thin odourless fluid (Ramadan, 1994; Fouad *et al*, 2001). Sometimes the cyst changes to abscess due to secondary bacterial infection caused by the ignorant intervention by the animal owner (Abu-Seida and Ahmed, 2007).

Ultrasonography, the cyst appears as a sac enclosed by a hyperechoic thick capsule and has heterogenic contents. The contents show a mixture of anechoic fluid and hyperechoic irregular scales and hair (Abu-Seida and Ahmed, 2007).

Under the microscope, the dermoidcyst in camels is lined by an ordered wall of stratified squamous epithelium. The lumen includes tufts of hair, scales and fluid. The basal cell layer has a large number of melanocytes. The dermis also contains sweat and sebaceous glands, as well as hair

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follicles. The epithelial wall invades the dermal-epidermal junction in an attempt to produce a new cyst containing intraluminal keratin. The dermis has sebaceous gland hyperplasia (Fouad *et al*, 2001).

For treatment, careful surgical excision of the dermoid cyst in camels is a curative therapy without recurrence or complications. The excised cyst contains brown thin fluid, hair tufts and grayish greasy scales. The cyst wall is thick, but the interior skin lining is haired, gray and irregular (Purohit *et al*, 1989; Ramadan, 1994; Fouad *et al*, 2001).

There are no data about the effects of gender and age of the affected animals on the nature of dermoid cysts in camels (*Camelus dromedarius*). This study records, for the first time, the effects of camel's gender and age on the nature of dermoid cysts.

Material and Methods

The present study was conducted on 1745 camels (*Camelus dromedarius*) from January 2023 through January 2024. These camels were collected from Berkash camel market and abattoirs in Cairo, Giza and Fayoum Governorates, Egypt. A complete

case history was taken whenever possible. The camels were examined for presence of dermoid cyst. The affected camel was subjected to thorough clinical examination. The diagnosis of dermoid cyst was based upon its characteristic location and clinical features as well as paracentesis. Gross examination of the cyst was also performed.

Data were presented as means \pm SE for quantitative variables and percentages for qualitative variables. Results were analysed using Pearson's correlation coefficient (*r*), the coefficient of determination (*R*²) (linear regression analysis) and Fisher's Exact test (*FET*) to examine the relationship between variables. PASW Statistics for Windows, Version 18.0.(Chicago: SPSS Inc.) was used for statistical analysis. Significance was set at *P* < 0.05.

Results

Out of 1745 examined camels, 35 camels (2.01%) had 39 dermoid cysts. The obtained case history revealed that all recorded cysts were congenital. Moreover, the cyst started as a firm, non-painful and round mass that grew slowly and became fluctuating

Table 1. Location of the recorded true dermoid cyst in different domestic animal species.

Animals	Locations	References
Camel	At the anteroventral aspect of the cranial third of the neck	Purohit <i>et al</i> (1989) Ramadan (1994) Fouad <i>et al</i> (2001)
Cattle	At periocular region At the ventral midline of the cranial portion of the cervical area At the nasolacrimal duct At the mandibular gland	Adams <i>et al</i> (1983) Baird <i>et al</i> (1993) Steinmetz <i>et al</i> (2009) Sato <i>et al</i> (2023)
Horse	At the temporal area At dorsal midline At the lower jaw	Mason (1974) Hillyer <i>et al</i> (2003) Bienert-Zeitel <i>et al</i> (2011)
Donkey	At the ventral aspect of the cranial third of the neck just caudal to the larynx	Abu-Seida and Ahmed (2007)
Sheep	At the neck region	Jubb and Kennedy (1970)
Goat	Anteroventral aspect of the cranial third of the neck	Gamlem and Crowford (1977)
Dog	At the dorsal skull At the intracranial region At the cervical region At the tongue At the intestine At the abdomen	Alexander (1981) Targett <i>et al</i> (1999) Tshamala and Moens (2000) Liptak <i>et al</i> (2000) Saber <i>et al</i> (2013) Jones <i>et al</i> (2019) Kim <i>et al</i> (2022)
Cat	At the spinal cord at the level of the third thoracic vertebra At the intracranial region At the thyroid glands At sublumbar and flank regions At the tail At the nasopharynx At the spinal cord at level of the 7 th to 8 th thoracic vertebra	Henderson <i>et al</i> (1993) Chenier <i>et al</i> (1998) Rochat <i>et al</i> (1996) Tolbert <i>et al</i> (2009) Akhtardanesh <i>et al</i> (2012) Koch <i>et al</i> (2022) Nishida <i>et al</i> (2024)
Pig	At the mammary gland	Günther (1967)

over the time. The affected animals had normal clinical parameters.

All of the recorded cysts were located at the anterolateral aspect of the cranial third of the neck just over or near the jugular vein and had various diameters (Fig 1). Regarding the gender, the affected camels were 21 males and 14 females. The age of diseased camels ranged between one and 16 years. Concerning laterality, the recorded dermoid cysts located at the right side of neck in 18 camels and at the left one in 13 camels. However, four camels had bilateral dermoid cysts.

The cyst appeared as fluctuating, round (n=35) or oval (n=4), painless and movable swelling covered



Fig 1. Dermoid cyst in camels. Small-, medium- and large-sized cysts at the right side of the cranial third of the neck.

with normal haired skin. Gross examination of the cyst revealed a well-defined, encapsulated sac. The interior of cyst was lined with haired uneven skin and had multiple hair tufts, squamous debris, keratinous material, masses of greasy scales and coffee-coloured fluid. The recorded cysts were either unilocular (n=34) or multilocular (n=5). The volume of the cystic contents ranged between 4 and 250 mL.

Statistical analysis revealed that there were no statistically significant associations between the camel's gender and the nature of the recorded dermoid cysts ($P > 0.05$) as shown in Table (2). However, there were statistically significant associations between the camel's age and the nature of the recorded dermoid cysts in terms of volume of the cystic contents and presence of septa ($P < 0.05$) as shown in Table (3). There were no statistically significant associations between the camel's age and the shape as well as involvement of the dermoid cysts ($P > 0.05$).

A strong positive correlation was noticed between the camel's age and volume of the cystic contents ($r = 0.98$, $P < 0.0001$) as shown in Fig (2). The linear regression analysis indicated a significant association between the camel's age and the volume of cystic contents of dermoid cyst, where each one-year increase in the affected camel's age increased the volume of the cystic contents by 17.01 mL ($R^2 = 0.96$, $P < 0.0001$).

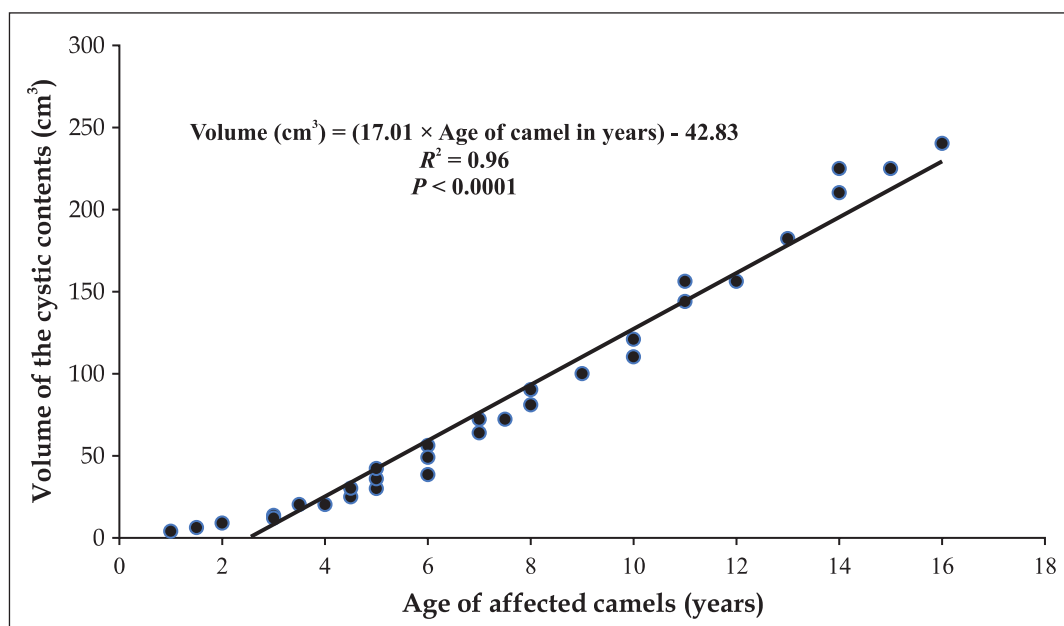


Fig 2. Scatter plot between the age of the affected camels (N=39) and volume of the contents of the recorded dermoid cysts. The equation of regression analysis and the coefficient of determination (R^2) are indicated in the figure ($P < 0.05$).

Table 2. Effect of camel's gender on the nature of the recorded dermoid cysts.

Nature of cysts and age of affected camels		Total number (39)	Gender		P-value
			Female	Male	
Involvement	Bilateral	8	2 (50%)	2 (50%)	1.000
	Unilateral	31	12 (38.7%)	19 (61.3%)	
Shape	Oval	4	1 (25%)	3 (75%)	0.631
	Round	35	15 (42.9%)	20 (57.1%)	
Presence of septa	Multilocular	5	2 (40%)	3 (60%)	1.000
	Unilocular	34	14 (41.2%)	20 (58.8%)	
Volume (mL)	4 to 15	6	2 (33.3%)	4 (66.7%)	0.939
	20 to 50	15	6 (40%)	9 (60%)	
	51 to 100	8	4 (50%)	4 (50%)	
	110 to 250	10	4 (40%)	6 (60%)	

Table 3. Effect of camel's age on the nature of the recorded dermoid cysts.

Nature of cysts		Age (year)					P-value
		Total number (39)	1 to 3.9	4 to 6.9	7 to 10.9	11 to 16	
Involvement	Bilateral	8	0	4 (100%)	0	0	0.113
	Unilateral	31	7 (22.6%)	9 (29%)	8 (25.8%)	7 (22.6%)	
Shape	Oval	4	1 (25%)	3 (75%)	0	0	0.380
	Round	35	6 (17.1%)	12 (34.3%)	9 (25.7%)	8 (22.9%)	
Presence of septa	Multilocular	5	0	0	1 (20%)	4 (80%)	0.004*
	Unilocular	34	7 (20.6%)	15 (44.1%)	8 (23.5%)	4 (11.8%)	
Volume (mL)	4 to 15	6	6 (100%)	0	0	0	< .0001*
	20 to 50	15	1 (6.7%)	14 (93.3)	0	0	
	51 to 100	8	0	1 (12.5%)	7 (87.5%)	0	
	110 to 250	10	0	0	2 (20%)	8 (80%)	

Discussion

Dermoid cysts are more common than other cutaneous cysts in camels (Jubb and Kennedy, 1970; Ramadan, 1994). According to Jubb and Kennedy (1970), dermoid cysts are often slow-growing and asymptomatic unless they develop into an abscess. Similarly, the present findings revealed that the cyst started as a firm, non-painful and round mass that grew slowly and became fluctuating over the time. Moreover, the affected animals had normal clinical parameters.

True dermoid cyst is congenital but not always hereditary and it is caused by aberrant ectoderm and

blastoderm folding in embryos (Purohit *et al*, 1989). Gamlem and Crawford (1977) reported dermoid cysts in the same locations on a doe and her progeny, perhaps related to hereditary congenital epithelial dysplasia. In addition, Jubb and Kennedy (1970) found an unconfirmed familial occurrence of dermoid cysts in Merino sheep. Congenital epithelial dysplasia is the most usually proposed explanation. However, there is limited evidence to back up this notion (Gamlem and Crawford, 1977). The affected camels in this study were genetically unrelated, making hereditary causes of the dermoid cyst unlikely. Nevertheless, the recorded dermoid cysts in the present research

are congenital in origin. Rarely, traumatic epidermal implantation might possibly lead to development of dermoid cyst (Jubb and Kennedy, 1970).

Diagnostic imaging modalities like radiography (Steinmetz *et al*, 2009), ultrasonography (Abu-Seida and Ahmed, 2007), computed tomography (Jones *et al*, 2019; Koch *et al*, 2022; Nishida *et al*, 2024) and magnetic resonance imaging (Targett *et al*, 1999; Nishida *et al*, 2024) were used for diagnosis of deep dermoid cyst in different animals. In the present study, we depended upon the characteristic location, clinical features and paracentesis findings because they are confirmative for diagnosis of dermoid cyst.

The present results revealed that the total incidence of dermoid cyst in camels is 2.01%. Nearly similar finding (2.06%) was previously recorded by earlier authors (Fouad *et al*, 2001). All clinical signs and gross findings of the recoded dermoid cysts are similar to those previously mentioned in the veterinary literature (Purohit *et al*, 1989; Ramadan 1994; Fouad *et al*, 2001). Also both males and females are affected with dermoid cyst with no significant difference between them.

Although the camel's age had an effect on the nature of the dermoid cyst in the affected camels, the camel's gender had no effect. The current results revealed a strong positive correlation between the camel's age and volume of the cystic contents. This is in agreement with Purohit *et al* (1989) who recorded that the diameter of dermoid cyst in camels varies from 5 cm up to 15 cm, depending upon the time of development. This finding could be attributed to the continuous secretion of the sweat and sebaceous glands and accumulation of the dropped hair, tissue debris and scales inside the cyst.

Regarding presence of septa inside the dermoid cyst, there was statistically significant association between the camel's age and presence of septa ($P < 0.05$). This could be attributed to development of daughter cysts inside the original one over the time. Microscopically examined dermoid cyst in a donkey showed presence of a daughter cyst with characteristic intraluminal keratin laminations (Abu-Seida and Ahmed, 2007). Moreover, several studies recorded multilocular dermoid cysts in camels (Purohit *et al*, 1989; Ramadan 1994; Fouad *et al*, 2001).

Although surgical excision of the dermoid cyst is an efficient treatment, careful dissection of the cyst from its neighbouring vital structures is highly recommended due to its critical location just over or near the jugular vein (Ramadan, 1994; Fouad *et al*, 2001).

Conclusions

Dermoid cyst is a common congenital cutaneous cyst in camels with an incidence of 2.01%. Dermoid cysts have an identical location on the anterolateral aspect of the cranial third of the neck and characteristic features. The camel's gender has no effect on the nature of the dermoid cysts. However, the camel's age has an effect on the nature of the dermoid cysts in terms of volume of the cystic contents and presence of septa. Each one-year increase in the affected camel's age increased the volume of cystic contents by 17.01 mL.

Conflicts of Interest

The authors declare no conflict of interest.

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