

Gross Anatomy of the Celiac, Cranial Mesenteric and Caudal Mesenteric Arteries in Hooded Crow (*Corvus cornix*)

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With 4 figures

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Abstract

The Celiac artery in hooded crow originated from descending aorta. It gives off the proventricular artery, splenic arteries then terminated with the right and left celiac arteries. The right celiac artery detached the right hepatic, left hepatic, gastroduodenal and the right gastric arteries. The gastro duodenal artery supplies the pylorus and duodenum. The right gastric artery gives off the ventral proventricular, dorsal gastric and ventral gastric arteries. The dorsal and ventral gastric arteries supply the gizzard. The left celiac artery gives off the left gastric artery to gizzard, the jejunal branch, duodenal branch, and pancreatico-duodenal artery. The cranial mesenteric artery originated from the descending aorta then gives off the duodo-jejunal artery, ileal branches, jejunal arteries. the duodo-jejunal artery divided into duodenal and jejunal branches. The ileal branches are

the dorsal and ventral ileal arteries. The caudal mesenteric artery arose from the descending aorta then divided into cranial and caudal branches. The cranial branch is distributed in the cranial part of rectum and cecum. The caudal branch supplies the caudal half of rectum, cloaca and cloacal bursa.

Keywords: celiac- cranial mesenteric-artery- crow

Introduction

The Hooded Crow (*Corvus cornix*) is an omnivorous bird species (Cocker et al., 2005). It is an opportunistic predator and scavenger has a wide range of food including grain, small mammals, carrion and rubbish (Coombs, 1978; Yom-Tov, 1974). It is a major predator of bird's eggs and young (Mehlum, 1991; Luginbuhl et al., 2001 and Sullivan and Dinsmore,

1990). The hooded crow is distributed locally in Nile Delta and valley (Mahmoud, 1997). Recent increasing usage of different avian species rather than domestic chicken as models for biological research leads the anatomists to focus their studies on the morphology of these species (Baumel, et al, 1993; Dyce et al., 1996 and McLelland, 1990). Some studies were carried out on the celiac artery of birds like Khalifa (2014). This study aimed to augmenting the knowledge on the gross morphology of arterial supply of viscera in the hooded crow in particular and to compare it with other birds. Therefore, the findings of this study might have a valuable contribution to the avian anatomy and surgery.

Material and methods

The present study was carried out on eight adult apparently healthy hooded crows of both sexes obtained from farms in Ismaillia. Each bird was anaesthetized by IM injection of 0.5 cc of 2% xylazine Hcl (3mg/kg) followed by injection of heparin (Cal Heparin 5000 I.U.) in the wing vein to prevent blood clotting then the bird was exsanguinated through the common carotid artery. The abdomen then was opened and the viscera were displaced to see the descending aorta. The descending aorta then was cannulated and

flushed with normal saline then was injected with gum milk latex coloured with red Rotring ink (Tompsett and Wakelly, 1965). The whole birds then were immersed in a mixture of 10% formalin and 2% phenol and 1% glycerol and were left to 2-3 days in room temperature. The celiac, cranial mesenteric and caudal mesenteric arteries were then dissected. The observations were photographed with Sony digital camera 10 mp. The nomenclature was adopted to the Nomina Anatomica Avium (Baumel et al., 1993)

Results

Celiac artery

It originates from ventral aspect of the descending aorta (Fig 1) under the level of 4th thoracic vertebra, between spleen, lung and right lobe of the liver. It continues between spleen, proventriculus and right lobe of liver till reaching the junction between the gizzard and proventriculus to terminate by two terminal branches; right and left celiac arteries. It detaches proventricular and splenic arteries before its termination.

The **proventricular artery** (Fig 1) arises from the cranial aspect of celiac artery. Just below its origin it gives off esophageal branch to the end part of esophagus and two to four small proventricular twigs, then it continues as dorsal gastric artery

which gives off small fine branch to the proventriculus then it proceeds to end in the gizzard.

The **splenic arteries** (Fig 2) are 8-9 fine arteries arise from the cranial aspect of celiac artery. The 1st branch originated half cm under the origin of proventricular artery while the last branch arises half cm under the origin of hepatic artery

The **right celiac artery** (Fig3) dips between the junction of the proventriculus and gizzard and right lobe of liver then it is directly broken down into five branches 3mm distal to its origin; right hepatic, left hepatic, gastroduodenal and right gastric arteries. The **right hepatic arteries are two branches**(Fig3) supply the right lobe of the liver. The **left hepatic artery** (Fig 3) supplies the left lobe of the liver. The **gastroduodenal artery** (Fig 3) supplies the pylorus and 1st part of duodenum. The **right gastric artery** (Fig 3) gives off three branches: ventral proventricular artery to the right and ventral surfaces of the proventriculus, dorsal gastric artery to the craniodorsal sac of the gizzard and ventral gastric artery to the caudo-ventral sac and cranio-ventral muscle of the gizzard.

The **left celiac artery** (Fig 2) courses between the right side of the caudal pole of the spleen and the left side of right lobe of liver and gall

bladder then passes caudo-ventrally between jejunum, duodenum and pancreas till reaching above the flexure between the ascending and descending duodenum to be continued as pancreatico-duodenal artery. It breaks down into four branches; left gastric, jejunal, duodenal and pancreatico-duodenal arteries. The **left gastric artery** (Fig 2) supplies the caudoventral and dorsolateral muscles of the gizzard. The **jejunal branch** (Fig 2) to the jejunum. The **duodenal branch** (Fig 2) supplies the duodenum. The **pancreatico-duodenal artery** (Fig2) vascularizes the duodenum and pancreas.

cranial mesenteric artery (Fig 4) It is originated from the ventral aspect of descending aorta under the 6th thoracic vertebra. It then directs caudoventrally between ilium on left side, duodenojejunal flexure on right side and kidney dorsally. It proceeds in the same direction to be terminated in the center of jejunal loop by the jejunal branches. It gives off duodeno-jejunal and ileal arteries before its termination.

The **duodeno-jejunal artery** (Fig. 4) arises from the caudal aspect of the cranial mesenteric artery medial to the duodeno-jejunal flexure then directly divides into duodenal and jejunal branches. The duodenal branch (Fig 4) supplies the proximal part of ascending loop of duodenum then

anastomoses with duodenal branch of left celiac artery. The jejunal branch (Fig 4) vascularises the 1st small part of jejunum and anastomoses with the 1st jejunal artery.

The **ileal branches** (Fig 4) are two branches; dorsal and ventral ileal arteries. The **dorsal ileal artery**(Fig4) arises from the cranial aspect of cranial mesenteric artery at the level of duodeno-jejunal artery and directs cranially to supply the most caudal part of the ileum. It then anastomoses with the cranial branch of caudal mesenteric artery. The **ventral ileal artery**(Fig4) arises from the cranial aspect of cranial mesenteric artery about half cm ventral to the dorsal ileal artery. It directs caudally to be distributed in the cranial part of ileum and the most caudal part of jejunum. It anastomoses with the last jejunal artery.

The **jejunal arteries**(Fig4) are about 15-20 branches and are considered as the terminal branches of cranial mesenteric artery. They descend ventrally in the mesojejunum until reaching the mesenteric border of jejunum sending cranial and caudal branches. The cranial branch of each jejunal artery joins the caudal branch of the preceding one to form arterial arches from which numerous fine branches detach running on each side of jejunum until reaching its free border.

Caudal mesenteric artery (Fig 4) It arises from the ventral aspect of the descending aorta at the level of the caudal end of sacrum. It then descends ventrally caudal to the caudal division of kidney and extends for about 1cm in the mesorectum to be terminated by cranial and caudal branches.

The **Cranial branch** (Fig 4) passes cranially on the mesenteric border of the rectum, sending two branches to its both sides. The caudal one distributes in the wall of cranial part of rectum while the cranial one distributes in the wall of most cranial part of the rectum, then extends to supply cecum. The **caudal branch**(Fig4) directs caudally on the mesenteric border of rectum then detaches branches to the its caudal half, cloaca and cloacal bursa.

Discussion

The celiac artery in hooded crow is the 1st visceral branch of the descending aorta like that were recorded by Khalifa (2014) in cattle egret and Kuru (2010); Kutul (2002); Aslan and Takci (1998); Silva et al., (1997); Fowler (1991); King and McLelland (1984) and Lauper et al., (1975) in domestic birds.

The celiac artery in crow originates from ventral aspect of descending aorta like that were recorded in domestic fowl by Kuru (2010), Kurtul

and Dursun (2002), Franz and Salomon (1993), Miladinovic et al. (1986), King and McLelland (1984), Lauper et al. (1975) while Khalifa (2014) in cattle egret, Silva et al. (2005) in chicken, Duzler et al. (2011) in quail, Ragab et al. (2013) in goose. On other hand, Alan et al. (2016) in flamingos stated that the celiac artery originates from the right surface of the descending aorta.

The celiac artery in crow is detached from the descending aorta under the level of 4th thoracic vertebra similar to Khalifa (2014) in cattle egret while, Haligur and Duzler (2010) reported that, the celiac artery arises at the level of the 2-3 ribs. On the other hand, (Kuru, 2010), 2002; Dursun, 2002; Franz and Salomon, 1993; Miladinovic et al., 1986; King and McLelland, 1984; Lauper et al., 1975) mentioned its origin at the 5th - 6th thoracic vertebra in domestic fowl. It originates at the level of the third/fourth thoracic intervertebral junction and the fourth pair of costae in flamingo (Alan et al., 2016)

The celiac artery in hooded crow supplies the end part of esophagus, proventriculus, spleen, liver, gizzard, duodenum and pancreas. These findings were in accordance with Khalifa (2014) in cattle egret and (Kuru, 2010; Kutul, 2002; Aslan and Takci, 1998; Silva et al., 1997;

Fowler, 1991; King and McLelland, 1984 and Lauper et al., 1975) in domestic fowl but these authors mentioned that celiac artery supplied part from ileum in contrary with the present study in addition to that the current work found that the celiac artery detaches esophageal branch that did not recorded by the previous authors.

The 1st branch of celiac artery in crow is proventricular artery similar results reported by Kurtul and Haziroglu (2002), Silva et al. (1997) in rooster, drake, pigeons and geese, Haligur and Duzler (2010) in red falcons and Alan et al. (2016) in flamingo but Kuru (2010) in domestic fowls; Aycan and Duzler (2000) in eagle owl; McLeod et al. (1964) in domestic fowls, Malinovsky (1965) in buzzard, Nickel et al. (1977) in domestic Fowls stated that the first branch from the celiac artery is the esophageal artery. The esophageal artery in crow in the present study originated from the dorsal proventricular artery while Alan et al. (2016) did not record it in flamingo. On the other hand, Duzler et al. (2011) in Japanese quail, Vasconcelos et al. (2012) in ostrich mentioned that the esophageal artery and dorsal proventricular artery originate from the celiac artery with a common trunk.

The splenic arteries originate from the celiac artery or dorsal proventricular artery or left celiac or right celiac

(Malinovsky and Novotna, 1977; Silva et al., 1997; Pinto et al., 1998; Aslan and Takci, 1998; Haligur and Duzler, 2010 and Kuru 2010 in domestic fowl; Duzler et al., 2011 in Japanese quail; Goncalves et al., 2011 in blue-fronted amazon; Geeverghese et al. 2012; Vasconcelos et al. 2012 in ostrich; Ragab et al. 2013 in the domestic goose; and Khalifa, 2014 in the domestic goose). The present study showed that the splenic arteries come directly from celiac artery except the 1st branch which originated from the dorsal pro-ventricular artery and the last branch from the hepatic artery. In flamingos, three splenic arteries arise directly from the celiac artery, and the fourth originates from right celiac artery Alan et al. (2016).

The celiac artery in crow bifurcates into right and left celiac arteries similar to that reported by Malinovsky and Novotna (1977) in domestic fowl; Pinto et al. (1998) in domestic duck; Kurtuland Haziroglum (2004) in rooster, drake, and pigeon; Silva et al. (2005) in female fowls; Kuru (2010) in domestic fowl; Haligur and Duzler (2010) in red falcon; Geeverghese et al. (2012) in domestic pigeons; Vasconcelos et al. (2012) in ostrich. On other hand Chiasson (1982) in pigeon and Aycan and Duzler (2000) in eagle owl did not report that bifurcation.

The right celiac artery detaches right hepatic arteries, gastroduodenal, and right gastric artery. Khalifa (2014) in cattle egret reported that it gave off the ileocecal, gastroduodenal, right gastric arteries and pancreaticoduodenal artery. Kuru (2010) in domestic fowl, Aslan and Takci (1998) in geese, Silva et al (1997), Franz and Salomon (1993) and Baumel (1975) in domestic fowl added that, the splenic arteries, right hepatic artery, ileal arteries also originated from the right branch of the celiac artery.

The left branch of the celiac artery in crow gives off left gastric artery, duodenal branch, jejunal branch and pancreatico-duodenal artery. Khalifa (2014) in cattle egret and Kuru (2010), Haligur and Duzler (2010) and Getty (1975) in domestic fowl reported that it detaches ventral pro-ventricular artery, ventral gastric artery and left gastric artery, that in agreement with Kuru (2010); Haligur, Duzler, (2010), Getty (1975) in domestic fowl and Khalifa (2014) in cattle egret reported that, the left branch of the celiac artery gives off the right hepatic artery.

In agreement with Farag et al. (2013) in turkey, Nickel et al., (1977) and Campos et al. (2006) in the fowl and Pinto et al. (1998) in the domestic duck, the cranial mesenteric artery in crow originates just caudal to the origin of celiac artery.

In hooded crow, the cranial mesenteric artery branches into duodenojejunal, ileal and jejunal arteries like that recorded by Farag et al. (2013) in turkey. Nickel et al. (1977) in fowl mentioned that the first vessel arising from the cranial mesenteric artery is the A. ileocecalis then continues as the truncus jejunalis. Pinto et al. (1998) in the domestic duck described the cranial mesenteric artery as dividing into three branches, the first to colorectum, the second that gives the jejunal arteries and the third to right cecum and ileum.

The ileal branches in hooded crow are two branches; dorsal and ventral ileal arteries. there are 6 ileal arteries in turkey (Farag et al., 2013), 1-4 in the fowl (Santana et al., 2001), 5-13 in bumpkin chickens (Cardoso et al., 2002).

The colic branch of the cranial mesenteric artery or ileocecal artery that observed by Farag et al. (2013) in turkey did not observed in or in any available literatures except Ebada et al. (2006) in the ostrich who's recorded a proper colic artery arising from the cranial mesenteric artery.

The Caudal mesenteric artery in hooded crow arises from the ventral aspect of the descending aorta dividing into cranial and caudal branches. Similar results were reported by Pinto et al. (1998) in the domestic duck, Santana et al. (2001) and

Campos et al. (2006) in the fowl while, Ebada et al. (2006) in the ostrich mentioned that the caudal mesenteric artery gives off 10-12 long branches.

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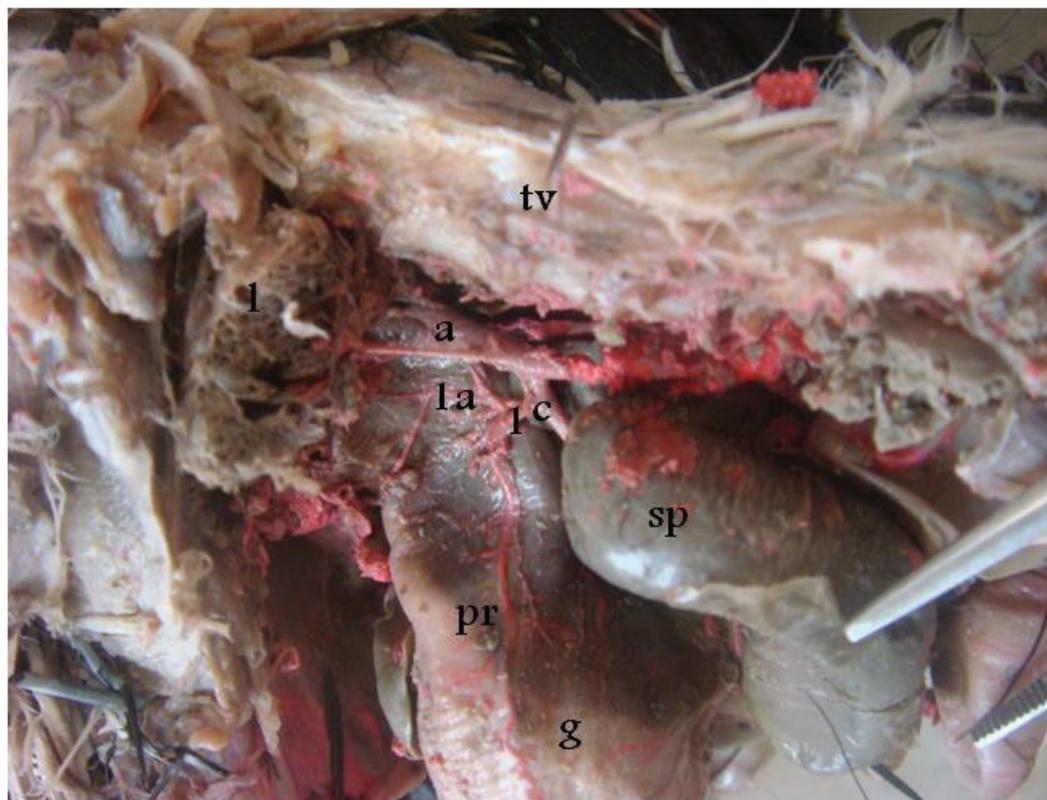


Fig (1): a photograph of opened abdomen of hooded crow showing; a) Aorta, c) celiac, 1) proventricular artery, 1a) oesophageal branch, sp) spleen, pr) proventriculus, g) gizzard, tv) thoracic vertebrae, l) lung

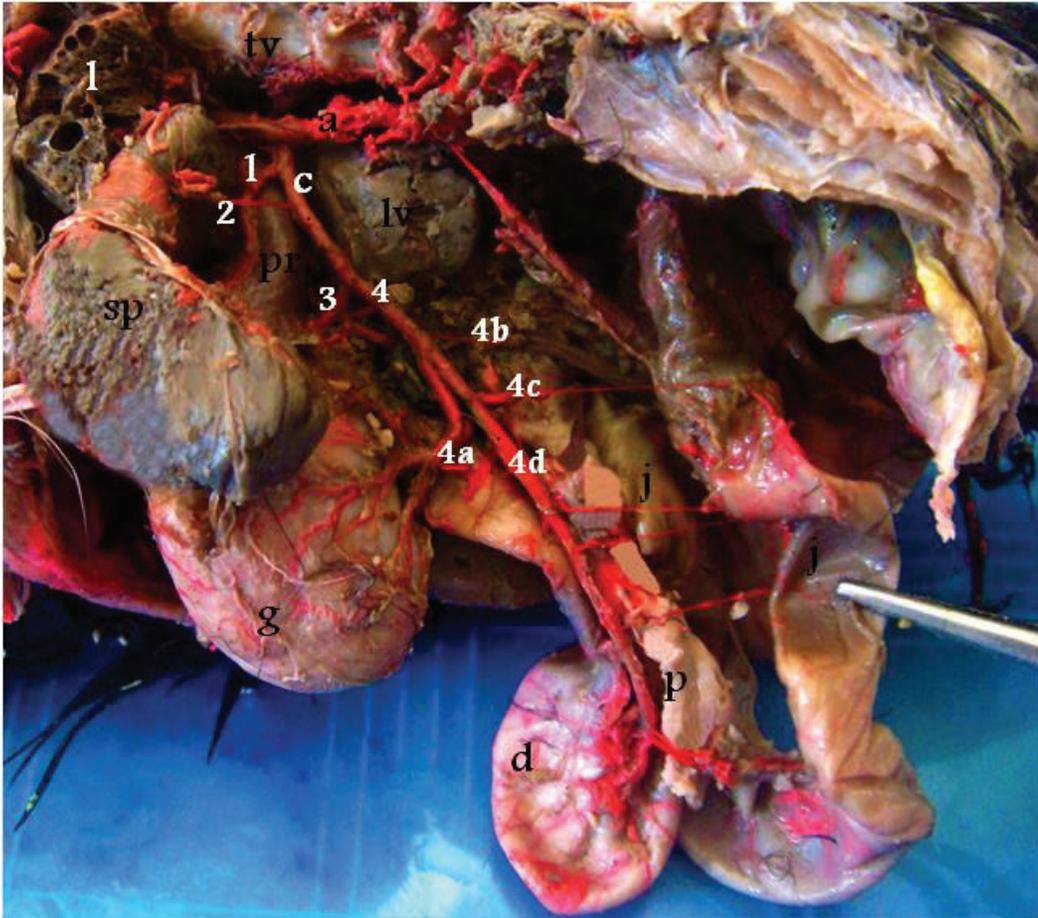


Fig (2): a photograph of viscera of hooded crow showing; a) aorta, c) celiac, 1) proventricular artery, 2) splenic, 3) right celiac, 4) left celiac, 4a) left gastric, 4b) duodenal, 4c) jejunal, 4d) pancreaticoduodenal, l) lung, lv) liver, sp) spleen, d) duodenum, j) jejunum, p) pancreas, tv) thoracic vertebrae, pr) proventriculus, g) gizzard.

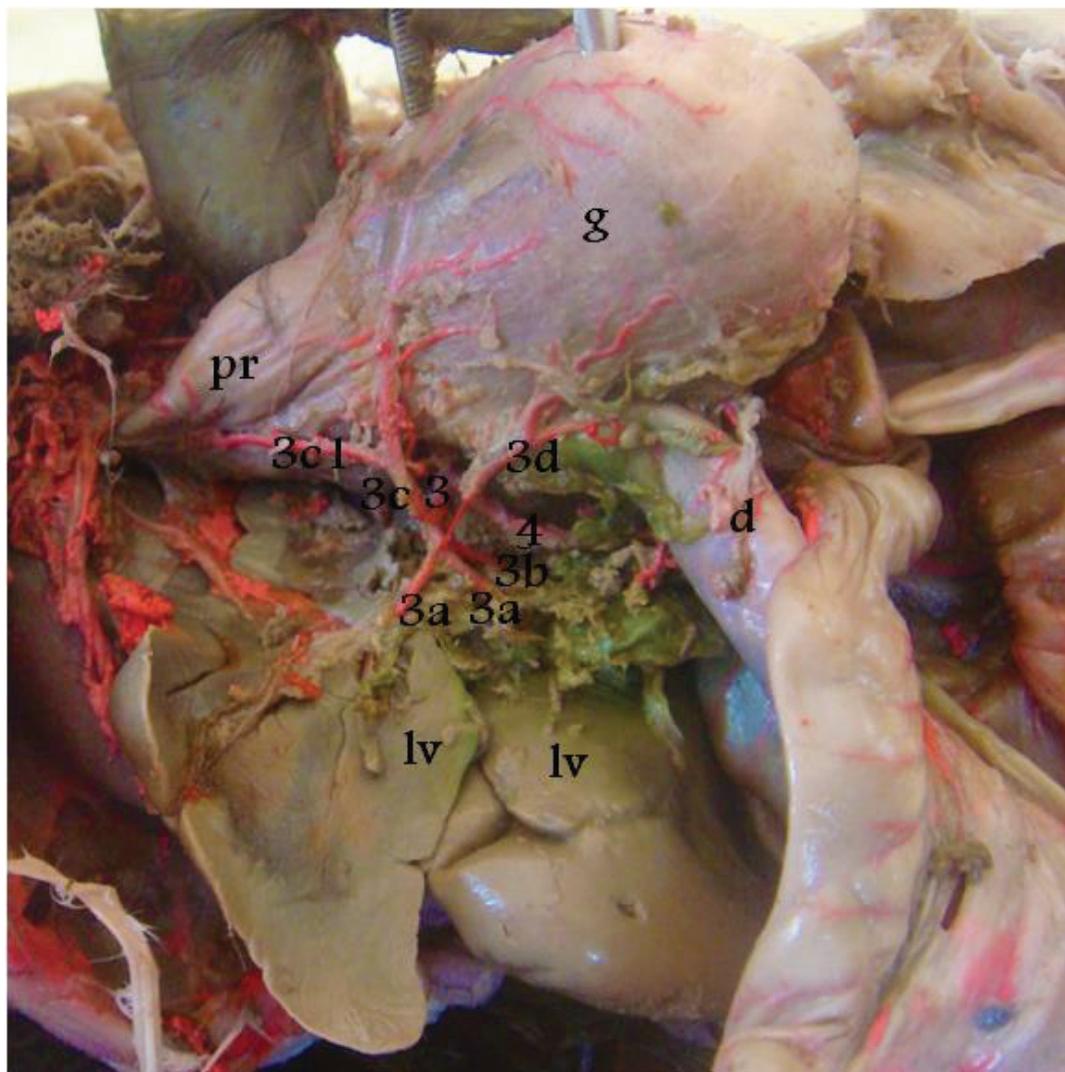


Fig (3): a photograph of opened abdomen of hooded crow showing; 3) right celiac, 4) left celiac, 3a) right hepatic, 3b) left hepatic, 3c) right gastric, 3c1) proventricular branch, proventriculus, g) gizzard, d) duodenum, lv) liver.

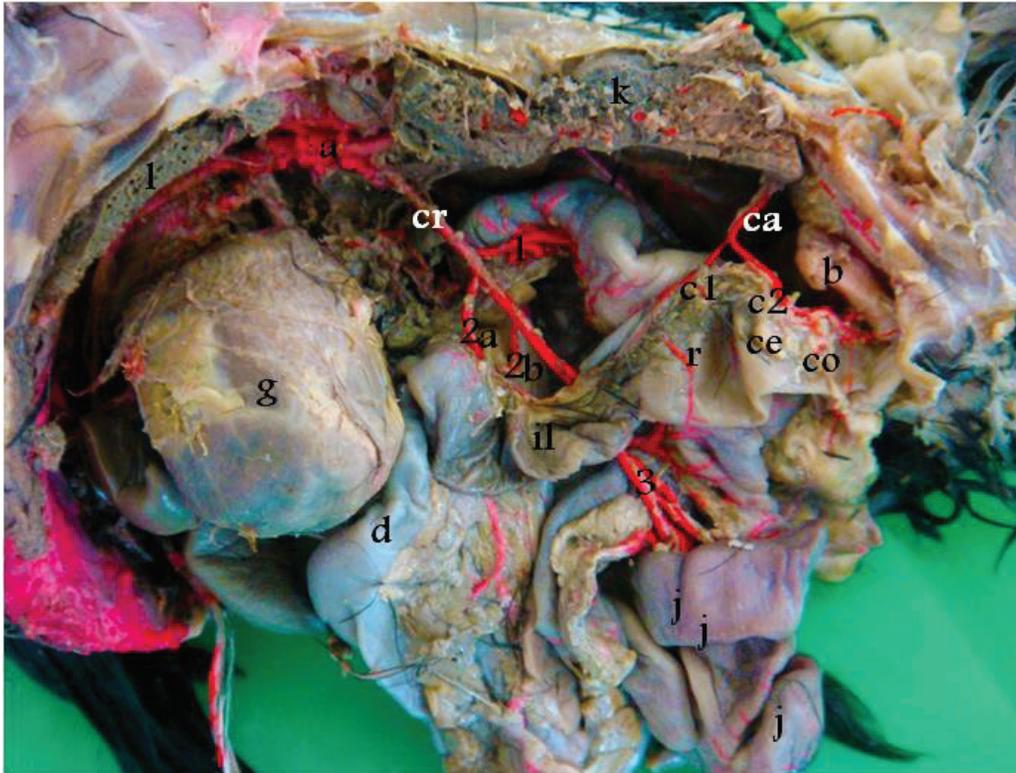


Fig (4):a photograph of viscera of hooded crow showing, a) Aorta, cr) cranial mesenteric artery, ca) caudal mesenteric, 1) duodinojejunal artery, 2a) dorsal ilial artery, 2b) ventral ileal artery, 3) jejuna arteries, c1) cranial branch, c2) caudal branch, g) gizzard, d) duodenum, j) jejunum, il) ileum, ce) cecum, r) rectum, co) cloaca, b) cloacal bursa, k) kidney, l) lung.

Animal species in this Issue

Hooded Crow (*Corvus cornix*)



Kingdom: Animalia & Phylum: Chordata & Class: Aves & Order: Passeriformes & Family: Corvus & Genus: *Corves* & Species: *C. cornix*

Except for the head, throat, wings, tail, and thigh feathers, which are black and mostly glossy, the plumage is ash-grey, the dark shafts giving it a streaky appearance. The bill and legs are black; the iris dark brown. Only one moult occurs, in autumn, as in other crow species. The male is the larger bird, otherwise the sexes are alike. Their flight is slow and heavy and usually straight. Their length varies from 48 to 52 cm (19 to 20 in). When first hatched, the young are much blacker than the parents. Juveniles have duller plumage with bluish or greyish eyes and initially a red mouth. Wingspan is 98 cm (39 in) and weight is on average 510 g.

The hooded crow, with its contrasted greys and blacks, cannot be confused with either the carrion crow or rook, but the *kraa* (help·info) call notes of the two are almost indistinguishable.

Source: Wikipedia, the free encyclopaedia