Histological study of hepatic bile ducts in the common quail (Coturnix coturnix)

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ABSTRACT: The aim of this investigation was to study the histological structure of the hepatic bile ducts in common quail (Coturnix coturnix). Twenty clinically healthy adult female and male common quail were used. Histological results showed that the hepatic bile ducts possessed tunica mucosa, tunica muscularis and tunica serosa. The tunica mucosa forms some simple folds which appeared to be irregularly distributed over the whole luminal surface and were almost non isometric. The mucosa was lined by non ciliated simple cuboidal to columnar epithelium which was covered by a continuous striated border of microvilli. No goblet cells were observed among epithelial cells. Deep invaginations of the surface epithelium were observed to have grown down into the underlying mesenchyme, showing a tubular gland like appearance. The lamina muscularis mucosa was absent. The thin lamina propria-submucosa was contained loose connective tissue which consisted of numerous diffuse lymphatic aggregations. No glands were observed in lamina propria-submucosa. The tunica muscularis was composed of an outer circular and an inner longitudinal layer of smooth muscle fibers. The loose connective tissue of tunica serosa or adventitia was made up of blood vessels, adipose tissues, parasympathetic ganglion and nerve fibers. No significant sex-based differences were found. In conclusion, the histology of the hepatic bile ducts of the Coturnix coturnix was similar to that in Alectoris chukar except for the epithelial downgrowths and tunica muscularis.

Key words: Coturnix coturnix; Hepatic bile duct; Histology; Sex

INTRODUCTION

The common quail, Coturnix coturnix, is a small bird in the pheasant family Phasianidae. It is widespread and is found in parts of Europe and Asia. In recent years this species has been reared intensively in Iran and is used annually for meat and egg production. Regarding the large investments in this field, providing knowledge of the histology and biology of this species could be quite valuable. The avian liver is a bilobed organ that lies in the mid-coelomic cavity. Each lobe is drained by separate hepatic bile ducts into the distal ascending loop of duodenum (King and McLelland, 1984).

For the elucidation of histology of biliary ducts, some investigations have been carried out in different avian species, such as the chicken (Ghoddusi and Roger Kelly, 2004; Yoshida et al., 2010), ostrich (Stornelli et al., 2006), guinea fowl (Sivagnanam and Geetha, 2008), duck (Yoshida et al., 2010), and chukar partridge (Mobini, 2012). However, knowledge of the histology of the hepatic bile ducts in common quail seems to be less sufficient. Also, research on Coturnix coturnix in Iran has started very recently, which makes this investigation even more important. The aim of this study was to describe the normal histological findings of extra hepatic bile ducts of common quails and comparison of these features with other bird species.
A total of 20 clinically healthy adult Coturnix coturnix of both sexes (10 females and 10 males) were obtained from the Research farm of household bird's maintenance of College of Veterinary Medicine, Azad University of Shahrekord. The birds were deeply anesthetized by excess ether inhalation. The guidelines of the ethical committee of Shahrekord Azad University were strictly followed during the procedure. The gall bladders and extra hepatic bile ducts were removed from the donors, placed in physiological saline and cut open therein to expel intravesical bile which is injurious to the epithelial tissues. The specimens were fixed in 10% buffered formalin solution for 24 to 48 hours, dehydrated and embedded in paraffin in routine manners. Tissue samples (5 µm) were stained by hematoxylin eosin for general observations (Kierman, 1999). Sections were observed under light microscope.

RESULTS

No evident difference between the male and female common quails was observed in the histology of hepatic bile duct. Histological results showed that wall of hepatic bile duct in the common quail was composed of tunica mucosa, muscularis and tunica serosa (Figure 1).

The tunica mucosa was lined by non ciliated simple cuboidal to columnar epithelium. The apical cytoplasm of these cells was covered by a continuous striated border of microvilli. The tunica mucosa forms some simple folds, which were almost non isometric and appeared to be irregularly distributed over the whole luminal surface of the bile ducts (Figure 2). The goblet cells were not observed among epithelial cells.

Deep invaginations of the surface epithelium were observed to have grown down into the underlying mesenchyme, showing a tubular gland like appearance. The lamina muscularis mucosa was absent. The thin lamina propria-submucosa was contained loose connective tissue which consisted of numerous diffuse lymphatic aggregations (Figure 2). No glands were observed in lamina propria-submucosa.

Light microscopic examination revealed that the tunica muscularis of the hepatic bile ducts in common quails was made up of an outer circular and an inner longitudinal layer of smooth muscle fibers (Figures 1, 2).
Figure 2. Higher magnification of the hepatic bile duct of common quails, lumen (L), simple cuboidal (Cu) to columnar epithelium (Co), non isometric fold (F), striated border (arrowheads), lamina propria-submucosa (Lp-Sm), diffuse lymphatic aggregations (arrows), epithelial invaginations (I), inner longitudinal (IL), and outer circular layers of tunica muscularis (Oc), tunica adventitia (Ta), adipose tissues (Ad). Hematoxylin eosin × 400

The outermost tunica of the free surface of the hepatic bile ducts was the serosa, which loose connective tissue invested by mesothelium, whereas in attached surface was adventitia. The loose connective tissue of tunica adventitia was composed of blood vessels, adipose tissues, parasympathetic ganglion and nerve fibers (Figure 3).

Figure 3. The tunica adventitia (Ta) of hepatic bile duct of common quails was composed of blood vessels (B), adipose tissues (Ad), parasympathetic ganglion (G), and nerve fibers (N), lumen (L). Hematoxylin eosin × 400

DISCUSSION

In the present study, the histology of the extra hepatic bile duct showed no significant differences according to sex which is in agreement with the results reported by Mobini (2012). The wall of the extra hepatic bile duct in the Coturnix coturnix possessed tunica mucosa, lamina propria-submucosa, tunica muscularis and tunica serosa, which was similar to those of chukar partridge (Mobini, 2012) and guinea fowl (Sivagnanam and Geetha, 2008).

In the common quails the mucous membrane of the hepatic bile duct was thrown into simple folds and covered with an epithelial tissue which consisted of a single layer of columnar cells. Similar results were also reported by Mobini (2012) in the chukar partridge.

Mobini (2012) reported that the mucosal folds of chukar bile duct were irregular and non isometric. Similar findings were observed in this study.

Although some variations were observed in the epithelium of tunica mucosa, but it was mainly lined by non-ciliated simple columnar cells similarly to the findings of Stornelli et al. (2006) in ostrich, Sivagnanam and Geetha.
(2008) in guinea fowl and Mobini (2012) in chukar partridge. The luminal surfaces of epithelial cells which were covered by a continuous striated border of microvilli agree with the results obtained from Dellmann and Eurell (1998) and Mobini (2012).

In the Coturnix coturnix the lamina muscularis was absent in the hepatic bile duct mucosa. This finding mirrors the results of Sivagnanam and Geetha (2008) for guinea fowls and Mobini (2012) for chukar partridges.

In the present study, goblet cells and glands were not found in mucosa of quail hepatic duct which again concords with the findings of Mobini (2012) in Alectoris chukar. However, the epithelial downgrowths were observed in tunica mucosa unlike those of chukar hepatic bile duct.

Previous studies in some avian species reported the numerous diffuse lymphatic aggregations in lamina propria-submucosa of hepatic bile duct (Ciobotaru and Militaru, 2002; Mobini, 2012). Lymphatic aggregations were also observed in this study.

While Mobini (2012) has noticed that the tunica muscularis of hepatic bile duct in Alectoris chukar was composed of a thick layer of circularly arranged muscle fibers, Sivagnanam and Geetha (2008) have reported an outer and inner longitudinal layer and a middle circular layer of smooth muscle fibers in guinea fowl hepatic bile duct. In common quails however, there were an outer circular and an inner longitudinal layer of smooth muscle fibers.

The tunica adventitia of hepatic bile duct in quails agrees with the results obtained from Mobini (2012) and Sivagnanam and Geetha (2008).

It is concluded that the histology of the hepatic bile ducts of the common quail was generally similar to that in chukar partridge except for the tunica muscularis, which consisted of an outer circular and an inner longitudinal layer of smooth muscle fibers. In addition, the epithelial downgrowths were observed in tunica mucosa. No significant sex-based differences were found.

REFERENCES


