

## Papillary Cystadenocarcinoma in a Budgerigar (*Melopsittacus undulatus*)

Amir Asghari Baghkheirati<sup>1</sup>, Sara Shokrpour<sup>2\*</sup>, Mohammad Hassanzadeh<sup>1</sup>, Javad Javid  
Nezhad<sup>1</sup> and Jamshid Razmyar<sup>1</sup>

1. Department of Avian Diseases, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

2. Department of Pathology, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

### Abstract

Budgerigar (*Melopsittacus undulatus*) is a tiny colorful parrot that is one of the most popular pets around the world. This study was performed on a 5-year-old male budgerigar with a large and fluid-filled mass in the anterior part of the neck. For determining tumor origin, fine needle aspiration was accomplished and the tumor content was cultured on Blood and MacConkey agars (aerobic and anaerobic conditions). Besides, tumor ultrasonography and whole-body radiographs in lateral and ventrodorsal positioning were done. Finally, the tumor was removed, fixed in 10 % neutral buffered formalin, and stained with Hematoxylin and Eosin (H & E). According to the radiology and ultrasonography results, the tumor (5.2 cm × 4 cm × 3.7 cm) had a homogenous structure and was filled with echogenic fluid content. The tumor content culture revealed no

bacterial growth. Histopathologically, the mass was composed of cystic spaces with invagination of the lining epithelial cells to form intraluminal papillae. The tumor was diagnosed as a papillary Cystadenocarcinoma.

30 **Keywords:** Budgerigar, Cystadenocarcinoma, Histopathology, Radiology, Ultrasonography

### **Case History:**

Budgerigar is an attractive colorful parrot that originated in Australia. This little bird is a monogamous species that is widely kept as a domestic pet all around the world. Although most  
35 parrots are at risk, budgerigars have stable populations and are not considered endangered (Kalmar *et al*, 2010). This gregarious parrot has a short breeding cycle and its lifespan is 10-15 years (Kubiak, 2020; Banaszewska *et al*, 2014). Adenomas and cystadenomas are benign neoplasms derived from glandular epithelium. In budgerigar, adenomas have been identified in different organs including the oviduct, uropygial gland, adrenal gland, thyroid (Robat, 2017),  
40 pituitary gland (Langohr *et al*, 2012), proventriculus (Gal *et al*, 2011), and kidney (Simova-Curd *et al*, 2009). To the best of our knowledge, there is no previous report about the occurrence of papillary cystadenoma in a budgerigar (*Melopsittacus undulatus*).

### **Clinical Presentation**

45 A 5-year-old budgerigar (*Melopsittacus undulatus*), weighing 65.7g, with a huge, soft, and fluid-filled mass in the anterior part of the neck and respiratory distress was referred to the Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran (Figure 1). The bird was fed with a high-energy, seed-based diet and the owner had little information about proper psittacine diet

requirements and care. According to the morphological characteristic (cere color: blue), and  
50 molecular sex determination test it had confirmed that the bird was a male budgerigar. The bird  
was not able to maintain its balance or sit on a perch properly due to the large mass. Also, some  
of the bird's normal activities (Such as flying, eating, and drinking) were limited. The owner  
declared that he had not used any specific medication before. Initially, aminophylline (ampoule  
250mg/10ml) was used in a NE-C900 nebulizer (Omron Co, Japan) to improve the respiratory  
55 status of the bird. A fine-needle aspiration (FNA) biopsy was used for the determination of the  
mass nature. Also, standard whole-body radiographs (DirectView Classic CR System; Kodak,  
Rochester, USA), in lateral and ventrodorsal projections, were taken. In addition,  
ultrasonography (GE Vivid7 Ultrasound, Horten, Norway) of the mass was done. 100 µl of the  
mass content was used for bacterial culture on Blood and MacConkey agars (Merck KGaA,  
60 Darmstadt, Germany). The culture media were transferred to the Avian Microbiology  
Laboratory, Faculty of Veterinary Medicine, University of Tehran and incubated aerobically in a  
Memmert INB200 incubator (Memmert GmbH + Co.KG, Schwabach, Germany) at 37°C for 24  
to 48 hr.

It was important to identify pathogenic organisms in wet smears, and stained cytological  
65 samples. Therefore, Fresh, and direct fecal samples were used for wet mount preparation, and  
gram staining, and glass slides were examined with ×400 and ×1000 magnification. In addition,  
the smears obtained from the mass content were subjected to Gram and Giemsa staining  
methods. After that, a CH30 light microscope (Olympus Co, Japan) was used for examining the  
stained smears. Because of the bird's condition and poor response to therapy, the owner declined  
70 further treatment options like surgery and elected euthanasia. The mass was removed for

histopathological evaluation at necropsy, fixed in 10 % neutral buffered formalin, dehydrated, embedded in paraffin wax, and stained with Hematoxylin and Eosin (H & E).



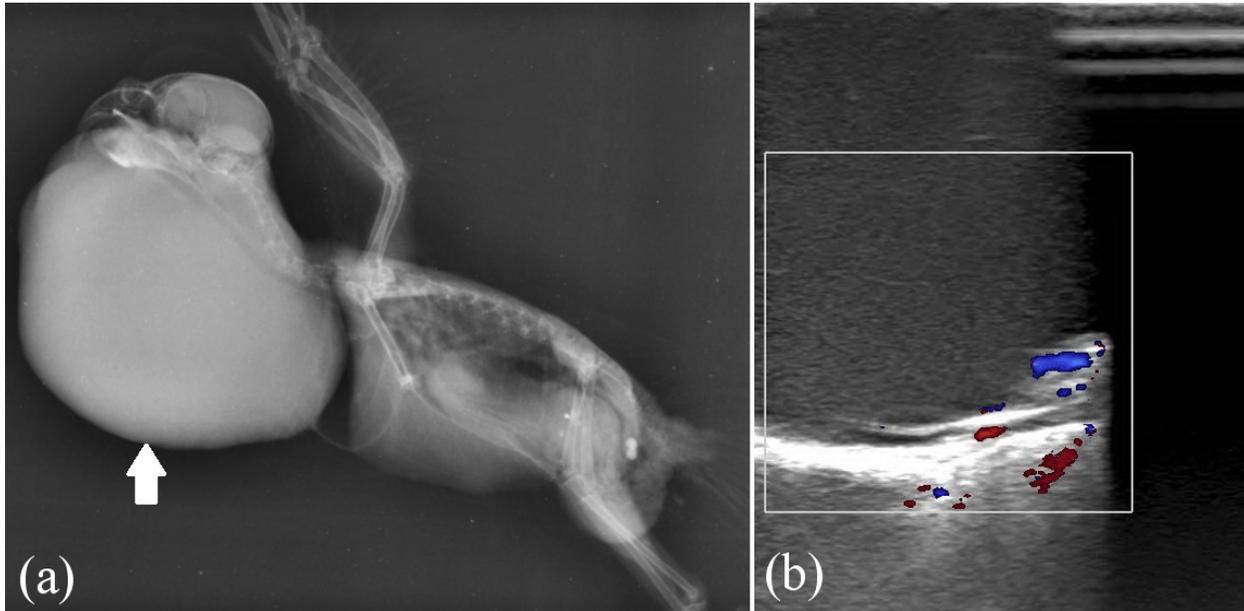
**Figure 1.** A male budgerigar with a large mass in the anterior part of the neck (arrows).

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### Diagnostic testing

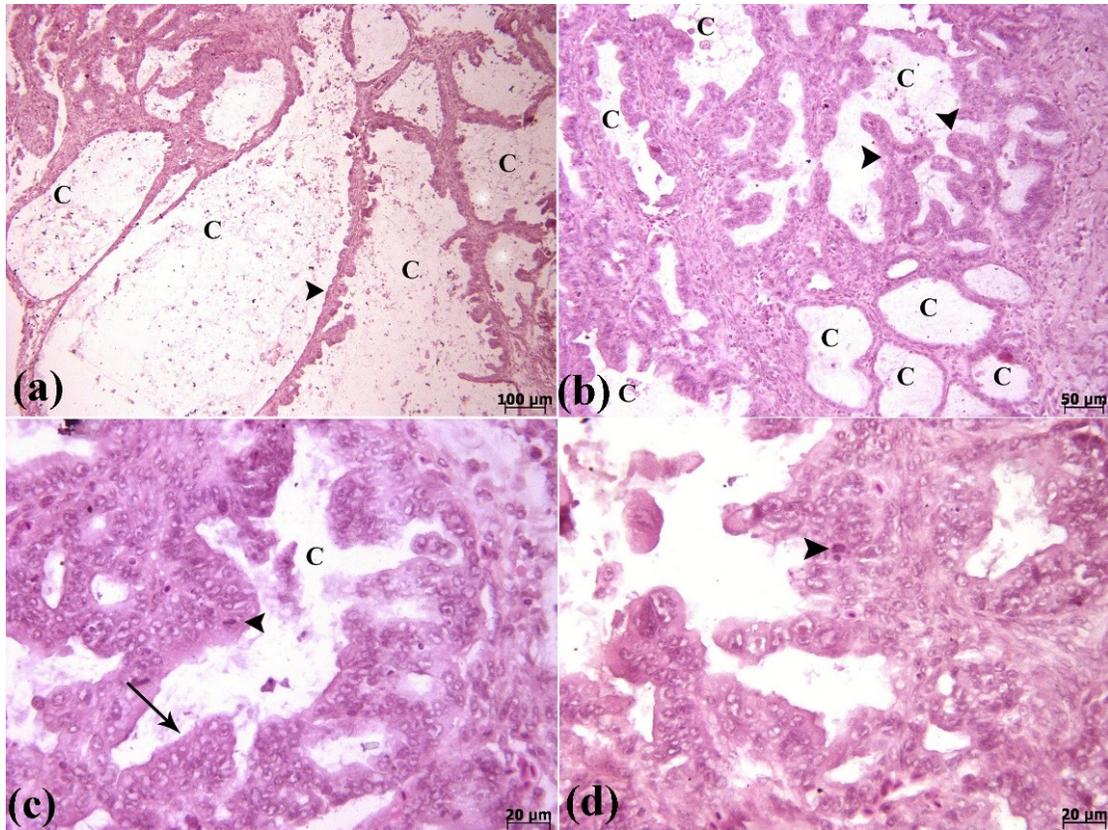
A viscous, translucent, and yellow-orange fluid was collected during tumor FNA and used in aerobic and anaerobic bacterial cultures, but no bacterial growth was observed. In the cytological evaluation of Giemsa stained smears, different phases of the cell cycle (including Metaphase and  
80 Telophase) were identified. In other words, the mitotic figure was one of the features of the examined slides. Furthermore, fecal samples were examined, but no signs of bacterial, fungal, or parasitic diseases were found in wet and Gram-stained smears. Based on the radiology and ultrasonography results, the tumor (5.2 cm × 4 cm × 3.7 cm) had a homogenous structure and was filled with echogenic fluid content. As shown in Figure 2a, the anterior part of the bird's neck  
85 (from the lower jaw to the thoracic inlet) is occupied by the tumor. Also, rim vascularization was

observed in ultrasonography examination (Figure 2b). No bone involvement was detected and no evidence of metastases was found in other organs. Postmortem examination revealed mild hyperemia of the lungs. No other gross lesions were observed.



90 **Figure 2.** (a) A soft tissue mass (arrowhead) in the frontal aspect of the neck was observed in radiography. (b) tumor rim vascularization in ultrasonography examination.

Histopathologically, the mass was composed of cystic spaces of variable size and showed invagination of the lining epithelial cells to form intraluminal papillae. The cysts were supported  
95 by fibrovascular stroma (Figure 3a, 3b). The lining of the cystic structures was simple to lightly stratified layers of neoplastic cuboidal to columnar epithelial cells (Figure 3a, 3c). Several cystic lumens were contained necrotic and desquamated epithelial cells. Neoplastic cells had small and round to ovoid nuclei, inconspicuous nucleoli, and a moderate amount of eosinophilic cytoplasm (Figure 3c). These cells were showed little nuclear or cellular pleomorphism. Mitotic figures  
100 were occasionally visible (Figure 3c, 3d).



**Figure 3.** (a-d): Histopathological findings of papillary cystadenocarcinoma. (a) Variable size of cystic structures (C) and the cystic wall by a simple layer of neoplastic epithelial cells (arrowhead). (b) Dilated cysts (C) lined by intraluminal papillae (arrowheads). (c) The cystic wall (C) by stratified layers of neoplastic columnar epithelial cells (arrow), mitotic figure (arrowhead). (d) Mitotic figure (arrowhead) H&E.

### Assessments

Cystadenomas are primary tumors that consist of fluid-filled cystic spaces. Although they are found in any tissue. The ovary and kidney are the most commonly affected organs (Hochleithner, 1990; Reavill, 2004; Harrison & Lightfoot, 2006 and Powers *et al*, 2019). Cystadenocarcinomas are a discrete group of epithelial tumors described by invasive growth and cystic structures that

often organized in a papillary pattern (Azmanis *et al*, 2013 and Baron *et al*, 2020). Cystadenomas and cystadenocarcinomas have been reported in a variety of avian species including African Grey Parrot (*Psittacus erithacus*) (Hochleithner, 1990), Timneh African Grey Parrot (*Psittacus erithacus timneh*) (Azmanis *et al*, 2013), rainbow lorikeet (*Trichoglossus moluccanus*) (Baron *et al*, 2020), saker falcon (*Falco cherrug*) (Samour *et al*, 2001), sulphur crested cockatoo (*Cacatua galerita*) and galahs (*Eolophus roseicapillus*) (Raidal *et al*, 2006). The grade and clinical stage of tumor, are important criteria in the prognosis of avian tumor. Tumors with high grade have a poor prognosis. Although surgical excision is a proper approach for low and intermediate-grade tumors and can be done without much difficulty (Kubiak, 2020). In this study, the owner declined more treatment and the budgerigar was humanely euthanized using appropriate techniques. In some studies, the origin of the tumor was not identified due to various reasons. In 1990, Hochleithner observed a large, fluid-filled mass near the left eyelid of a 15-year-old African Grey Parrot. According to the histopathological findings, the tumor was diagnosed as a cystadenoma. The exact origin of the mass was not identified, but the author proposed the lacrimal glands as a tumor's origin because of the tissue type and location. (Hochleithner, 1990). In another study, Simova-Curd and colleagues (2009) identified a well-demarcated retrobulbar mass in an African grey parrot which was histologically diagnosed as adenoma. Although the origin of the adenoma was not determined in their study and the harderian gland was suggested as the origin, due to the location of the neoplasm (Simova-Curd *et al*, 2009). Adenocarcinomas of the ovary, oviduct, pancreas, kidney, proventriculus, and pituitary gland have been reported from different species in a common manner, but rarely described in salivary glands (Simova-Curd *et al*, 2009, Gal *et al*, 2011, Langohr *et al*, 2012 and Robot, 2017). Finally, similar to other studies (Hochleithner, 1990 and Simova-Curd *et al*, 2009), based on histopathological

findings and location of the mass, salivary glands were suggested as the origin of the papillary adenocarcinoma in Budgerigar.

### Conclusion

The origin of the papillary cystadenocarcinoma remained unknown in the present study, but based on histopathological findings and location of the mass, we suspect that it may have been from the salivary glands.

### Conflict of Interest

The authors declare that there are no conflicts of interest.

### References:

1. Azmanis, P., Stenkat, J., Hübel, J., Böhme, J., Krautwald-Junghanns, M. E., & Schmidt, V. (2013). A Complicated, Metastatic Humeral Air Sac Cystadenocarcinoma in a Timneh African Grey Parrot (*Psittacus erithacus timneh*). *Journal of avian medicine and surgery*, 27(1), 38-43. DOI: [10.1647/2011-035](https://doi.org/10.1647/2011-035). PMID: 23772455
2. Banaszewska, D., Biesiada-Drzazga, B., Ostrowski, D., Andraszek, K., & Wereszczynska, A. (2014). Assessment of Budgerigar (*Melopsittacus undulatus*) hatching in private breeding. *Acta Scientiarum Polonorum. Zootechnica*, 13(3), 29-36.
3. Baron, H. R., Foo, T. S. Y., & Phalen, D. N. (2020). Humeral air sac cystadenocarcinoma in a rainbow lorikeet (*Trichoglossus moluccanus*). *Australian Veterinary Journal*, 98(4), 168-171. DOI: [10.1111/avj.12915](https://doi.org/10.1111/avj.12915). PMID: 32017026
4. Gal, J., Marosán, M., Kozma, A., & Mándoki, M. (2011). Solitary adenoma in the proventriculus of a budgerigar (*Melopsittacus undulatus*) diagnosed by

immunochemistry. *Acta Veterinaria Hungarica*, 59(4), 439-444.

160 DOI:[10.1556/AVet.2011.031](https://doi.org/10.1556/AVet.2011.031). PMID: **22079705**

5. Samour, J. (2015). *Avian medicine*. Elsevier Health Sciences.

6. Hochleithner, M. (1990). Cystadenoma in an African grey parrot (*Psittacus erithacus*). *Journal of the Association of Avian Veterinarians*, 4 (3), 163-165.

165 7. Kalmar, I.D., Janssens, G.P., & Moons, C.P. (2010). Guidelines and ethical considerations for housing and management of psittacine birds used in research. *Institute for Laboratory Animal Research*, 51 (4), 409-423. DOI:[10.1093/ilar.51.4.409](https://doi.org/10.1093/ilar.51.4.409) . PMID: **21131717**

8. Kubiak, M. (2020). Budgerigars and Cockatiels. *Handbook of Exotic Pet Medicine*. 141-164.

170 9. Langohr, I. M., Garner, M. M., & Kiupel, M. (2012). Somatotroph pituitary tumors in budgerigars (*Melopsittacus undulatus*). *Veterinary pathology*, 49(3), 503-507. DOI: [10.1177/0300985811419530](https://doi.org/10.1177/0300985811419530) . PMID: **21900544**.

175 10. Powers, L. V., Mitchell, M. A., & Garner, M. M. (2019). Macrorhabdus ornithogaster infection and spontaneous proventricular adenocarcinoma in budgerigars (*Melopsittacus undulatus*). *Veterinary pathology*, 56(3), 486-493. DOI: [10.1177/0300985818823773](https://doi.org/10.1177/0300985818823773). PMID: **30651051**

11. Raidal, S. R., Shearer, P. L., Butler, R., & Monks, D. (2006). Airsac cystadenocarcinomas in cockatoos. *Australian veterinary journal*, 84(6), 213-216. DOI: [10.1111/j.1751-0813.2006.tb12803.x](https://doi.org/10.1111/j.1751-0813.2006.tb12803.x) . PMID: **16821490**

180 12. Reavill, D. R. (2004). Tumors of pet birds. *Veterinary Clinics: Exotic Animal Practice*, 7(3), 537-560. DOI: [10.1016/j.cvex.2004.04.008](https://doi.org/10.1016/j.cvex.2004.04.008). PMID: **15296864**

13. Robat, C. S., Ammersbach, M., & Mans, C. (2017). Avian oncology: diseases, diagnostics, and therapeutics. *Veterinary Clinics: Exotic Animal Practice*, 20(1), 57-86. DOI: [10.1016/j.cvex.2016.07.009](https://doi.org/10.1016/j.cvex.2016.07.009). PMID: 27890293
- 185 14. Samour, J. H., Naldo, J. L., Wernery, U., & Kinne, J. (2001). Thyroid cystadenocarcinoma in a saker falcon (*Falco cherrug*). *Veterinary Record*, 149, 277-278. DOI: [10.1136/vr.149.9.277](https://doi.org/10.1136/vr.149.9.277). PMID: 11558665
- 190 15. Simova-Curd, S., Richter, M., Hauser, B., & Hatt, J. M. (2009). Surgical removal of a retrobulbar adenoma in an African grey parrot (*Psittacus erithacus*). *Journal of avian medicine and surgery*, 23(1), 24-28. DOI: [10.1647/2008-008R.1](https://doi.org/10.1647/2008-008R.1). PMID: 19530403

خلاصه:

### آدنوکارسینوم کیستیک پاپیلاری در یک باجریگار

امیر اصغری باغ خیراتی<sup>1</sup>، سارا شکرپور<sup>2</sup>، محمد حسن زاده<sup>1</sup>، جواد جاویدنژاد<sup>1</sup> و جمشید رزم یار<sup>1</sup>

- 195 1. گروه بیماری های طیور، دانشکده دامپزشکی دانشگاه تهران، تهران، ایران  
2. گروه پاتولوژی، دانشکده دامپزشکی دانشگاه تهران، تهران، ایران

باجریگار (*Melopsittacus undulatus*) طوطی کوچک رنگارنگ و حیوان خانگی محبوب در سرتاسر جهان می باشد. این مطالعه بر روی یک باجریگار نر 5 ساله همراه با توده بزرگ و پر از مایع در قسمت قدامی گردن، انجام شد. به منظور تعیین منشأ تومور، اسپیراسیون با سوزن ظریف انجام شد و محتوای تومور بر روی آگار خون دار و مک کانکی (هوازی و بی هوازی) کشت داده شد. به علاوه، سونوگرافی از تومور و رادیوگرافی کل بدن در موقعیت جانبی و پشتی - شکمی انجام شد. در نهایت، تومور برداشته شد و در فرمالین بافر خنثی 10٪ تثبیت گردید و با رنگ آمیزی معمول هماتوکسیلین - ائوزین (H&E) رنگ آمیزی شد. بر

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اساس نتایج رادیولوژی و سونوگرافی، تومور (5/2 سانتی متر × 4 سانتی متر × 3/7 سانتی متر) ساختاری همگن داشت و با مایع

اکوژنیک پر شده بود. رشد باکتری در کشت محتویات تومور مشاهده نشد. از لحاظ هیستوپاتولوژی، توده از فضا‌های کیستیک

205 همراه با تکثیر سلول‌های اپیتلیوم پوششی، در جهت تشکیل پاپیلای داخل لومن تشکیل شده بود. تومور به عنوان آدنوکارسینوم

کیستیک پاپیلاری تشخیص داده شد.

کلمات کلیدی: باجریگار، آدنوکارسینوم کیستیک، هیستوپاتولوژی، رادیولوژی، سونوگرافی

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