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Age related morphological change in bursa of Fabricius of chabro bird

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Abstract

The study was conducted on the bursa of Fabricius of 30 Chabro birds. The birds were selected after hatching irrespective of the sex and divided into five groups (0, 30, 60, 90, and 150) days of age. The bursa was located on the dorsal aspect of cloaca. The shape of the bursa was oval and it was creamy white color. Luminal surface of the bursa was occupied by number of large and small folds called plicae. The significant increase in body weight with age advances. The weight, length, width, thickness and plical (length and height) increased significantly up to 4th group and then decreased while plical width start decreasing from 3rd group onwards. The bursal index significantly increased in 1st and 2nd group and then start decreasing and significantly decreased in 4th and 5th group. It is conclude that after 4th group involution in bursa take place in chabro bird.

Keywords: Bursa of fabricious, chabro bird, involution, morphology

Introduction

The bursa of Fabricius, is peculiar to birds, is the dorsal diverticulum of the proctodeal wall of the cloaca [5]. In chicken it is considered to be a 'central or primary' lymphoid tissue and is responsible for the production of B- lymphocytes which causes humoral immunity. It is not only a primary lymphoid organ but also a secondary organ due to the presence of a T cell dependent area i.e. the diffusely infiltrated area which is located on the dorsal bursal duct [2]. The bursa reaches its maximum size at 8–10 weeks of age then, like thymus, it undergoes involution. By 6–7 months most bursae are heavily involuted [2]. Review of literature revealed no information about the age related study on the bursa of fabricius of the Chabro bird. This study will not only reveal their morphogenesis but also provide a firm basis to understand the involuntary process in the bursa of Chabro bird in the face of changing environmental scenario.

Materials and Methods

Study was conducted in the department of Anatomy and Poultry Farm of the U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan, Mathura, Uttar Pradesh, India. The bursa of Fabricius of thirty apparently healthy Chabro bird irrespective of the sex were selected at the time of hatching and grown in separate portions of the same poultry farm. These birds were divided into five groups consisting of six birds in each at 0, 30, 60, 90 and 150 days after hatching. Before the utilization of birds, weight of each bird was taken on digital weighing machine. The abdominal cavities of six birds were opened through the careful dissection and the bursa of Fabricius of each bird was exposed. The location, shape, size and colour of bursa and its relations with adjacent organs were recorded. Morphometrical and biometrical observations viz; on the weight of bursa, length, width, thickness and number of the plicae, length, width and height of plicae were recorded.

Statistical analysis

The data generated were analyzed using analysis of variance of Statistical package for Social science (SPSS for window, V20.0; SPSS Inc., Chicago, IL USA). Significance was determined at $P < 0.05$ and the value are presented in the table.

Results and Discussion

The bursa of Fabricius of chabro bird was located on the dorsal aspect of cloaca and connected to the dorsal wall of the proctodeum by a small stalk in all age groups (Fig-1). This observations was in accordance with [4] in Quail [9], in Khaki Campbell duck [1], in game fowl and [16] in Guinea fowl.

The shape of the bursa of Fabricius was oval in all the age groups (Fig-1). This finding was in agreement with [14, 11] and [16] in Guinea fowl [7], in Turkey and [9] in Khaki Campbell duck. In contrast [6], in White Pekin ducks and [15] in indigenous ducklings reported that the bursa of Fabricius occurred as a cylindrical, caecum like structure with pointed apex in two months old White Pekin ducklings. These differences might be due to breeds and strain variation.

Bursa of Fabricius was creamy white in colour in all age groups of chabro bird. Which was similar to the observations of [14] in Guinea fowl [15]; in Indigenous ducklings and [9] in Khaki Campbell ducks, who reported that the colour of bursa of Fabricius was pale yellowish in colour. But [7] reported that the colour of bursa of Fabricius was pale pink after 5 months of age in turkeys.

The mean body weight and bursal weight has been summarized in table 1. There was significant increase in the body weight of chabro bird from group 1st to 5th group. The body weight of chabro bird increased maximum from group 3rd to 4th group thereafter that it decreased significantly. This observation was in accordance to Singh *et al.* (2006) in Guinea fowl.

The result of mean weight analysis of bursa of Fabricius was summarized in table 1. The bursal weight increased significantly from group 1st to 4th and then decreased significantly in group 5. The maximum bursal weight was observed in group 4th. The maximum increment in bursal weight was noticed between 1st and 2nd group then it was decreased suddenly, it may be due to the involutory process occurred in bursa. Whereas [7] in Turkey and [16] in Guinea fowl recorded the maximum weight of bursa of Fabricius at 4 months of age. While [3] in White Pekin duck reported the maximum weight of bursa of Fabricius at 26-30 days of age, [8] in Broiler chicken reported the maximum weight of bursa of Fabricius at 10 weeks of age. It might be due to the breed, strain nutritional variation [10] in chicks and [14] in Keets reported that the percent increment in weight of bursa also influenced by strain and sex of the bird and rearing method. [12] in White Leghorn and [13] reported in Shaver Cockerels that average weight of bursa reached maximum of 3.21 gm by 9th to 10th weeks.

The mean bursal index were summarized in table 1. There was significant increase in bursal index from group 1st to 2nd and 3rd and 4th and where as significantly decreased from 4th to 5th group. In the present study the body weight was positively correlated with bursal index upto 2nd group ($p < 0.05$). Simillar observations were made by [16] in Guinea fowl. After 3rd group bursal index was negatively correlated with weight and it was in total agreement with [7] in Turkey.

The result of the bursal length, width, and height were summarized in table 2. The significant increase in these values were observed from 1st to 4th group and then significantly decreased ($p < 0.05$). The highest values of these parameters were observed in 4th group and maximum time increment of these values were observed between 1st and 2nd group this regression may be due to involutory process. Whereas [14] in Guinea fowl and [9] in Khaki Campbell duck reported that average length increased linearly up to 4th weeks

of age [9] documented the length of bursa at 1st, 2nd, 3rd and 4th weeks 13.43 ± 0.17 mm, 17.06 ± 0.03 mm, 22.49 ± 0.09 mm and 27.01 ± 0.06 mm, respectively [15] reported that the breadth of bursa was 0.53 cm in 21 day duckling of Bangladesh [6]. who stated that the diameter increased upto 58 days and then steadily decreased upto 155 days in White Pekin ducks and [7] in Turkey reported that the diameter of the bursa of Fabricius increased gradually and reached the maximum of (17.73 ± 1.31 mm) at six months of age. Afterwards it gradually decreased with increase in age. These differences might be due to the variation in the age, breed, strain and nutritional status.

The luminal surface of the bursa of Fabricius in Chabro bird was occupied by number of large and small folds called plicae (Fig-2). The similar observations were made by [6] in White Pekin ducks and [7] in Turkey; [16] in Guinea fowl. In the present study the number of larger plicae folds were 13 in number in 1st, 2nd, 3rd and 4th group whereas in 5th group it consisted of 9-11 plicae, only. These findings were in accordance with the findings of [7] who found 11-13 plicae in Turkey and [1] in game fowl who found 12 plicae in Game fowl. Whereas [16] in Guinea fowl reported that the number of plica varied with sex and age of bird. It gradually increased and reached maximum 16 in male and 15 in female at 2 months of age and during involution the plicae were indistinguishable. [11] in Helmeted Guinea fowl and [14] in Keets also mentioned the numbers of plicae in each species. The result of plical length, height and width has been summarized in table 3. These values significantly increased upto 4th group and then significantly decreased in 5th group. The highest spurt of these observations were observed in 4th group and maximum time increment were observed between 1st and 2nd group (table 3). As observed by [1] in Game fowl.

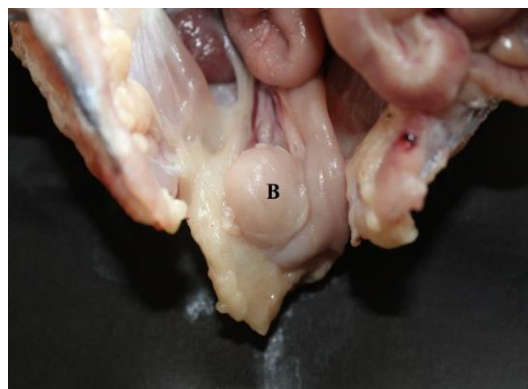


Fig 1: Photograph of bursa of Fabricius of 30 days old chabro bird showing insitu position of bursa of Fabricius (B).



Fig 2: Photograph of normal bursa of Fabricius of 90 days old chabro bird plicae.

Table 1: Showing age related changes in body weight, bursa weight, bursal index, increment in body weight and weight of bursa of Fabricius in chabro bird.

Parameters	1 st Group	2 nd Group	3 rd Group	4 th Group	5 th Group
Body weight (gm)	37.97 ± 1.86 ^a (33.65 - 44.42)	414.68 ± 17.68 ^b (376.00 - 475.00)	980.83 ± 43.66 ^c (820.00 - 1122.00)	1575.2 ± 139.92 ^d (1033.00 - 2040.00)	1994.2 ± 185.30 ^e (1400.00 - 2660.00)
Bursa weight (gm)	0.446 ± 0.003 ^a (0.04 - 0.06)	1.47 ± 0.064 ^b (1.25 - 1.68)	2.00 ± 0.27 ^b (1.30 - 3.15)	3.27 ± 0.35 ^c (2.14 - 4.67)	1.83 ± 0.22 ^b (1.26 - 2.60)
Bursal Index (%)	0.12 ^a	0.36 ^b	0.20 ^c	0.27 ^b	0.09 ^d
Increment in body weight (Times)	-	10.92	2.36	1.6	1.26
Increment in bursa weight (Times)	-	3.29	1.36	1.63	-1.78

Note:

1. Values in parentheses indicate ranges.
2. Different superscript shows significant change in values and similar superscript shows non-significant change in values between the groups

Table 2: Showing age related changes in bursa length, width, height, and increment in bursa length, width, and height of bursa of Fabricius in chabro bird.

Parameters	1 st Group	2 nd Group	3 rd Group	4 th Group	5 th Group
Bursa length (mm)	5.76 ± 0.23 ^a (4.96 - 6.55)	15.94 ± 0.58 ^b (14.68 - 18.70)	17.99 ± 1.14 ^{bc} (14.10 - 20.91)	19.85 ± 0.63 ^c (17.70 - 21.41)	15.88 ± 0.74 ^b (13.83 - 19.04)
Bursa width (mm)	4.84 ± 0.18 ^a (4.14 - 5.20)	12.14 ± 0.40 ^b (10.42 - 13.11)	12.79 ± 0.50 ^b (11.27 - 14.70)	16.14 ± 0.71 ^c (14.03 - 18.45)	13.09 ± 0.56 ^b (11.66 - 15.37)
bursa height (mm)	2.02 ± 0.16 ^a (1.70 - 2.55)	10.14 ± 0.29 ^b (8.80 - 10.75)	11.55 ± 0.50 ^c (10.45 - 13.41)	13.91 ± 0.28 ^c (13.13 - 14.67)	11.03 ± 0.77 ^{bc} (8.65 - 13.87)
Increment in bursa length (Times)	-	2.76	1.12	1.1	-1.25
Increment in bursa width (Times)	-	2.5	1.05	1.26	-1.23
Increment in bursa height (Times)	-	5.01	1.13	1.2	-1.26

Note:

1. Values in parentheses indicate ranges.
2. Different superscript shows significant change in values and similar superscript shows non-significant change in values between the groups

Table 3: Showing age related changes in plicae length, height, width, and increment in plical length, height and width (in times) of bursa of Fabricius in chabro bird.

Parameters	1 st Group	2 nd Group	3 rd Group	4 th Group	5 th Group
Length of plicae (mm)	3.31 ± 0.09 ^a (1.26 - 5.25)	12.47 ± 0.17 ^b (9.12 - 15.71)	14.35 ± 0.28 ^c (7.88 - 20.47)	15.33 ± 0.27 ^d (11.31 - 20.12)	13.85 ± 0.54 ^c (8.38 - 20.86)
Height of plicae (mm)	1.20 ± 0.03 ^a (0.33 - 1.79)	3.70 ± 0.09 ^c (2.16 - 6.51)	3.72 ± 0.12 ^c (1.77 - 5.98)	4.15 ± 0.13 ^d (2.09 - 7.69)	2.68 ± 0.12 ^b (1.20 - 4.86)
Width of plicae (mm)	0.39 ± 0.01 ^a (0.12 - 0.68)	1.38 ± 0.03 ^b (0.89 - 2.24)	1.31 ± 0.05 ^b (0.69 - 2.87)	1.64 ± 0.04 ^c (0.94 - 2.43)	1.74 ± 0.07 ^c (1.03 - 2.93)
Increment in plical length (Times)	-	3.76	1.15	1.06	-1.1
Increment in plical height (Times)	-	3.08	1	1.11	-1.54
Increment in plical width (Times)	-	3.53	-1.25	1.05	1.06

Note:

1. Values in parentheses indicate ranges.
2. Different superscript shows significant change in values and similar superscript shows non-significant change in values between the groups.

Conclusions

Analysis of statistical data revealed that all the biometrical parameters increased significantly from group 1st to 4th afterwards there was significantly decreased was noticed in group 5th, maximum growth occurred upto 2nd group. From this study it can be inferred that growth of bursa was highest in 4th group afterwards involution takes place.

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