

< Short Communication >

An occurrence of mammary spindle cell carcinoma in a dog

Sunhwa Hong¹, Hyun-A Lee¹, Dong-Woo Kim¹, Tae-Wan Kim², Okjin Kim^{1*}

¹Center for Animal Resources Development, Wonkwang University, Iksan 570-749, Korea

²College of Veterinary Medicine, Kyungpook National University, Daegu 702-701, Korea

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Abstract

A bitch was presented for investigation of the mass in left 5th mammary gland. The partial mastectomy was performed and submitted for the histopathological diagnosis. The mammary mass was firm and white colored. The cut surface was separated with several lobules and developed vessels. The central area of the mass formed the cavity filled with inflammatory exudates. The dominant component of the tumor was the bundles of spindle-shaped cells. Some tumor cells possessed atypical nuclei and were arranged in a solid nest. Cysts were microscopically composed of hemorrhage, necrosis, and exudates, partially surrounded by tumor cells and granulation tissues. Histopathologically, the mammary mass revealed spindle cell carcinoma. The bitch made a complete recovery following the mastectomy. This case was a rare mammary spindle cell carcinoma in a dog.

Key words : Mammary gland, Tumor, Spindle cell, Carcinoma, Canine

INTRODUCTION

One of the great advantages of canine mammary gland tumor model is that it is spontaneous in this organ. As the clinical evolution of spontaneous canine breast cancers is natural, their genetic and morphophysiological aspects may be very much informative compared with some aspects of the human species (Vail and MacEwen, 2000). In comparative pathology, canine mammary gland tumors have been given special interest because of their similarities with human breast cancer. Malignant epithelial tumors of the canine mammary gland that are composed of solid masses of interlacing elongate cells are relatively rare and may closely resemble fibrosarcomas (Kusewitt et al, 1992). Such tumors are generally classified as spindle cell carcinomas and are often considered a subtype of solid carcinoma (Misdorp et al, 1972). Some pathologists have used the term 'malignant myoepithelioma' to identify the tumor

(Fowler et al, 1974), although there is little evidence to suggest that the tumors originate from myoepithelial cells. Recently, the incidences of canine mammary tumors have been increased in Korean veterinary clinics (Cho et al, 2008). The mammary gland tumor ranks first as the epidemiological issue in oncology of both female dogs and humans (Vail and MacEwen, 2000). Here, we report a rare mammary spindle cell carcinoma in a female dog.

CASE REPORT

This study describes a case of the mammary spindle cell carcinomas in a dog. A 13-year old female mongrel dog was 9 kg weights and presented for investigation of mammary mass on the left 5th udder. The mass was enlarged from 3 to 9 cm diameter during recent 3 months. The bitch had menopause status from 2 years ago. The dog had been submitted to mammary dissection. Staging of the tumors were evaluated by the physical examina-

*Corresponding author: Okjin Kim, Tel. +82-63-850-6668,
Fax. +82-63-850-7308, E-mail. kimoj@wku.ac.kr

tions including TNM (tumor-node-metastasis) system. Routine screening laboratory tests were also performed on the basis of hematology. Blood cell counting and serum chemistry were performed with Fully Automatic Hematology Analyzer for Multispecies (Hemavet 950 FS, Drew Scientific Inc, TX, USA) and 7150 automatic analyzer (Hitachi Co, Tokyo, Japan). After surgical mastectomy operation, the mammary mass was fixed in 10% formalin, and was submitted for histopathological examination. Following fixation, tissues were processed routinely and embedded into paraffin blocks. Four-micrometer-thick sections were cut and stained with hematoxylin and eosin.

Blood test revealed lymphocytosis and mild increase

of white blood cell (WBC) and Alkaline phosphatase (ALP) (Table 1). The mastectomy was selected and microscopic histopathological examination was performed for the final diagnosis. Expanding and effacing the mammary gland was a 3x9 cm, unencapsulated, infiltrative, multilobulated neoplasm with multifocal areas of necrosis, hemorrhage, mineralization, and acicular clefts (Fig. 1A, B). The mastectomy was selected and microscopic histopathological examination was performed for the final diagnosis. The mammary mass was firm and white colored (Fig. 1C). The cut surface was separated with several lobules and developed vessels. The central area of the mass formed the cavity filled with inflammatory exudates (Fig. 1D).

Table 1. Laboratory results of the female mongrel dog in this case

Blood count		Differential count ($10^3/\mu\text{L}$)		Blood chemistry	
WBC ($10^3/\mu\text{L}$)	11.0 (5.0~14.1)*	Neutrophils segment	6.16 (2.9~12.0)	ALP (IU/L)	198 (1~114)
RBC ($10^6/\mu\text{L}$)	7.0 (4.95~7.87)	Lymphocyte	4.73 (0.4~2.9)	ALT (IU/L)	71 (10~109)
HB (g/dL)	16.2 (11.9~18.9)	Monocyte	1.1 (0.1~1.4)	BUN (mg/dL)	5.0 (8~28)
PCV (%)	45.5 (35~57)	Eosinophil	0 (0~1.3)	Creatinine (mg/dL)	0.60 (0.5~1.7)
MCV (fl)	66.0 (66~77)	Basophil	0 (0~0.14)		
MCHC (g/dL)	35.8 (32.0~36.3)				

*The reference ranges in blanks have been derived from the textbook 'Ducan & Prasse's Veterinary Laboratory Medicine - Clinical Pathology'.

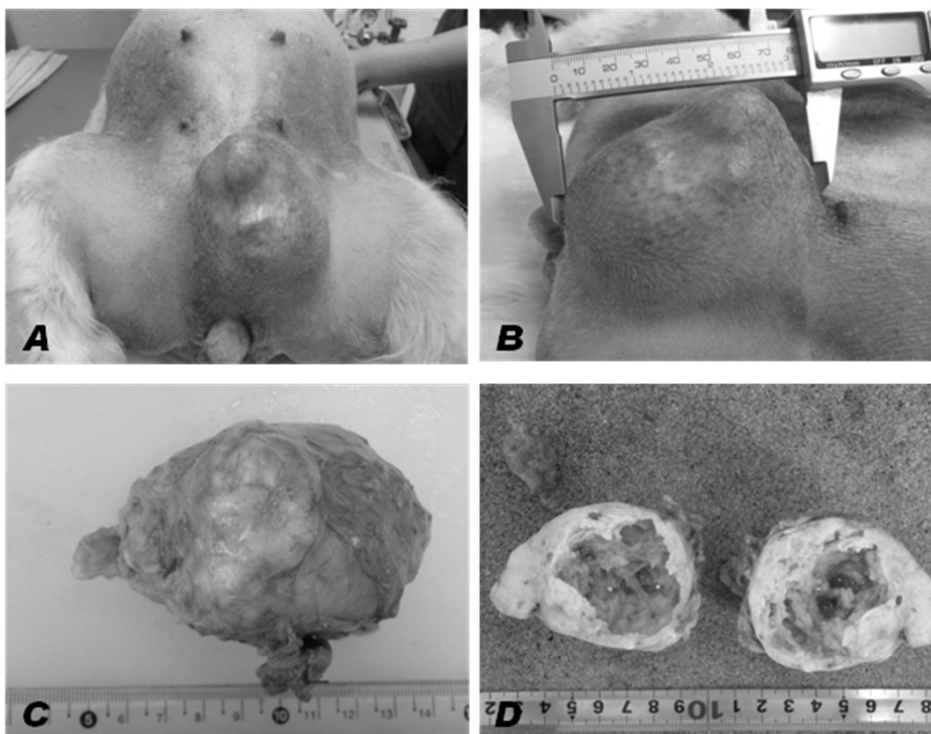


Fig. 1. Gross photograph of the mammary mass. (A) Mammary mass on the left 5th udder, (B) 9 cm diameter-mass, (C) Firm and white colored dissected mass, (D) The central cavity filled with inflammatory exudates.

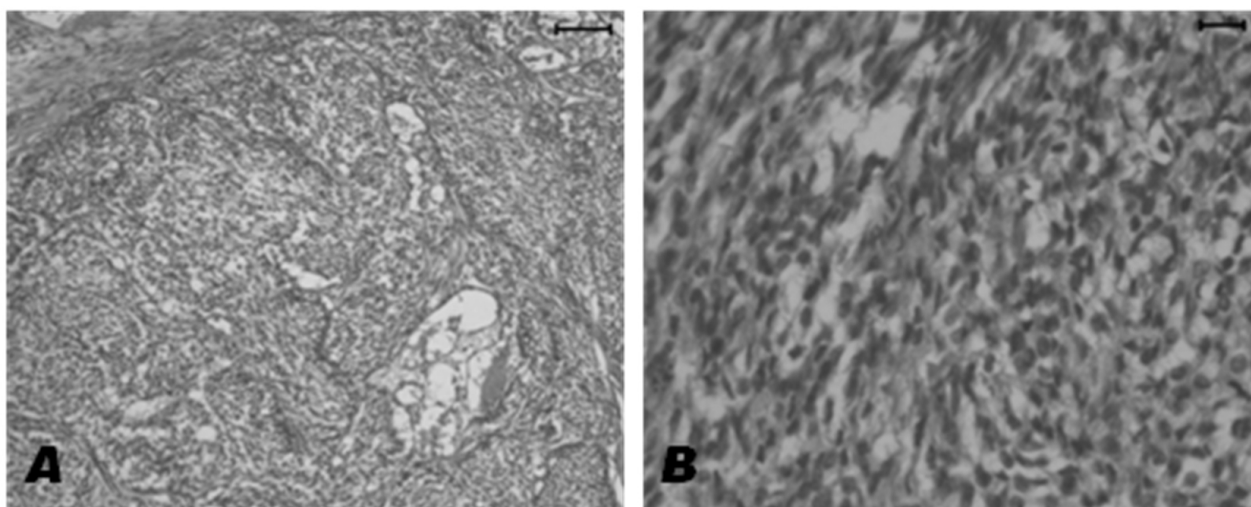


Fig. 2. Histopathological findings of the mammary mass. The dominant component of the tumor was the bundles of spindle-shaped cells. Hematoxylin & Eosin stain. (A) $\times 100$, (B) $\times 400$.

Histopathologically, the neoplasm incorporates and compresses adjacent ducts and elevates the overlying epidermis. Lobules are separated by variably thick bands of collagen and are composed of polygonal neoplastic cells arranged in islands and solidly cellular areas supported by fine fibrovascular stroma. The dominant component of the tumor was the bundles of spindle-shaped cells. The histological lesions were composed with bundles and whorls of fusiform cells without a lobular pattern and lack of glandular or tubular differentiation (Fig. 2A). Neoplastic cells resembled plump fibroblasts with round or elongated vesicular nuclei and frequently vacuolated cytoplasm and were frequently embedded in or surrounded by a pink to light blue chondromatous matrix. Some tumor cells possessed atypical nuclei and were arranged in a solid nest (Fig. 2B). Cysts were microscopically composed of hemorrhage, necrosis, and exudates, partially surrounded by tumor cells and granulation tissues. On the basis of the histopathognomic lesions consisting of the bundles of spindle-shaped cells, the mammary mass revealed spindle cell carcinoma.

DISCUSSION

Dogs represent a remarkable incidence of neoplasia, usually associated with environmental exposure to various carcinogens which are important to humans

(Lindblad-Toh et al, 2005; Schneider et al, 1969). Mammary tumors are the most common tumors in the female dog (Misdorp, 2002). Reports of the occurrence of malignant forms vary from 26 to 73% (Pérez Alenza et al, 1995), carcinoma being the most common malignant type (Misdorp et al, 1999). In dogs with high-grade simple carcinomas and metastasis to regional lymph nodes, the frequency of deaths was even worse. According to many veterinary authors, lymph node involvement was related to prognosis (Hellmén et al, 1993; Yamagami et al, 1996; Misdorp, 2002), as in human reports (Todd et al, 1987; Elston and Ellis, 1991). ALP was abnormal in a high proportion of mammary tumor cases with bone or liver metastases (Crivellari et al, 1995). In this study, we observed elevated ALP level. However, the metastasis to the regional lymph nodes and other organs in the patient dog was not occurred. We also detected the increased WBC numbers, which may be induced by the inflammation of the mammary tumor. The patient therefore had a good condition and prognosis. In canine mammary gland tumor, the age of the dog at mastectomy is considered by some authors to be a factor of prognostic significance (Hellmén et al, 1993; Misdorp et al, 1999; Pérez Alenza et al, 1995). In this study, the age of dog was very old. However, the results of follow-up study revealed very healthy recovery. Immunohistochemistry (IHC), in particular in combination with the use of monoclonal antibodies

(MoAbs), has proven to be a valuable and objective method in tumour evaluation, supplementary to histological examination (Miettinen, 1990). But, IHC alone cannot decisively differentiate between tumours (Diaz et al, 1991; Tsubura et al, 1991). The current gold standard for tumor diagnosis is histopathology (Nazir et al, 2010). In this study, we did not obtain a specific MoAb for canine mammary spindle cell carcinoma and could not conduct IHC for the differentiation of the tumor types. However, we diagnosed the case as a canine mammary spindle cell carcinoma based on the pathologic histopathological lesions.

The bitch made a complete recovery following the mastectomy. This case was a rare mammary spindle cell carcinoma in a dog.

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REFERENCES

- Cho SJ, Son MW, Rho JR, Kim O. 2008. A case report of canine complex mammary gland tumor. *Lab Anim Res* 24: 457-460.
- Crivellari D, Price KN, Hagen M, Goldhirsch A, Gelber RD, Castiglione M, Coates AS, Rudenstam CM, Collins J, Lindtner J, Cortes-Funes H, Gudgeon A, Simoncini E, Byrne M, Schniirch HG, Fey M, Tattersall MHN, Forbes JF, Cavalli F, Reed R, Senn HJ. 1995. Routine tests during follow-up of patients after primary treatment for operable breast cancer. International (Ludwig) Breast Cancer Study Group (IBCSG). *Ann Oncol* 6: 769-776.
- Diaz NM, McDivit RW, Wick MR. 1991. Microglandular adenosis of the breast. An immunohistochemical comparison with tubular carcinoma. *Arch Pathol Lab Med* 115: 578-582.
- Elston CW, Ellis IO. 1991. Pathological prognostic factors in breast cancer. I. The value of histological grade in breast cancer: experience from a large study with long-term follow-up. *Histopathology* 19: 403-410.
- Fowler EH, Wilson GP, Koestner A. 1974. Biologic behavior of canine mammary neoplasms based on histogenetic classification. *Vet Pathol* 11: 212-229.
- Hellmén E, Bergström R, Holmberg L, Spångberg IB, Hansson K, Lindgren A. 1993. Prognostic factors in canine mammary tumors: A multivariate study of 202 consecutive cases. *Vet Pathol* 30: 20-27.
- Kusewitt DF, Hahn FF, Muggenburg BA. 1992. Ultrastructure of a spindle cell carcinoma in the mammary gland of a dog. *Vet Pathol* 29: 179-181.
- Lindblad-Toh K, Wade CM, Mikkelsen TS, Karlsson EK, Jaffe DB, Kamal M, Clamp M, Chang JL, Kulbokas EJ 3rd, Zody MC, Mauceli E, Xie X, Breen M, Wayne RK, Ostrander EA, Ponting CP, Galibert F, Smith DR, DeJong PJ, Kirkness E, Alvarez P, Biagi T, Brockman W, Butler J, Chin CW, Cook A, Cuff J, Daly MJ, DeCaprio D, Gnerre S, Grabherr M, Kellis M, Kleber M, Bardeleben C, Goodstadt L, Heger A, Hitte C, Kim L, Koepfli KP, Parker HG, Pollinger JP, Searle SM, Sutter NB, Thomas R, Webber C, Baldwin J, Abebe A, Abouelleil A, Aftuck L, Ait-Zahra M, Aldredge T, Allen N, An P, Anderson S, Antoine C, Arachchi H, Aslam A, Ayotte L, Bachantsang P, Barry A, Bayul T, Benamara M, Berlin A, Bessette D, Blitshteyn B, Bloom T, Blye J, Boguslavskiy L, Bonnet C, Boukhgalter B, Brown A, Cahill P, Calixte N, Camarata J, Cheshtsang Y, Chu J, Citroen M, Collymore A, Cooke J, Dawoe T, Daza R, Decktor K, DeGray S, Dhargay N, Dooley K, Dooley K, Dorje P, Dorjee K, Dorris L, Duffey N, Dupes A, Egbiremolen O, Elong R, Falk J, Farina A, Faro S, Ferguson D, Ferreira P, Fisher S, FitzGerald M, Foley K, Foley C, Franke A, Friedrich D, Gage D, Garber M, Gearin G, Giannoukos G, Goode T, Goyette A, Graham J, Grandbois E, Gyaltzen K, Haféz N, Hagopian D, Hagos B, Hall J, Healy C, Hegarty R, Honan T, Horn A, Houde N, Hughes L, Hunnicutt L, Husby M, Jester B, Jones C, Kamat A, Kanga B, Kells C, Khazanovich D, Kieu AC, Kisner P, Kumar M, Lance K, Landers T, Lara M, Lee W, Leger JP, Lennon N, Leuper L, LeVine S, Liu J, Liu X, Lokyitsang Y, Lokyitsang T, Lui A, Macdonald J, Major J, Marabella R, Maru K, Matthews C, McDonough S, Mehta T, Meldrim J, Melnikov A, Meneus L, Mihalev A, Mihova T, Miller K, Mittelman R, Mlenga V, Mulrain L, Munson G, Navidi A, Naylor J, Nguyen T, Nguyen N, Nguyen C, Nguyen T, Nicol R, Norbu N, Norbu C, Novod N, Nyima T, Olandt P, O'Neill B, O'Neill K, Osman S, Oyono L, Patti C, Perrin D, Phunxhang P, Pierre F, Priest M, Rachupka A, Raghuraman S, Rameau R, Ray V, Raymond C, Rege F, Rise C, Rogers J, Rogov P, Sahalie J, Settupalli S, Sharpe T, Shea T, Sheehan M, Sherpa N, Shi J, Shih D, Sloan J, Smith C, Sparrow T, Stalker J, Stange-Thomann N, Stavropoulos S, Stone C, Stone S, Sykes S, Tchuinga P, Tenzing P, Tesfaye S, Thoulutsang D, Thoulutsang Y, Topham K, Topping I, Tsamla T, Vassiliev H, Venkataraman V, Vo A, Wangchuk T, Wangdi T,

- Weinand M, Wilkinson J, Wilson A, Yadav S, Yang S, Yang X, Young G, Yu Q, Zainoun J, Zembek L, Zimmer A, Lander ES. 2005. Genome sequence, comparative analysis and haplotype structure of the domestic dog. *Nature* 438: 803-819.
- Miettinen M. 1990. Immunohistochemistry of solid tumors. Brief review of selected problems. *APMIS* 89: 191-199.
- Misdorp W, Cotchin E, Hampe JF, Jabara AG, von Sandersleben J. 1972. Canine malignant mammary tumors. II. Adenocarcinomas, solid carcinomas and spindle cell carcinomas. *Vet Pathol* 9: 447-470.
- Misdorp W, Else RW, Hellmen E, Lipscomb TP. 1999. *Histological Classification of Mammary Tumors of the Dog and the Cat*. Armed Forces Institute of Pathology and the American Registry of Pathology and The World Health Organization Collaborating Center for Worldwide Reference on Comparative Oncology, Washington, D.C., USA, vol. 7, pp. 11-29.
- Misdorp W. 2002. Tumors of the mammary gland. In: *Tumours in Domestic Animals*, 4th Edit., D. J. Meuten, Ed., Iowa State Press, Iowa, pp. 575-606.
- Nazir RT1, Sharif MA, Iqbal M, Amin MS. 2010. Diagnostic accuracy of fine needle aspiration cytology in hepatic tumours. *J Coll Physicians Surg Pak* 20: 373-376.
- Pérez Alenza MD, Rutteman GR, Kuipers-Dijkshoorn NJ, Peña L, Montoya A, Misdorp W, Cornelisse CJ. 1995. DNA flow cytometry of canine mammary tumours: the relationship of DNA ploidy and S-phase fraction to clinical and histological features. *Res Vet Sci* 58: 238-243.
- Schneider R, Dorn CR, Taylor DO. 1969. Factors influencing canine mammary cancer development and postsurgical survival. *J Natl Cancer Inst* 43: 1249-1261.
- Tsubura A, Okada H, Senzaki II, Hatano T, Morii S. 1991. Keratin expression in the normal breast and in breast carcinoma. *Histopathology* 18: 517-522.
- Todd JH, Dowle C, Williams MR, Elston CW, Ellis IO, Hinton CP, Blamey RW, Haybittle JL. 1987. Confirmation of a prognostic index in primary breast cancer. *Br J Cancer* 56: 489-492.
- Vail DM, MacEwen EG. 2000. Spontaneously occurring tumors of companion animals as models for human cancer. *Cancer Invest* 18: 781-792.
- Yamagami T, Kobayashi T, Takahashi K, Sugiyama M. 1996. Prognosis for canine malignant mammary tumors based on TNM and histologic classification. *J Vet Med Sci* 58: 1079-1083.