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Cutaneous Leiomyoma Localized on the Head and Dorsal Fin of a Goldfish (Carassius Auratus)

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Abstract

Carassius auratus, is a popular freshwater ornamental fish of the family *Cyprinidae* is widely preferred by the hobbyists. A case of adult goldfish, *Carassius auratus* with cutaneous leiomyoma is reported in this study. *C. auratus* with two round to spherical grey white coloured unencapsulated nodules measuring about 1.2 x 1.3 x 0.9 cm and 0.9 x 0.8 x 0.5 cm in size on the dorsal fin and near the mouth in the head region, respectively was examined. Histopathological examination of the nodules revealed interlacing bundles of neoplastic smooth muscle cells with cigar shaped nuclei with no mitotic figures. Based on the gross, histopathological and special staining examinations, the nodules were confirmed as leiomyoma.

Keywords: Goldfish, leiomyoma, neoplasm, pathology

Carassius auratus, commonly known as Gold fish is a popular ornamental fish species with attractive, colouration, shape and fin configuration. Malignancies or the presence of a tumor in human or animal tissue are caused by the loss of cell cycle control (Rocha, 2013). Sarcomas are malignant tumour arising from mesenchymal cell lines. Leiomyoma and leiomyosarcoma are two groups of tumours of smooth muscle cells in the urogenital system, gastrointestinal system, and skin of human beings and animals. Leiomyosarcoma is an aggressive soft tissue sarcoma derived from smooth muscle cells, typically of uterine, gastrointestinal or soft tissue origin (Enzinger, 1988; Tomas *et al.,* 2009). Natural fish populations have been found to have tumours in almost all tissue systems, but most of these tumours are of unknown aetiology (Harshbarger, 1977). The skin leiomyoma in *C.auratus* associated with an infectious agent was documented as early as 1948 by Schlumberger. Cutaneous infiltrative lipoma in *C. auratus* have been documented (Sood *et al.,* 2017); Neoplastic tumours in great barracuda *Sphyraena barracuda* and oil sadine *Sardinella longiceps* and common odontogenic tumours in Great barracuda and *Sphyraena jello* have been reported on the southeast coast of India (Gopalakrishnan *et al.,* 2011; Vijayakumar *et al.,* 2014; Singaravel *et al.,* 2015; Singaravel *et al.,* 2017). In freshwater fish, epidermal papilloma *Anabas testudenius* (Sarkar and Chaudhuri, 1953); and osteogenic fibroma on the premaxilla of an Indian catfish, *Wallago attu* (Sarkar and Chaudhuri, 1958) have been reported. In our study, a very rare tumour type, thought to arise from the basal cells of the epidermis, has been documented in the head of *C. auratus*.

Materials and Methods

C. auratus, (11cm) with two round to spherical grey white unencapsulated nodules on the

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dorsal fin and in the head region was collected from a fish rearing facility in Chennai, Tamil Nadu, India (13.1306 N 80.2143 E). The fish was euthanized with an overdose of anaesthetic (MS-222, Sigma). The nodules were collected in 10% formalin for histopathological examination. The tissues were dehydrated with graded alcohol, cleared by xylol, and embedded in paraffin wax. Paraffinized tissue sections were cut into 4 to 6 µm thickness and stained with Haematoxylin and Eosin (H&E) stain (Bancroft and Gamble, 2008). The tissues were subjected to Picrosirius red special staining to differentiate collagen and muscle fibers. Following the staining process, the samples were examined and documented under a microscope (EVOS, Thermo Fisher Scientific).

Results and Discussion

Examining the fish sample revealed two nodules on the dorsal fin and near the mouth of the head region. Gross examination of the nodules revealed round to spherical grey white coloured unencapsulated nodules measuring about 1.2 x 1.3 x 0.9 cm and 0.9 x 0.8 x 0.5 cm in size on the dorsal fin and near the mouth of the head region, respectively (Fig.1).

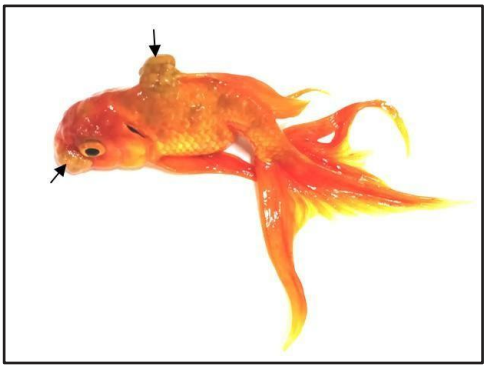

Fig. 1. *Carassius auratus* with nodules on the dorsal fin and mouth region

Histopathological examination of the nodules revealed interlacing bundles of neoplastic smooth muscle cells (Fig.2), arranged in a haphazard pattern. The neoplastic cells contained cigar-shaped vesicular nuclei with blunt ends, scanty cytoplasm with no mitotic figures (Fig.2). Picrosirius red special staining revealed neoplastic smooth muscle cells in yellow color (Fig.3). The gross microscopic examination of the mass confirmed the presence of cutaneous leiomyoma.

Neoplasms in fish are less aggressive than the neoplasms in mammals (Mesbah *et al.,* 2016). The development of neoplasia in fish is also a multifactorial and multistage process that may result from acquired genetic characteristics or exposure to various environmental agents such as chemicals or infectious agents, including viral agents as in other vertebrates, intrinsic factors such as age, gender, genetic predisposition, and extrinsic factors such as temperature, season, and environmental quality, although the aetiology of the majority of spontaneous neoplasms in fish has not been identified (Groff, 2004).The virus families *Herpesviridae, Papillomaviridae*, and *Retroviridae* have been reported to be associated with tumour development in fish (Coffee *et al.,* 2013). Neoplasms originate from various cell groups and are called by various names according to the tissue structure: lipoma, liposarcoma, fibroma, fibrosarcoma, leiomyoma, and leiomyosarcoma (Robbins and Kumar, 1987). Although tumours originating from connective tissue are frequently seen in fish (Rezaie *et al.,* 2017), leiomyoma is uncommon in fish (Sarkar *et al.,* 1955; Ciltas and Hisar, 2005). Leiomyoma is histologically similar to fibroma and schwannoma, which are types of mesenchymal tumours (Morales and Schmidt, 1991; Cooper and Valentine, 2002; Namazi *et al.,* 2014). According to the tissue structure, they orginate from various cell groups and go by various names: lipoma, liposarcoma, fibroma, fibrosarcoma, leiomyoma and leiomyosarcoma (Robbins *et al.,* 1987). Some of these tumours have been reported in fish such as *Squalus fernandinus*, *Raja macrorhychus*, *Sardina pilchardus*, *Salmo gairdneri* and *C. auratus* (Mawdesley-Thomas *et al.,* 1975). Swim bladder leiomyosarcoma in Atlantic salmon (*Salmo salar*) has been demonstrated to be caused by viral infection (McNight, 1978). Leiomyomas have been reported from stomach, mouth, skin, head, fins and testicles of fish (Schlumberger, 1949; Budd *et al.,* 1975; Herman and Landolt, 1975; Pfeiffer and Asashima, 1990; Citlas and Hisar, 2005). Sarkar et al. (1955) reported a leiomyoma on the fins of an Indian catfish *Mystus Osteobagrus seenghala*

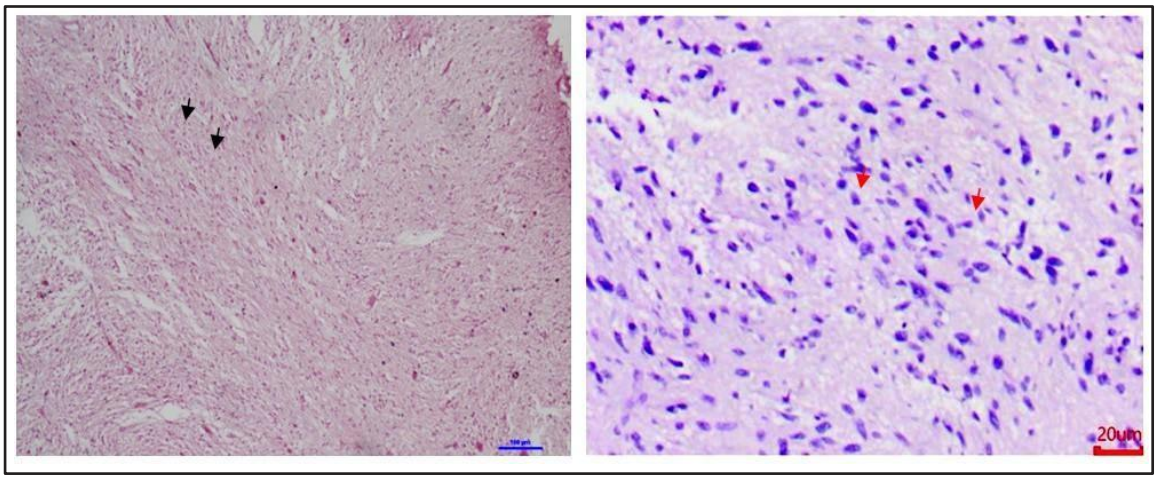

Fig.2. Leiomyoma in *C.auratus* - Neoplastic mass consisting of interlacing bundles of smooth muscle fibres (black arrow) Scale bar:100 µm, Cigar shaped nuclei with blunt ended (red arrow) (Scale bar H&E: 20 µm)

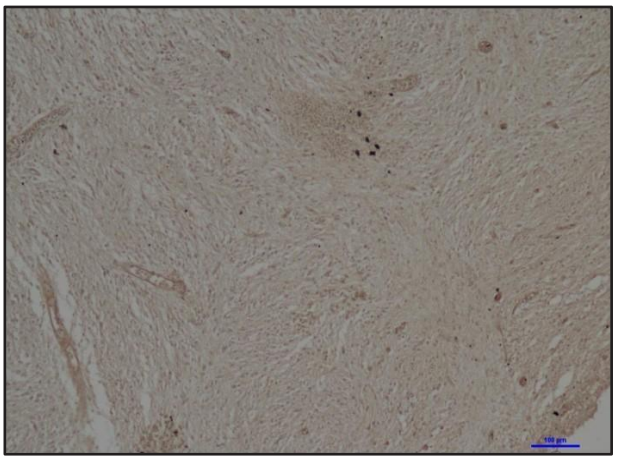

Fig.3. Leiomyoma in *C.auratus* - Neoplastic smooth muscle cells showed yellow color, Picrosirius red (Scale Bar 100µm).

Sykes. Gonadal neoplasms in fish are rare but include neoplasms of mesenchymal origin, such as the ovarian and testicular leiomyomas and fibro leiomyomas of yellow perch *Perca flavescens* (Budd *et al.,* 1975). Leiomyoma in the intestinal wall of *Sardina pilchardus*. (Ramos and Peleteiro, 2003), in the head (Ciltas and Hisar, 2005), gill, and operculum regions of goldfish (Oryan *et al.,* 2015). However, in the present case, the nodules were located on the dorsal fin, near the mouth on the head. Neoplasia may be examined by direct examination of small tissue sections (or squash preparations), tissue imprints of cutaneous or external lesions stained with Romanowsky reagents. Diagnosis of neoplasia following immunochemical methods, imaging techniques like survey radiography, ultrasonography (Harms, 1995); scintigraphy and computed tomography (Bakal *et al.,* 1998), and magnetic resonance imaging techniques have been reported in fish (Groff, 2004). In the present study, a gross examination of the mass showed that the masses were not encapsulated as reported earlier (Oryan *et al.,* 2015). Microscopic examination of the mass revealed interlacing bundles of smooth muscle cells with cigar shaped nuclei and scanty cytoplasm, which is in accordance with earlier reports (Ciltas and Hisar, 2005; Oryan *et al.,* 2015). Picrosirius red special staining revealed yellow coloured smooth muscle as observed by Ciltas and Hisar, (2005) in the Van Gieson stain. The most important salient feature of malignant neoplasms in fishes is local invasion (Grizzle *et al.,* 1998). We observed no local invasion in the present case. No metastasis was also observed as documented by the earlier researchers (Ciltas and Hisar, 2005; Oryan *et al.,* 2015). In the present case, the benign type of smooth muscle tumour, *i.e.,* leiomyoma, was recorded on the dorsal fin and near the mouth on the head. Several factors, *viz.,* environmental carcinogens, chemical, and physical agents, infectious agents, and water pollution, have been identified as cause of tumours in fish (Rocha *et al.,* 2017), and in the present case, the cause was not identified. In fish, skin tumours, being visible externally, are among the most frequently observed, as fish, being inhabitants of aquatic systems, are often exposed to contaminants. Neoplasms, which are

specific lesions and pathological changes are commonly found in fishes inhabiting polluted waters, revealing an association between the injury and exposure to irritants (Bernet *et al.,* 1999).

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References

Bakal, R.S., Love, N.E., Lewbart, G.A. and Berry, C.R. (1998). Imaging a spinal fracture in a kohaku koi (*Cyprinus carpio*): techniques and case history report. *Vet. Radiol. Ultrasound*, **39**(4):318-321.

Bancroft, J.D. and Gamble, M. eds. (2008). Theory and practice of histological techniques. Elsevier health sciences.

Bernet, D., Schmidt, H., Meier, W., Burkhardt-Holm, P. and Wahli, T. (1999). Histopathology in fish: proposal for a protocol to assess aquatic pollution. *J. fish dis*., **22**(1):25-34.

Budd, J., Schroder, J.D. and Dukes, K.D. (1975). Tumors of the yellow perch. *Pathol. fish*., 895-906.

Cooper, B.J. and Valentine, B.A. (2002). Tumors of the muscle. In "Tumors in domestic animals".

Çiltas, A and Hisar, O. (2005). Leiomyoma localized on the head of a goldfish (*Carassius auratus*). *Turkish J. Vet. Anim. Sci*., **29**(4):1077-1079.

Coffee, L.L., Casey, J.W. and Bowser, P.R. (2013). Pathology of tumors in fish associated with retroviruses: a review. *Vet. Pathol*., **50**(3):390-403.

Enzinger, F.M. (1988). Chapter 15 Leiomyosarcoma: Enzinger FM, Weiss SW, eds, Soft Tissue Tumor, The CV Mosby Company: St.

Gopalakrishnan, A., Maran, B.A.V., Puvanendran, V., Rajkumar, M., Balasubramanian, T. and Ferguson, H.W. (2011). Neoplasia in the Indian oil sardine, *Sardinella longiceps* (Valenciennes), and the great barracuda, *Sphyraena barracuda* (Edwards), from the south-east coast of India. *J. Fish Dis*., **34**(11):881-885.

Grizzle JM, and Goodwin AE. (1998) Neoplasms and related lesions. In: Leather land A.F, Woo P.T.K, editors. Fish diseases and disorders, vol 2, non-infectious disorders. Wallingford: CABI Publishing; p. 37–104

Groff, J.M. (2004). Neoplasia in fishes. Vet. Clin.: *Exot. Anim. Prac*., **7**(3), pp.705-756.

Harms, D. (1995). Alveolar rhabdomyosarcoma: a prognostically unfavorable rhabdomyosarcoma type and its necessary distinction from embryonal rhabdomyosarcoma. In *Soft tissue tumors* (pp. 273-296). Springer, Berlin, Heidelberg.

Harshbarger, J.C. (1977). Role of the registry of tumors in lower animals in the study of environmental carcinogenesis in aquatic animals. *Ann. NY Acad. Sci*.;(United States), 298.

Herman, R.L. and Landolt, M. (1975). A testicular leiomyoma in a largemouth bass, *Micropterus salmoides*. *J Wildl Dis*, **11**(1),:128-9.

Morales, P. and Schmidt, R.E., (1991). Spindle-cell tumour resembling haemangiopericytoma in a common goldfish, *Carassius auratus* (L.). *J. Fish Dis*., **14**(4):499-502.

Mawdesley-Thomas, L.E. (1975) Neoplasia in Fish. In: Ribelin, W.E., Migaki, G., Eds. The pathology of Fishes, The University of Wisconsin Press, USA. : 805-870.

McKnight, I.J. (1978). Sarcoma of the swim bladder of Atlantic salmon (*Salmo salar* L.). *Aquac*., **13**(1):55-60.

Mesbah, M., Rezaie, A. and Dezfuly, Z.T., (2016). Case report of chondroma in a grass carp (*Ctenopharyngodon idella*). In Veterinary Research Forum (Vol. 7, No. 2, p. 173). Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.

Namazi, F., Hasiri, M.A., Oryan, A. and Moshiri, A., (2014). Hemangiopericytoma in a young dog: Evaluation of histopathological and immunohistochemical features. *Vet. Res. Forum*. **5(**2):157-160.

Oryan,A., Alidadi,S., Shayegh,H. and Geramizadeh, B. (2015). Cutaneous Leiomyoma in a Goldfish *Carassius auratus. Fish Pathol*., **50** (3): 112–114.

Pfeiffer, C.J. and Asashima, M. (1990). Gastric leiomyomas in the Japanese newt, *Cynops pyrrhogaster*; ultrastructural observations. *J. compar. pathol*., **102**(1):79-87.

Ramos, P. and Peleteiro, M.C., (2003). Três casos de neoplasias espontâneas em peixes. *Rev. Port. Cienc. Vet*, **98**(546):77-80.

Rezaie, A., Tulaby Dezfuly, Z. and Peyghan, R.. (2017). Fibrosarcoma in a Goldfish (*Carassius auratus*): a Case report. *Iran J Vet. Sci. Techno*., **9**(1):45-48.

Robbins, S.L., and Kumar, V. (1987) Basic Pathology. Saunders, Philadelphia.: 290-299.

Rocha, C.A.M. (2013). As pernas do caranguejo: cancer crura. *Belém:[editora desconhecida]*.

Rocha, C.A.M., Moreira-Nunes, C.A., da Rocha, S.M., da Silva, M.A.S. and Burbano, R.R., (2018). A review on occurrence of neoplasia in fish. *Acta Fisheries* Aqua. Res., **5**(2):19-24.

Sarkar, H.L. and Dutta-Chaudhuri, R. (1953). On the occurrence of an epidermal papilloma in koi fish*, Anabas testudenius* (Bloch). *J Indian Med Assoc*. **22**(4): 152-154.

Sarkar, H.L., Kapoor, B.G. and Duttachaudhuri, R. (1955). A study of leiomyoma, a mesenchymal tumour on the fins of an Indian catfish, *Mystus* (Osteobagrus) *seenghala Sykes*. Growth, **19**(4): 257-261.

Schlumberger, H.G. (1949). Cutaneous leiomyoma of goldfish: I. Morphology and growth in tissure culture*. Am. J. Pathol*., **25**(2):287.

Singaravel, V., Gopalakrishnan, A., Vijayakumar, R. and Raja, K. (2015). Prevalence and pathology of gastric tumours in Indian oil sardine (*Sardinella longiceps*) from Parangipettai coastal waters, southeast coast of India. *J. Coast. Life Med.*, **3**(8):592-595.

Singaravel, V., Gopalakrishnan, A., Raja, K., Vijayakumar, R. and Asrafuzzaman, S. (2017). Oral neoplasms in pick-handle barracuda Sphyraena jello from India. *Dis. Aqua. Org*., **125**(2):115-124.

Sood, N., Swaminathan, T.R., Yadav, M.K., Pradhan, P.K., Kumar, R. and Sood, N.K., (2017). First report of cutaneous infiltrative lipoma in goldfish *Carassius auratus*. *Dis. Aqua. Org*., **125**(3): 243-247.

Street, R. (2002). *Carassius auratus*. *On-line, Animal Diversity Web. Accessed May*, *5*, p.2005.

Tomas, D., Leniček, T., Tučkar, N., Puljiz, Z., Ledinsky, M. and Krušlin, B. (2009). Primary ovarian leiomyoma associated with endometriotic cyst presenting with symptoms of acute appendicitis: a case report. *Diagn. pathol*., **4**(1):1-4.

Vijayakumar, R., Gopalakrishnan, A., Raja, K. and Sinduja, K., (2014). Occurrence of tumour (odontoma) in marine fish *Sphyraena jello* from the southeast coast of India. *Dis. Aqua. Org*., **108**(1):53-60.